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# CONFLICT AND RESOLUTION

## During Co-operative Learning with Computers

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## Introduction

IN TWO CLASSROOM RESEARCH PROJECTS we used co-operative learning to encourage cognitive progress; this meant using **conflict** and its subsequent **resolution**. Both projects used problem-solving software, *Voyage of Mimi – Ecosystems with Island Survivors.*

## Co-operative learning – What is it?

Co-operative learning is much more than assigning children to groups, setting them a task and telling them to work co-operatively.

Interdependence is the first necessity – it is required since it encourages students to have an interest in each

other's learning as well as in their own. Therefore co-operative lessons are structured so that the children can learn only by relying on each other and helping each other. This can be managed in four or five different ways: (1) setting mutual goals; (2) dividing up the tasks between group members; (3) dividing materials, resources or information amongst group members; (4) assigning group members different roles; (5) by giving joint rewards.

Success for each individual depends upon the establishment of good working relationships within the group, and these relationships can be fragile. Therefore, children need to know how to use small group skills and these need to be modelled, taught and maintained. The teacher's role, as well as being that of classroom manager and consultant, is to guide the group in seeking their own solutions to what may be unproductive conflicts. An evaluation period in which the teacher helps analyse how the group is functioning is vital to running co-operative programmes. Within this structure, individual accountability is necessary to ensure that every member participates and reaches a level of mastery.

## Why Co-operative Learning?

Co-operative learning results in more helping and encouraging among students; members of co-operative groups believe they are liked and supported by the other students; there is a building of trust; optimal use is made of information provided by other students; group members have more confidence in their own ideas; more positive attitudes are held towards the subject and the instructional experience; and in many cases there is higher achievement than with competitive and individualistic learning approaches.

## Conflict and Conflict Resolution

The co-operative group provides diverse skills and knowledge, and the opportunity for the clash of ideas. In resolving these disagreements the children have to 'retrieve prior knowledge, seek new information, evaluate their own and other's answers, ideas and opinions, confront their own misunderstandings and lack of knowledge and as a consequence, restructure their own thinking.'

When two people have the same strategies, the probability of conflict is low. However, the chance of cognitive progress is also low. At the other extreme, where one child is more advanced in understanding, that child may entirely dominate the group and fail to explain the criteria for solving the problem. Somewhere between these extreme situations it is necessary for all the children to make the aspects of the problem clear to each other and find a satisfactory solution. The interdependence set up in co-operative learning is an important motivation to seeking solutions. As a bonus, less able students have an influence in the negotiation and final decision.

## Effectiveness of the Peer Group

There is good evidence that when children are communicating with their peers (rather than the teacher) they understand each other better, they use a familiar language and as they are working on the same problem, they are able to relate to each other's thinking and problem solving process. They also provide 'precise, relevant and, consequently, effective feedback.'

## Computers and Co-operative Learning

Computers and software do not make a classroom into a good learning environment just by being there. Rather, they are a valuable resource if used in an already good learning environment with a variety of different styles of learning.

The value of computer mediated instruction is (1) the motivation it gives (often due to its novelty); (2) the opportunity for experiencing and producing results which would be otherwise impossible; (3) the increase in peer interaction.

## Project Summary

Can a computer simulation program help teach about ecosystems within the classroom environment? How would children respond to working in small groups with computers? What sort of conflicts would arise and how would they be resolved? Would there be differences between groups of different sizes and composition? We were looking for answers to these sorts of questions.

Each class used two Apple IIe 128K computers and colour monitors, in a space set aside in the classroom. The software was *Voyage of Mimi, Ecosystems with Island Survivors* published by Bank Street College of Education, New York. You have been shipwrecked on an island and must survive for 12 months until a passing ship can pick you up. First a simple, but accurate ecosystem must be chosen for the island. The ecosystem must comprise 4 land species and 4 pond species. Information about how the food chain works is shown on the screen and more detailed information is available by pressing the '?' key. The battle for survival is divided up into 'months'. Every month each of the three or four castaways had to choose an activity which would help ensure their survival. The food supply level is shown in a simple graph and at the end of each 'month' you are shown graphs of the levels of the species in your ecosystem. To survive you have to ensure that you have adequate food, shelter and firewood. You must take into account the effects of the seasons on the species (e.g., certain plant species will only be available in summer, certain animals hibernate during winter). This information is available on screen through an easily accessed 'help' facility. The survivors must ensure adequate food for the species they chose, and consider the effects of wiping out a species or allowing one to grow unchecked.

