Kids Talk Technology: Strategies for Teachers

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Abstract

The paper explores five strategies that can be applied to a range of contexts to assist teachers to facilitate quality student conversation in technology education. Classroom conversations are core to establishing successful learning for children. In an effort to identify key elements of productive conversation this paper explores children' conversations in technology education in the primary classroom and suggests some strategies for facilitating higher level conversations. The research, which informed this paper, used a qualitative methodology that paid particular attention to the social nature of the classroom. Participants worked across two technology units of work over the period of a year, where a number of strategies were trialled to enhance the quality of conversation.

Keywords*: Classroom talk, Technology Education, Intercognitive Conversations, Interthink.*

Introduction

Classroom conversations are core to establishing successful learning for children for two main reasons. The first, being to deepen dialogue between teachers and children, to assist teachers' insight into their children' thinking and understanding. This enables teachers to adjust planning and teaching to the meet specific needs of their children. The second is that through engagement in dialogue with peers and teachers, children are able to expand their understanding and knowledge.

The New Zealand Curriculum (NZC) (Ministry of Education, 2007) encourages teaching approaches that are proven to have a positive impact on children' learning. These include creating a supportive learning environment, encouraging reflective thought, enhancing the relevance of new learning, the facilitation of shared learning, making connections to prior learning and experiences and providing sufficient opportunities to learn (p35). It is apparent that these strategies are all a natural part of quality classroom technology practice. We can surmise therefore that technology is well placed to motivate and engage children. Classroom talk plays a significant role in the successful implementation of effective teaching and learning. In this paper five strategies are investigated in relation to the facilitation of classroom talk. These strategies are: No Hand-up. Talking Partners, Collaborative Pros, Cons, Questions (PCQ), Questions as Statements-Tue or False and Icon Prompt. This study aimed to advance research in the area of learning in technology by studying children from two primary year levels carrying out the same or very similar technological practice. Insight was gained into how specifically structured strategies contribute to children's understanding within technological practice, towards technological literacy and the types of talk that facilitated this process.

Classroom Talk

During interaction between people oral language is a central aspect of cognitive, social and cultural development within a sociocultural paradigm and is more than a way of expressing ourselves (Burr, 1995; de Rosnay & Hughe, 2006). Oral language provides both the process and the product for cognitively focussed interactions and takes on a theoretical perspective of *socially constructed learning* (Fleer, 1995; Garcia-Mila, 2013). As oral communication takes place people are involved in the process of constructing and reconstructing themselves. Single utterances may mean different things to different people implying that there is potential for conflict and disagreement (Burr, 1995; Garcia-Mila, 2013). The significance of any given utterance must be understood against the background of language, with the actual meaning determined against a background of other utterances and actions (Bakhtin, 1981). Burr (1995)

cited a simple example: when asking the question "Does he take sugar?" to a parent about their child we could consider the question quite acceptable. On the other hand when asked to the wife of a blind man in his presence the same question could be considered insulting and demeaning. The same words have a different meaning when the situation and the people change.

Dialogue

Dialogue can be described as much more than oral language or talk; it is rather the relation with another or others. Not all talk is dialogue and not all dialogue is talk. It is complex and dynamic and often involves very different cultures, perspectives, ideas and people. Dialogue generally involves the use of words and it requires engagement with people (Mercer & Littleton, 2007; Shields & Edwards, 2005). Mercer and Littleton (2007) used a specific definition with focus on 'the discussion that takes place during the course of education activities'(Mercer & Littleton, 2007, p. 1). It is argued that teachers need to engage in quality dialogue with children and parents to help them make sense both cognitively and experientially of the world in which they live and work (Mercer & Littleton, 2007; Shields & Edwards, 2005). When people work together in problem solving situations they do much more than just talk together. They "inter-think" by combining shared understandings, combining their intellects in creative ways that often reach outcomes that are well above the capability of each individual. Problem solving situations involve a dynamic engagement of ideas with dialogue as the principle means used to establish a shared understanding, testing solutions and reaching agreement or compromise (Mercer & Littleton, 2007 (Mercer & Littleton, 2007). Dialogue and thinking together are an important part of life and one that has long been ignored or actively discourage in schools (Mercer & Littleton, 2007). Clarke (Gibbs, 2014) and Gibbs (2014) suggests that dialogue is a key component of effective formative assessment, however research has shown that a great deal of teacher interaction with children is about management rather than learning (Fleer, 1995).

People engaged in conversation normally establish a collective purpose or grounding for the conversation (Clark & Brennan, 1991). There are very clear implications here for technology given the collaborative nature of problem solving required to develop technological outcomes.

