Complex Instruction

Implementing CI into Mathematics

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Abstract: Bethany Brodeur noticed that her students were learning differently within the structure of a Complex Instruction rotation than they did when they were directed to “work together in your cooperative groups” in her first and second grade combination classroom. Her attention to the change in her students’ learning caused me to think about how Elizabeth Cohen’s often referenced Kurt Lewin’s comment “There is nothing so practical as a good theory.” As a result, I decided to ask two students who were teaching CI rotations if they would be interested in working together on a conference presentation that looked at their work through the eyes of Lewin’s dictum. They would take on responsibility for documenting and writing about their CI units and I, their advisor, would take on Lewin. Both Jennifer, an experienced teacher and MEd. candidate, and Bethany, a senior elementary education major, agreed to this task. The resulting papers formed the core of our presentation at the 2004 conference of the New England Educational Research Organization. Together, they form a short volume that integrates learning about CI with the practical implications of implementation of CI at the elementary and secondary levels. This paper reports Bethany’s description and reflection on her first time planning and teaching a CI rotation.

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Introduction

As I sat in class, I thought to myself, how is CI going to work in my classroom? I listened to what professor Rathbone was explaining, and at first, CI seemed like it was such a difficult process. It was October, my first and second grade students had only been in school for two months and groupwork was something that they had never been exposed to. My mentor teacher did not use groupwork in her classroom and when I approached her, she was unsure how groupwork could be incorporated into our classroom routine. With no room in our busy schedule, I was left with little opportunity to incorporate CI.

I came up with the idea to incorporate CI during math time. The idea came to me as I was introducing problem solving, a state criteria, to the students one afternoon. Problem solving was a new and totally abstract concept for my first grade students. As a student teacher, I was trying to think of ways problem solving could be a rich and enjoyable
experience for my students. Creating an environment of peer supportiveness was also one of my student teaching goals and I wanted to introduce new mathematical manipulatives. CI allowed me to do all three!

School Environment

My internship placement was a magnificent school atmosphere. The newly built school was a supportive and warm environment with extremely high levels of parent involvement. This upper to middle class school setting was bursting with excitement. The faculty and administration had a great communicative relationship. The classrooms were multi-aged ranging from kindergarten to fourth grade. Cooperation was a school-wide norm, which made introducing CI unproblematic. In order for CI to be successful you must have established a safe, trusting and respectful classroom environment. A structured educational setting helps students to feel self confident and secure among their peers. In order to established this within my 1-2 multi-age classroom the students and I started each day with a morning meeting. We sat in a circle, read the day’s newsletter, shared stories and upcoming events. Most importantly, we greeted one another as a wrap up to our meeting. Students greeted each other with a handshake and a smile. These daily meetings helped to form a sense of community within my classroom.

Collaborative Norms & Skills

Leading up to our CI work, the students and I discussed what groupwork should look and sound like. We created a T-chart of these examples (Appendix A: Picture 1). For instance, students all agreed that only indoor voices should be used, manners, and listening to group members were all important examples of what groupwork should sound like. The students then defined these examples further and explained to me what listening would look like. Students told me that I would know they were listening because no one else in their group would be talking and all group members would be making eye contact with the
speaker. I thought that the students’ responses were very detailed. This allowed everyone to
take an abstract word as *listening* and apply it to personal actions. Together, we modeled
these norms through role-playing demonstrations during morning meetings the week before
we implemented our CI rotation. The students generated a chart of collaborative skills they
thought were necessary in order for groupwork to be effective. Students came up with
thoughtful ideas such as:

- good problem solvers need to work together
- share ideas
- use several strategies
- use math tools to show thinking
- most importantly, good problems solvers must have fun solving problems with
  their friends.

Students need time to practice working with others. I introduced them to
groupwork before the rotations began. During literacy, I grouped my first and second grade
students by mixed ability to form peer reading buddies. Leading up to our CI work I also
made sure to use verbal forms of praise when I saw students using good communication
skills and acting as supportive friends. I wanted students to be recognized for their positive
behaviors in hopes that it would carry over during CI. I created a chart of collaborative
norms generated by the students and placed a copy at each table where the students worked
during CI. The list of norms served as friendly reminders of how groups work
collaboratively (Appendix A: Picture 2).