## Patricia Inder's Class

There were 14 boys and 16 girls in the Std.2/3 (Years 3/4) composite class I worked in. Twenty-eight children were interviewed – all had used a computer before and enjoyed working with them. They also believed that computers helped them to learn. None of the children had any experience with the program, *Voyage of Mimi.*

I put the children into groups of 3, six mixed, two all-boys and two all-girls. Eight out of the ten groups had at least one child the teacher said was of above average ability and in 7 groups a child with social problems was matched with a child the teacher knew to be easy-going and socially accomplished. The interviews were about attitudes to the computers and group work and I also found that no child had any prior knowledge of ecosystems.

I took an introductory session with the class the day before the study began. We discussed what an ecosystem is, investigating the fish tank as a community of living things. This was extended to look at what a food-web is. The children's ideas were written up and put on the wall using a food-web diagram with various parts to fill in. In this session we also discussed what co-operative learning is and agreed upon the following:

1. to listen to what other people say;
2. to wait our turn;

3. to think about others first;
4. to help each other – to use the computer and give ideas;
5. to be nice to other people;
6. to look at the person;
7. no fighting;
8. to talk on the point – explain why, don't shout.

These were the children's suggestions though 'explain why' came from a prompt by me. The introductory session ended with everyone playing at being a cat, a fish, pondweed or the walls of the fishtank. They were thus parts of an ecosystem and we had to invent rules about how to eat the species you needed to survive. We discussed, at the end of the game, what would happen if part of the chain was broken, if, for example, all the fish were eaten by the cat.

Children were assigned to groups and roles sorted out. Each had to be either keyboarder, leader, or screen reader. The roles were discussed and a chart was put up:

*Leader*

1. Tell group when 30 minutes nearly up.
2. Ensure children in group listen to each other and do not interrupt.
3. Tick list when group member joins in.
   (This job had to be abandoned due to misunderstandings and because in the excitement the children forgot to record.)

*Keyboarder*

1. Ask children in the group what they think before taking action.

*Screen reader*

1. Reads what is on the screen.
2. Explains the graph to the group
   (at the end of each 'month' and at the end of the game).

Each group had eight 40-minute sessions. This included 30 minutes at the computer and 10 minutes group evaluation. I directed the evaluation and made notes about any difficulties the children were having with either the program or within their group.

The only details the children were told about the program, *Voyage of Mimi*, were that they were shipwrecked on an island and had to find a way to survive for 12 months by selecting 4 land species and 4 pond species to live on their island. They were told that all the information they needed was available on the program and to read the screen to find out how to access it.

Groups were told they would receive a star on the Island Survivor's star chart if they survived and if all members of the group could answer a series of questions about the program, for example, *'How do you find out details about a species?'* or *'When choosing a species what do you need to think about?'*

## Results

*Understanding of the Concept of Ecosystems.*

Prior to the study, none of the children knew what either an ecosystem or a food-web was. After the study, 33 percent of the children had a limited knowledge of what an ecosystem was and 41 percent knew something about food-webs. This low rate is due to the fact that the final questions were not asked in context – they were not asked during the programme – and none of the concepts had been integrated into the full class programme (due to existing commitments.) The value of integrating the topic throughout the curriculum is seen in Ro Todd's project.

*Children's Responses to Working with Computers.*

All the children, before and after, said they enjoyed working with computers. Most believed computers help you to learn a particular subject, for example, spelling or mathematics. Probing further, before the project, some saw the computer as a 'tool' (I paraphrase their answers) and after the project many mentioned computers as a source of information.

*Children's Responses to Group Work.*

Prior to the study 89 percent of the children said they enjoyed working in groups. This reduced to 77 percent after the study. Seven of the 10 groups mentioned they had difficulty with someone taking over the keyboard or not listening to each other's suggestions. The interviews supported this. When asked, 81 percent felt their groups had worked well together.