Sociocultural Conflict Theory

Socio-cognitive conflict sees conflict as an essential ingredient of any joint involvement to bring about cognitive change. Doise and his colleagues (Doise, Mugney, & Perez, 1998; Doise & Mugny, 1984) have demonstrated that children working in pairs can solve problems at a more advanced level than those working by themselves (regardless of the ability of the partner). These studies revealed that when coming up against an alternative point of view (not necessarily the correct one) in the course of joint problem solving the children were forced to coordinate his or her own viewpoint with that of another child. The conflict could only be resolved if cognitive restructuring took place and therefore mental change occurred as a result of social interaction. When children were actively engaged in defending their particular view, and reasoning with other individuals, they experienced confrontational socio-cognitive conflict. The mental restructuring that followed allowed each partner to adopt an approach to this specific class of problem that is more advanced than that adopted previously when working as an individual (Lave & Wenger, 1996). These findings have significant implications for technology especially when children are working collaboratively with peers and /or stakeholders, towards an agreed upon or shared outcome.

Intercognitive Conversations

Intercognitive conversations describe the nature of talk where all participants learn through interaction and associated reflections. In this study when participants were learning in, and about, a common context and engaged in constructive talk or dialogue they actually assisted each other. While doing this, they also advanced their own knowledge in and about technology

(Fox-Turnbull, 2013). Debate, argument and or disagreement also assisted children's understandings in technology when participants were open to change and new ideas. In situations where conflict arose, and because in technology children are often developing one outcome per group, they have to find a single solution, which means either they accept others' ideas or reach a compromise (Fox-Turnbull, 2013).(de Rosnay & Hughe, 2006; Uwe, 1998)

Through dialogue with each other, children were able to take their knowledge and skill development further than they would have been able to do individually. This was exemplified by Rex (aged 6) who early in the study identified that working in his group was difficult but in the final focus group interview stated that working together the group had achieved more than he could have by himself. This has important implications for planning and teaching in technology. Talk is a vital component of learning. Teachers need to plan for and teach children to talk constructively, using debate and discussion as a tool for advancing understanding. During the initial stages of the project children also need to be taught how to listen to and accept others' ideas without necessarily agreeing with them. Teachers may further need to assist children to understand that, although their own ideas are not always accepted, their contribution is still important.

Methods

This was a qualitative study that paid particular attention to the social nature of the classroom. In the study data was interpreted to identify detailed aspects of the nature of classroom talk in technology. To do this many hours were spent in two classrooms, one Year 2 with six and seven year olds and one Year 6 with ten and eleven year olds, over the period of a year, during the delivery of two technology units. Each unit delivery involved the planning and implementation of a different predetermined whole school theme. Observations and oral recordings were taken, children and teachers were interviewed and teachers' planning and children' work samples were also analysed to develop a deeper understanding of the nature of classroom talk in technology education. The study took place in an urban New Zealand primary school.

Stimulated Recall using autophotographs was one of the research tools employed in this research. The participants were given disposable cameras to record their own technological practice. The autophotographs generated by the children were then used to stimulate discussion about their technological practice.

Higher Order Strategies to Enhance Talk

Throughout the study five strategies to develop higher order conversation were deployed with the children, some with both groups of children and others with one. These strategies included: *No Hands Up, Talking Partners, Collaborative PCQ, Questions as Statements-True or False* and *Icon Prompt*. In the sections below each is defined and illustrated with examples from the study.

No Hands Up and Talking Partners

The first and second strategies implemented in the study were done so in unison for reasons that will become obvious.

No Hands Up

Clarke (2005) found that even when an open question is asked children begin thinking but stop as soon as the first hands go up. Many children experience this so frequently that they eventually stop trying to think about the answer because of the constant interruption and they develop the belief that they are less able than their peers. In a *No Hands Up* classroom children move towards a solution (Clarke, 2008). When implementing this strategy all children are asked questions as before, but they are told that anyone may be called on to answer the question. To avoid the 'I don't know' response teachers are best to avoid recall questions, aiming to ask open

questions or questions about children' opinions or feelings, which avoid the right or wrong scenario (Clarke, 2005). After time to think children are asked randomly for their thoughts.

Talking Partners

Often paired with *No Hands Up*, *Talking Partners* are an effective way to instigate discussion with a range of questions for children to respond. After the asking of the question and before responding publically, children to talk to a randomly preselected talking partner for 30 seconds to one minute. The answers are then gathered from pairs using *No Hands Up* with one of the pair being the spokesperson; an emphasis is placed on a pair response rather than an individual response. This strategy allows children to think and articulate their understandings before speaking in a public domain such as to the whole class. It also enables shy less confident children to have a voice when in traditional settings they may not have the opportunity or feel confident to do so.

