

The effects of training teachers in specific questioning strategies on students' discourse and learning during cooperative learning

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Background to the Study

- Cooperative learning provides opportunities for students to dialogue together -> social and academic benefits (Johnson & Johnson, 1990; Slavin, 1995, Sharan & Shaulov, 1990)
- Both social and individual constructivism emphasise the importance of social interaction (Piaget, 1950; Vygotsky, 1978)
- Social interaction provides opportunities for students to use language to explain new experiences and realities and construct new ways of thinking and feeling (Mercer, 1996)

Concerns

- Students rarely engage in high level discourse (Melothe & Deering, 1999)
- King (1999) found that students generally do not elaborate on information, do not ask thought provoking questions, or use relevant prior knowledge and experiences
- Students are rarely asked cognitively challenging questions by their teachers where they are required to justify their positions (Galton et al., 1999)
- Teachers have a propensity to engage in initiation-response-feedback exchanges typical of the *who, what, when, where*, and *why* style of questioning.

Promoting student discourse

- Students only engage in high quality discourse when they have to provide reasons for their conclusions (Chinn, O'Donnell, & Jinks, 2000)
- Zuckerman et al.(1998) argued that the ability to ask and answer questions is stimulated by the adult so the answer supplied must induce the student to seek additional knowledge
- Webb & Mastergeorge (2003) identified the characteristics of effective helping.
 - (a) Help seekers needed to: Ask precise questions, persist in seeking help, and apply the explanation received.
 - (b) Help givers needed to: Provide detailed explanations, help the recipient apply the explanation, and monitor the recipient's understanding

Strategies that promote students' higher-level, complex thinking

- **The Ask to Think-Tel Why model of transactive peer tutoring** (King, 1997)
- The Ask to Think-Tel Why model – 5 types of questions:
 - (1) Review questions: *Describe... in your own words.*
 - (2) Probing questions: *Tell me more about...*
 - (3) Hint questions: *Have you thought about...*
 - (4) Intelligent-thinking questions: *What is the difference between...and ...?*
 - (5) Self-monitoring questions: *Have I covered all the points I need to?*

Cognitive Tools and Intellectual Roles

- **Cognitive Tools and Intellectual Roles** (Palincsar & Herrenkohl, 2002)
 - (1) **Cognitive tools:** (a) predicting, questioning, clarifying, and summarising
 - (2) **Intellectual roles:** Audience roles. Student provide feedback on how well the group predicted and theorised their work, how succinctly they summarised their results, and how they related their predictions and theories to their results.

Teacher's role in promoting student discourse

- Teachers need to explicitly teach students how to dialogue together so they learn to ask and answer questions and provide detailed feedback
- Teachers need to engage students in meaningful discussions
- Teachers have the potential to help students make their thoughts, reasoning, and knowledge explicit (Rojas-Drummond & Mercer, 2003)
- Teachers can be taught to challenge students' thinking and scaffold their learning (Gillies, 2004)

Research Questions

- Do teachers who have been trained to use specific communication strategies designed to challenge students' cognitive and metacognitive thinking demonstrate more verbal behaviours that challenge and scaffold students' learning than their untrained peers?
- Do students who work in cooperative groups where their teachers have been trained to use these specific communication strategies engage in more elaborative and help-giving behaviours than students who work in groups where their teachers have not received such training?
- Do students in the above teachers' classrooms obtain higher scores on follow-up reasoning and problem-solving activities?

Study design

- Comparative study on the effectiveness of training teachers to implement cooperative learning and specific communication skills in comparison to teachers who implement cooperative learning or small-group work only
- Three conditions: Cooperative + Communication (n = 18); cooperative (n = 16); small-group only (n = 17)
- Participants: 51 teachers (grades 5-6 across 17 schools) and students from these teachers' classrooms
- 2 groups of students from each teacher's classroom were audiotaped during their small group discussions

Training for conditions

- 2 days of workshops for all conditions
- Cooperative + communication training (skills for teachers to challenge and scaffold students' learning + Exploratory Talk, Ask to Think-Tel Why & Cognitive Tools & Intellectual Roles for students)
- Cooperative condition (key elements of cooperative learning)
- Small group condition only (strategies to promote effective learning & teaching – multiple intelligences, peer tutoring, strategies for including students with disabilities/learning difficulties) + ways of grouping students but not trained in cooperative learning

Communication skills for Teachers

- Probing & clarifying ideas
 - *Can you tell us a bit more about...?*
 - *Have you thought about...?*
- Acknowledging & validating
 - *I like that word. It creates a sense of mystery about the plot.*
- Confronting discrepancies & clarifying options
 - *I'm not sure I understand what you mean by that. Can you explain what you mean?*
- Tentatively offering suggestions
 - *Have you thought about...?*

Measures

Teachers' verbal behaviours:

1. **Control:** instructing, directing, commenting on effort
2. **Discipline:** individual, group, class
3. **Mediates:** paraphrases, prompts, challenges, scaffolds
4. **Encourages:** Praises students, encourages interactions
5. **Question:** short questions or IRF questions
6. **Maintenance:** helps student during learning, technical problems

Student verbal behaviours

1. **Question:** open & closed
2. **Short response:** limited unelaborated
3. **Engages:** engages in sustained exchanges, affirms another student's response, extends the discussion
4. **Interrupts:** butts in, negative
5. **Directs:** gives directions, disciplines another student
6. **Elaborations:** explanations, extends another student's response

Reasoning and problem-solving assessment criteria (Kratwohl, 2002)

Cognitive Process Dimension

Knowledge Dimension	Recall	Comprehension	Apply	Analyse	Evaluate	Create
Factual knowledge						
Conceptual knowledge						
Procedural knowledge						
Metacognitive knowledge						

Results for Teachers' Verbal Behaviours

- MANOVA (Group X Time) not significant for group, time, or group x time
- MANOVA at Time 1 – no significant differences between the groups
- MANOVA at Time 2 found significant differences between the groups in mediating behaviour
- Cooperative + communication > group-work only
- Cooperative + communication demonstrated more mediating behaviours, controlling, & questioning behaviours than group-work only

Results for Students' Verbal Behaviours

- MANOVA (Group X Time) showed significant differences for group but not time or group by time
- Post hoc comparisons showed significant differences between 1 & 2, 2 & 3, 1 & 3
- MANOVA at Time 1 – significant differences between the groups
- Follow-up univariate results showed significant differences in elaboration, questioning, short responses.
- Post-hoc comparisons showed significant differences between 1 & 2, 2 & 3, 1 & 3
- Students in the cooperative + communication condition used more elaboration than students in the cooperative & group-work only conditions

Results for Students' Verbal Behaviours (contd)

- MANOVA at Time 2 – significant differences between the groups
- Follow-up univariate results showed significant differences in elaboration, questioning, short responses, directs.
- Post-hoc comparisons showed significant differences between 1 & 2, 2 & 3, 1 & 3
- Students in the cooperative + communication condition used more elaboration than students in the cooperative and group-work only conditions
- Students in the cooperative + communication condition demonstrated more questioning, short answer responses, and directions than students in the group-work only condition

Intervention effects for students' reasoning and problem-solving (RP-S) activity as T1 and T2 over 3 conditions

Random intercept model shows

- no significant difference between Time 1 and Time 2 in students' RP-S activity
- significant difference between the three conditions
 - cooperative + communication >> group-work only condition
 - None of the other differences is significant
- population variances to be significantly differently from zero. Intra-class correlation coefficients suggest
 - 15% of total variation in students' RP-S activity is attributable to differences among teachers
 - 20% of total variation in students' RP-S activity is attributable to differences among students

Summary of Results

- Teachers in the cooperative +communication condition used more mediating behaviours than their group-work peers
- No significant differences between the cooperative+communication teachers and the cooperative teachers, possibly because the cooperative teachers incorporated some of the dialoguing into their teaching.
- Hertz-Lazarowitz & Shachar (1990) found that teachers in cooperative classes are more positive and helpful in their interactions and Gillies (2006) found teachers who implement cooperative learning use more mediated-learning behaviours than teachers who implement group-work only.
- Teachers in the cooperative+communication condition used more controlling behaviours – provided more explicit guidelines for the task

Summary of Results

Cooperative+Communication teachers asked more questions

Questions can be effective if used in conjunction with mediating behaviour:

T: *What have you got there?* (Short answer question)

S: *Our diorama*

T: *I wonder if you've considered using this information in your presentation?* (T. poses a tentative question to help mediate children's thinking)

S: *We thought of that and we're going to try and put it here. We think it's better to show it here with this so people can see what it means.* (S. provides a well reasoned response)

Summary of Results

- Students in the coop+com group provided more elaborations than coop and group-work only students
- Coop+Com students asked more questions, gave more short answer responses and provided more directions than students in the students in the coop or the group work-only condition
- Students in the coop condition also differed significantly from the group-work only condition in the questions, short responses, and directions they provided
- Students in the coop+com condition engaged in more RP-S activity than students in the group-work only condition. No significant differences between the coop and the group-work only condition.

Implications for learning

- Teachers' discourse is enhanced when they are trained in cognitive and metacognitive questioning strategies
- Teachers questions can stimulate children to provide more elaborated responses and helping behaviours. Teachers' questions can trigger in children the recognition that they need to provide more help and explanations to others
- Teachers can promote children's discourse by explicitly teaching those communication skills that challenge and scaffold student's higher-level thinking and learning during cooperative, small group discussions.