*Types of Conflict.*

The overall number of conflicts was higher during the study (8.4 incidents per hour) than before (3.2 per hour). Before using the computers most disputes were over actions the group should take; whilst using the computers most conflicts were about the roles within the group.

There were conflicts when a child took over a role from another child; when a child did not do what was expected of them within their role; over sharing materials; over seating arrangements; over selecting species or choosing tasks for the survivors. There were personality clashes and strife when one child acted without reference to other group members.

*Resolution of Conflict.*

Before the co-operative computer work, children were seen to be solving their conflicts 91 percent of the time. But only 74 percent of the conflicts at the computer got solved without help. The most common way of 'resolving' conflicts during the study was through use of verbal assertion (2.65 incidents per hour). The children did use negotiation and discussion (1.3 per hour) but physical assertion was almost as common (1.25 per hour).

Here is an example of an interaction with the children not listening to each other and one taking over the keyboard out of turn:

Kate: *I'm meant to be doing it. Let me do it.*

Tania: *OK what do you want to do?*

Kate: *I want to push it.*

Tania: *OK what do you want to do?*

Kate: *How do you get to here?*

Tania takes over the keyboard at this point.

*Differences Between Groups of Different Composition.*

The all male group had more conflicts over roles within the group and this was largely to do with the keyboarding role. They also used a higher rate of verbal assertion to resolve their conflicts, for example shouting, *'Don't take over!'*.

The groups who had an unsocial child *unmatched* with a child good at interaction were not very successful in working through the computer simulation. This was also true of groups with no child of above average academic ability. Social difficulty and personality clashes seemed to be the

biggest contributor to failing to 'survive'. In the words of one child in the all-girl group, their success was due to the fact that, *'we like each other'*. When there was disagreement in this group they became involved in discussion to correct the misunderstanding. The following interaction from their evaluation session illustrates this:

> There was a disagreement over whether the bears had run out. One of the group cited the graph which indicates the population levels of the species at the end of the 'month' to support her argument. When asked what they needed to think about for the next session, they reported, *'Try not to waste food and put some back. We learnt this from the last game. It took us quite a while to realise.'*

## Ro Todd's Class

In my Std.4 (Year 5) class in a lower socio-economic area, there were 10 boys and 10 girls. Some had very little knowledge of computers. Small group work was a typical feature of their classroom and I assigned the children to groups of different sizes and gender composition, all groups of mixed academic ability.

### *Procedure*

I interviewed each child, gaining some knowledge of what they knew of group work and of computers — and how they felt about them. To find out about their understanding of ecosystems I gave each child a slip of paper and asked them to write 'I think an ecosystem is...' and sign their name. The children were encouraged to guess if they did not know. After a few minutes they were given a second option, 'I do not know'. These slips of paper were collected and kept. I then provided a definition of ecosystems and the children brainstormed examples. For one of these, a farm, the discussion was extended; food chains and webs were discussed and the children indulged in several 'what-if' scenarios — what if the rabbit population continued unchecked? What would happen to farm animals, such as the cow? Later that day, there was a class session on objectives and rules for the project. The children were reminded that the project involved ecosystems and group work. The objectives that they agreed upon were:

1. To work well as a group.
2. To understand what ecosystems are and how they work.

The rules that the children agreed upon were:

1. All decisions must be agreed upon by the group.
2. When you say something, say why you think it is a good idea.
3. Listen with real care when other people are talking.
4. Criticise ideas, not people. (I prompted this one.)
5. Before you ask for help outside the group, check if anyone in the group has a solution, or if there is some way you can look up what you need to know.

These objectives and rules were left up on a board. The children were told about the groups and given time to choose a group name. Any group unable to agree upon a name was guided through a process of proposing names that they liked and then selecting one from this list by voting. These names were then written on the board together with access times on the computer.

The children were then split into 2 groups and introduced to the computer software by the class teacher and the researcher. They were given the instructions on a card for the basic commands and procedures needed for the program. The required roles were discussed. The children suggested that a person to record what they were doing and the progress they were making was necessary, and this idea was discussed. They were also prompted to discuss the types of decisions they would be involved in (e.g., how to allocate tasks fairly, what information they would need to select the species for their island) and various ways of resolving these problems.