One of the goals of CI is to introduce group roles and increase the students’
academic confidence in the eyes of their peers. Before assigning the students to a role, I
spent a great deal of time thinking about each student and the role that would best suit their
capabilities. Each group was made up of four first grade students. Group roles were a
reporter, facilitator, materials collectors, and recorder. I introduced all group roles with the
same amount of enthusiasm to ensure equality and importance of each role. The students
and I created a chart outlining each role and its responsibilities (Appendix A: Picture 3). When assigning the student roles I created a ceremonial setting. I called students to stand up in our circle as I placed their role card around their neck. Students, regardless of their role, smiled and appeared to be very proud of their responsibility. The students enjoyed wearing their role card. To many it felt like a badge of honor and it served as a friendly reminder to group members and myself as to what role each student was responsible for. By assigning roles in this way I was also pointing out to everyone that each student had an important function in the groupwork (Appendix A: Picture 4).

Problem Solving

Each group of students had the same four complex problems to solve over the course of the four-day CI rotation. Each group was given a different problem each day; no two groups were ever working on the same problem. The problems I selected were diverse and rich activities. I spent a good deal of time making sure the problems were appropriately challenging. (Appendix B) Each question was open-ended and each group had to show their solution using a demonstration, illustration, and sentences to explain their thinking. The groups were able to freely select any manipulatives from our materials table to help solve the problems (Appendix A: Picture 5). Manipulatives included: counting bears, counting rods, coins, number grids, colored pencils and paper, unifix cubes, blocks, number lines, and pattern blocks.

Our Four Days of Problem Solving

Day one: Be prepared for the first day of problem solving! We had talked about the “first days” in our university class as being out of the ordinary. The noise level rose as students discussed the problems and defined their roles. I heard my students say many times, “Well, I am the recorder so I am the one who should be writing.” I wanted to ease their confusion but I let it be. It was hard not interrupting but it is important to let students explore the process of groupwork before intervening. I allowed a little extra time on that
first day because it took students longer to get in the mode of working together. Each day of the rotation the students and I took the last five minutes to discuss what went well for their group. The groups took turns reflecting on their groupwork experiences. I felt that this was a crucial time for students because it allowed them to take ownership for their group actions and provide positive feedback to one another. During these wrap up times I allowed the students to lead the conversations I rarely intervened. This verbal process of identifying groupworking skills and referring back to our T-chart and roles chart helped to cement the CI norms. I made it a point to use the students’ groupworking examples as a prompt to refer back to our role playing demonstrations.

By the second and third day I saw my students in a way that I had never seen. Students were ALL participating group members. The noise level had decreased dramatically. Students were modeling the examples from our T-Chart and group demonstrations. When walking around the classroom, one group caught my attention so I listened in from a distance so they would not know I was there. The group was starting to argue over their answer and their noise level began to rise. The facilitator of the group confidently spoke up and told the group that they were getting too loud. He told his group that they all needed to stop talking, put down their materials and take four deep breaths. Without any hesitation the group members did as their facilitator suggested. I was so amazed! Not only did it help the group get back on track but it was wonderful to see a student who lacks interpersonal skills take on the role of facilitator so respectfully.

By the end of the second day, I observed students sharing roles and responsibilities within each group. For example, one group was passing their paper around the circle allowing each person to draw and/or write down part of their solution. I saw group members helping the materials collector carry materials over to and return them from their tables. These demonstrations told me that students were feeling confident with their roles and responsibilities (Appendix A: Picture 6).