The organisation and training of talking partners is essential regardless of age. Clarke (2005) suggests a number of guidelines and rules for *Talking Partners*:

1. Talking Partners have to be randomly set and changed regularly to ensure children experience different ideas and personalities.
2. A typical time slot about three weeks. When picked the children will sit next to their new talking partner. If they are working in ability groups then they obviously need a talking partner within their group, for example they may have three talking partners at a time, one for maths- within their group, one for reading within their group and one for all other times.
3. Teachers need to ensure children know who they are talking to. For junior children an imaginary 'magic spot', a predesignated place in the classroom, for each pair helps cement who they are working with.
4. Teachers should model how to talk with their talking partner creating a set of class rules from the demonstration.

Suggested rules for talking partners include:

1. look at your partner when they are talking
2. look interested, nod occasionally
3. don't fidget or let other things distract you
4. let you partner express his or her views
5. think about what the partner is saying
6. sometime "let go" of what you want to say if you think your partner's train of thought is interesting
7. stay focused, try to be clear about what you mean when you speak
8. say more than one or two words
9. be prepared to compromise or constructively persuade (Clarke, 2005).

In order to facilitate intercognitive conversations the classroom teachers set up a classroom culture of *No Hands up* and *Talking Partners*, both implemented simultaneously. After they have had an opportunity to discuss their responses to the questions the teachers randomly selected children to share their conversations with the rest of the class. Children selected responded on behalf of their pair. The questions below followed a class visitor from a local theatre speaking about props and the showing of video of a stage play. The children's task was to design and make props for their school production.

Year 2:

1. Why are props important to a stage play?
2. If your bedroom was to become a scene for a play which things would be the most important props? Why?
3. How do props make plays better?
4. Of the props the theatre prop manager showed us which one was the best and why? (Figure 1 shows two of those brought)

Year 6:

1. Imagine a play in which there is a scene with children having dinner in front of the television watching their favourite show.
    i. What props would be needed?
    ii. What would they be made of?
    iii. Rank them according to their significance
2. What attributes would the props need to display if the play was being repeated for five consecutive nights?
    i. Justify the inclusion of each one.

The Year 2 teacher indicated in her final interview that she intended to continue to use both of these strategies in the future. She also noticed significant change in one member of the class particularly Issy, a very shy child who had previously never contributed to oral discussion in class. During the course of the technology units she began to contribute regularly. Fleur indicated that she realised that Issy knew a great deal and had a lot to offer but had not been given the opportunity nor felt comfortable enough to do so on previous occasions.

Collaborative PCQ

The third strategy used in the study was *Collaborative PCQ*. This is a strategy used to facilitate critical thinking, it is used to analyse a potential decision before finalising it. PCQ is offered to children as a three columned template, as see in Figure 1, where children, note their responses in groups. The ‘Pros’ column invites them to list all the benefits, strengths, pluses, advantages of an idea from as many points of view as possible. The second column ‘Cons’, deals with the negative aspects, contra- ideas and disadvantages and weaknesses of a decision or idea. The ‘Questions’ column offers an opportunity to ask questions, engage curiosity or probe the ‘what ifs’. To help develop the divergent thinking stems such as ‘I wonder…’ ‘What if…’ or ‘It would be interesting to know…’can be used for the ‘Questions’ column. This column allows teachers to see children who have remarkable insight into designs or issues.

PCQ Idea:_____ **Name**

Pros	Cons	
List all the benefits, strengths, plusses, advantages of an idea from as many points of view as possible.	*List all the negative aspects, contra ideas, disadvantages, weaknesses of an idea from as many points of view as possible.*	*Offers probing 'I won 'What 'It wou*

Figure1 Teacher template of the PCQ chart

At Year 6 this strategy was used on two occasions during the props unit. The first was to critique existing pictures of existing props. Figure 2, Alan's autophotograph illustrates an example of some pictures that were used for the children to critique a range of objects as potential props. In his stimulated recall interview Alan stated "It [the PCQ activity] helped us think about what we needed to do to make our props".

Figure 2 Alan's autophotograph of the props pictures studied

Later in the unit the children also undertook a *Collaborative PCQ* about their own designs. This activity could also be used to assist children's critique of their peers' designs from other groups. Using the PCQ of his actual design Alan was about to tell the researcher about his design "I think it was that it was going to be strong because it was going to be made out of wood, so

strong and durable. The bits of wood weren't too big so they were rounded so it would fit into someone's hand."