For the next nine school days, the children worked in their groups at the computer for 30 minutes each day. The computers were available to the children at lunchtime and interval on wet days.

During this time, other class activities were linked to the ecosystem theme. For instance, an art lesson involved the children in drawing a map of their imaginary island, including features such as lakes, shelter and so on and giving it a name. The teacher often made reference to the concepts involved in ecosystems throughout all curriculum areas. Towards the end of the project the class set up an aquarium.

At the end of the study, the children were given a written test on ecosystems and aspects which would show how well they had explored the information available in the program. The children were then re-interviewed about group and computer work.

## Results

### *Understanding of the Concept of Ecosystems.*

Before the computer work none of the children had any understanding of ecosystems. Typical answers were:

> *A system to do with science.*
>
> *Something that has an echo.*

At the end of the study, 17 of 19 had an understanding of what an ecosystem is; for example one child answered,

> *A community of living things and their surroundings.*

The test at the end also demonstrated that they had explored the information in the software. For example, they had discovered that a certain pond plant species will be found on land as well as in ponds, and that turtles can be food for humans.

### *The Children's Responses to Working with Computers.*

They were enthusiastic about the whole project, from beginning to end. Their comments showed this:

> *It was good working with friends, because if you got stuck you had someone to ask.*
>
> *Often the boys sit together and the girls sit somewhere else. It's nice to work together.*

Children mentioned the game aspect of the program most when they explained what they liked about using computers and attributed much of the co-operation they had shown to wanting to 'survive' the 12 months the program set as its goal. Hunting and fishing was a popular aspect.

> *I like the hunting and fishing best – I was really good at it.*

Turning off the computer was the part they liked least!

### *Types of Conflict that Arose.*

The types of conflict that arose were (1) management issues, for example, choosing a group name and allocating roles; (2) how to survive in the program task, for example, how much food should be stored, whether to hunt fish or build shelter.

*Resolution of Conflict.*

The management issues tended to be resolved in the groups of three by majority rule. The groups of four often had to get the teacher to intervene — majority rule was not an option and there always seemed to be a two-by-two division. For example, in choosing a name both the groups of four failed to reach a unanimous decision and appealed to the researcher who asked if they could explain why they each thought their choice was a good one. The response was, *'Cos it's cool'*, countered by, *'Well ours is better.'* The researcher then asked if they could think of another way to decide. One group decided to flip a coin and the other group followed suit.

Both groups of four also had problems in allocating roles. Disputes tended to be resolved in favour of the person seated at the computer. In fact this occurred in all the conflicts I observed. Three of the groups decided the computer would be operated by each person when it was their turn to choose, as one of the castaways, a survival task. Use of the computer at other times was seemingly random. The group of all-boys decided that the role of computer operator would last throughout a session and rotate daily. All groups agreed that the role of recorder would rotate daily and that the recorder would note the species chosen, the name of the castaway responsible for that species, the activities chosen each 'month', the status of the species at the end of the day and the outcome of the game.

Issues relating to how to survive in the program also tended to be resolved by the person seated at the computer. The person at the computer was able to ignore discussions and simply continue to operate the keyboard. In the early stage of the project, very little explanation was given with suggestions or disagreement. As the project progressed more explanations were offered, for example, with the suggestion that food be thrown back was the explanation that it would spoil if they collected too much. However, the decisions made were still dominated by the person operating the keyboard.

*Differences Between Groups of Different Size and Composition.*

No differences in understanding the concept of ecosystems emerged that could be attributed to the different size or composition of the group, though it would be difficult to generalise with the limited number of groups to compare.

Both groups of four had more problems in choosing group names, had conflict over the allocation and rotation of roles and resorted to outside help. These two groups were also observed making more personal remarks of a negative nature, for example, *'Shut-up, Arthur, just 'cos you're a know-it-all'; 'Der ...oh youse are hopeless'; 'Shut your mouth'*. The two groups of four were the last to survive and both managed to do so only because they were given extra time on the last day of the project.

The group who gave the most explanations when making suggestions was the group of three boys, followed by the group of three girls. The first group to survive was the group of three boys, followed by the group of three girls. These two groups were more successful at solving conflicts and the children showed concern and respect for other group members.

## Discussion

From both these exploratory studies, there are several issues that are worthy of note for future projects using computer software used and co-operative learning.