On the final day, the students shared their work with the class. All groups were
proud of their accomplishments and I saw lots of smiles all around. When presenting their solutions, students were complementing group members for their ideas. Watching the students take on the role of teacher and presenter demonstrated to me that groupwork really can work! These students made tremendous growth in the area of problem solving. Most importantly however, they grew as peer supporters, I observed this in a number of ways:

- Sharing ideas and making eye contact with the speaker
- Using “I” messages when sharing their thoughts and providing feedback
- Taking turns helping one another with their responsibilities
- Complementing each other’s ideas and hard work
- Giving encouraging and supportive comments to their group members
- Including everyone’s point of view and ideas

Assigning Competence

By encouraging students in front of their peers, it provides a positive example for all group members to follow. Students need to hear specific goal-oriented forms of encouragement in order to stay on task and motivated. While students were working in their groups, I walked around the classroom observing each group’s interactions. Everyday, I assigned competence to one team member from each group. For example, when a student was drawing a representation of how his group used manipulatives, I made sure to recognize his detailed work. I said, “Wow. Billy, your illustration is very detailed, it is easy for me, as the reader, to see exactly how you and your group members solved this problem. You’re a very talented illustrator, maybe someday you will an architect or an illustrator of children’s books”. I also observed advanced math thinkers assigning competence and encouraging lower ability students by giving them simple tasks to complete. Students love to hear compliments, it builds upon their self-confidence and it increases their social status. Strengthening students’ social status can have great academic consequences. For example, students feel more confident speaking aloud, sharing ideas and
taking risks.

Assessment

To assess the students’ knowledge of mathematical manipulatives, I created a pre and posttest. Before implementing CI, I asked the students what tools help them to be a good problem solvers. The pre test showed basic math tools that we had used such as number grids and calculators but it was interesting to observe that none of the students mentioned using their peers as a math tool. The posttest however, did reveal that students learned to use new mathematical manipulatives (counting bears and unifix cubes) and more than half of the students recorded that they now used friends as a tool (Appendix A: Pre/Post Results). Pre and posttests were an excellence way to track students’ progress over the time of this rotation.

As part of a university requirement I tracked four students, two of lower academic ability and two socially at risk students over the course of the CI rotation. I began this assessment by administering an individual social status questionnaire to my students. Not surprising, due to the nature of our classroom environment, there was not a large status difference between the students. Through my previous internships I believe that my findings were not be reliable in other school and classroom situations. This status treatment survey allowed me to better understand the students’ perceptions of their peers. This also gave me insight as to how I should group my students.

I used the results of the status survey along with antidotal notes and observations to assess these targeted students. My findings revealed that these individual students were able to be successful, positive and contributing group members. They sat close to their group members, asked questions, and spoke assertively when offering their thoughts. Group members supported these individuals by rephrasing statements, offering positive inclusive gestures, such as an arm around the shoulder (Appendix A: Picture 7 & 8). Tracking allowed me to identify more results CI had in my classroom.
Conclusion

The best feeling a teacher can have is when s/he knows they have made a difference. As I reflect on this experience, I feel that I have made a difference. I believe that I helped to teach sixteen children the importance of communication and teamwork. Students who I did not expect to take on an assertive role during these rotations shined! Looking back it seemed to me that the simplicity of this rotation was based a four aspects:

- Specific use of T-charts and skill building
- Making each role unique and special
- The overall context of the school environment
- Connecting the social and academic classroom structure

The use of T-charts helped to refine broad terms and clarify questions for the students. This visual representation served as a reminder to the students during the rotations. Practicing the roles through demonstrations allowed students to define their role and responsibilities. The overall context of the school was inviting and supportive. The students were aware that they learn differently and respected each other differences. This was evident when I implemented a status survey before the start of CI. The multi-age classroom was focused around peer learning, which made the introduction of groupwork less difficult because students felt comfortable interacting with one another. CI makes the connection between social and academic structure intentional. Having students accountable for specific responsibilities makes them feel like an important and contributing part of the group. Assigning competence to the students increases their social status in the eyes of their peers and builds upon their self-confidence which as huge academic consequences.

I learned once again, that meaningful learning occurs in numerous ways for students. Recognizing students multiple strengths and providing students with multiple structures to learn new information helps to meet the student’s individual and group learning capabilities.