Questions as Statements-True or False

In this strategy questions are each turned into statements, which the children are asked to discuss and either 'Agree' or 'Disagree' with and justify their response. Prior to the children presenting and justifying their responses they are given an opportunity to talk about their thinking with their talking partner. This strategy offers an excellent opportunity to justify thinking and foster high quality discussion.

The Year 2 teacher used the *Questions as Statements-True or False* strategy. She developed a series of statements, and gave them to the class one at a time. The statements included:

1. props need to be small
2. a thimble is a good prop
3. a banana cannot be a prop
4. a pencil sharpener as a prop needs to be small.

After *Talking Partner* discussions the children shared their ideas with the class. On occasions pairs of children successfully justified opposite opinions. The first was when one pair identified 'props needed to be small' as true because of the size of related and relative props. Another group argued the statement to be false because small props were difficult for the audience to see - recalling what the visitor from the local theatre company had said. This is exemplified in the extract below:

Teacher:	A pencil sharpener as a prop needs to be small. Agree or disagree?
Jamie:	Agree because if you had a big pencil sharpener you would need to have a big pencil
Eddie:	Disagree because if it was small you would [not] see it

This illustrates the flexibility and critical thinking involved in such as activity. These children learned that opposing views can be argued as correct depending on the position of the stakeholder or other people involved.

Icon Prompt

The final strategy discussed in this paper is *Icon Prompt* used to engage children in debatable topics and allowing them to see issues from a variety of perspectives. The perspectives used in this study can be seen in Table 1. A different icon is used for each perspective. The children are given an icon representing a feeling, perspective or viewpoint for them to take.

Table 1 *Icons Used in Icon Prompt Strategy (I T C Publications, 2006)*

☺	Who stands to gain or benefit? Who is happy about the current situation?
☹	Who stands to lose? Who is unhappy with the present situation?
$	What are the money aspects of the issue? Who will pay? How much will it cost? (not used in this study)
?	What are the unasked/unanswered questions? Are there any other issues linked to this topic/ situation?
	How does this affect me? How does this link to what I already know?

During the *Icon Prompt* activity (I T C Publications, 2006) the children worked in their groups of three. The following extracts are comments from the Year 2 children engaged in the activity. The icons in front of each statement indicate the perspective of each comment.

☺ Jayda: The wings we made them ourselves.

☺ Anne: Because looking at the criteria we have achieved.

☺ Anne: The wings to make them the same and make the tail a bit stronger.

☹ Lauren: Change the other side so that it was the same

☹ Moke: The edge because it is messy.

☹ Lauren: Cutting out the fins.

? Debby: Everyone wanted different shaped fins and it was hard.

? Jayda: Wings paint them and make them straight.

? Finn: Not working by myself.

♥ Finn: I feel happy because the biggest challenge was not working by myself.

♥ Rex: I am feeling happy because we made it big so the audience could see it.

♥ Jesse: Happy because I really liked papier-mâchéing.

This extract illustrates the use of the *Icon Prompt* strategy to facilitate children's evaluation of their final outcome. They were able to comment on their technology practice using a range of ideas and considerations.

Engaging children in activities such as those outlined above facilitates their evaluation and synthesis of ideas to new situations (I T C Publications, 2006). This is particularly useful in technology when children are designing technological outcomes for other clients and stakeholders.

Conclusion

Higher order teaching strategies foster learner focussed conversations, enable children to articulate ideas in a low risk environment before sharing with a wider audience, assist children to draw from a range of views to enhance their design ideas and improve their technology practice and the quality of child designed technological outcomes through critique and honest evaluation. This paper outlines five strategies that have proven successful in facilitating higher order thinking and conversation in technology education in the primary classroom, however as the Ministry of Education (2007) reminds us, one size does not fit all. "Since any strategy works differently in different context for different children, effective pedagogy requires that teachers inquire into the impact of their teaching on their children" (p. 35).

The findings indicate that children's conversations have a significant impact on their learning in technology. This learning comes in a range of forms and types, and includes not only direct content knowledge but also process knowledge and knowledge about ways to behave and collaborate with others. Understanding this can assist teachers to develop children's thinking through the implementation of a range of teaching strategies.

This study showed that learning can be facilitated through the careful implementation of planned and focused strategies that facilitate dialogue with peers enabling child engagement in the synthesis, analysis and evaluation of knowledge and skills (Bloom, 1956). This study has demonstrated that children' technological knowledge, skills and outcomes were considerably enhanced through engagement in these planned learning strategies.

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