1. *Voyage of Mimi* has American/Canadian species and seasons. It must be remembered that, even when clearly explained, the children may not relate as easily to this, as they would to their own experience.
2. For co-operative learning to occur, interdependence is required. There is no interdependence inherent in this particular program. There was no need for interaction between the children for the group to survive. To survive it required only one child to interact with the computer. We built the co-operation into the grouping, not into the program. Without task interdependence built into the program the person seated at the computer can hold all the power.
3. Even if a software program requires inter-dependence, children need the necessary communication and co-operation skills. It may be necessary to teach these skills and allow children to monitor their own use of them.
4. These projects did not promote cognitive conflict. What occurred was verbal and physical assertion rather than discussion. For example, passive dominance of the keyboard, pushing a child's hand away, or *'Don't! It's my turn.'* This may have reflected the lack of co-operation and communication skills.
5. Strangely enough, resolution of conflict is not a necessary condition for cognitive restructuring and development. Resolution may in fact prevent the child from progressing, especially when a solution is *imposed*, the child giving in to the dominant person's wishes. Again this reflects the need for co-operative skills and a vested interest in each other's ideas and learning.
6. In Patricia Inder's class, the evaluation at the end of each session was invaluable for resolving interpersonal conflicts. This was in fact necessary for the groups to continue working together. In one particular group, at the end of their first session, they were sitting with their backs to each other and by session 5, one of the group reported *'I want to be in another group'*. The group complained that one child would get excited and physically take over the keyboard and make choices for the group which they did not necessarily perceive to be the right ones.

   By session 5, the researcher was trying to get them to focus on what happened when they did listen to what each other had to say and when they worked together. They told the researcher that, *'When we agree on the things, it's better cos you get to carry on.'* The researcher gave them some direction halfway through the session, suggesting that each have a turn on the keyboard when decisions about their own plant or animal were to be made.

   After this evaluation session, the group reported a very successful session the next day. Two of the comments made were: *'I asked Kim if I could press <return> and she agreed.'* and, *'I like working in this group now,'* (from the boy who wanted to change groups earlier on). In Ro Todd's study, however, the program had a motivational effect on interpersonal skills in 4 of the 6 groups and ensured they worked together successfully.
7. It was clearly important from these two studies that a computer program such as this should not be used in isolation, but rather integrated across the curriculum, so that the children have an opportunity to understand and work with the new concepts being discovered.

## Notes

MS PATRICIA INDER was studying at the University of Otago at the time this research was carried out. She may now be contacted at Raumati School, Box 2055, Raumati Beach, New Zealand.

MS RO TODD was also studying at the University of Otago at the time this research was carried out. She may be contacted at the Dunedin College of Education, Private Bag, Dunedin, New Zealand.

A fuller account of this research was first published in *Computers in New Zealand Schools*, Vol.2, No.1, March 1992. Our thanks to the editors, Dr Kwok-Wing Lai and Dr Bruce McMillan, for their permission to work up this edited version.

The computer program used in this research is

Bank Street College Project in Science and Mathematics (1985) *The Voyage of Mimi – Ecosystems with Island Survivors (a computer simulation in ecology)*, New York: Holt, Rinehart and Winston.

Similar findings to those in these studies were reported in an investigation of a co-operative computer-mediated writing task undertaken by NZCER in 1988. See

Ashworth, D.J. and Atmore, D.L. (1989) *Collaborative Word-Processing: Evaluation of Exploratory Studies in Educational Computing. Study 12.* Wellington: NZCER.

**Co-operative learning** has been extensively researched by Johnson and Johnson. Most of the research indirectly mentioned in the first part of this ***set*** item can be found in their publications below, or has been done by others, to whom they refer. Readers of ***set*** may like to refer first to

Johnson, D.W. and Johnson, R.T. (1987) Co-operative Learning, Computer Assisted, ***set*** No.1, 1987, Item 13.

and

Johnson, D.W. and Johnson, R.T. (1987) Co-operative Learning Strategies for Mainstreaming/Integration, ***set*** No.1, 1988, Item 4.

then

Johnson, D.W. and Johnson, R.T. (1979) Conflict in the classroom: Controversy and Learning, *Review of Educational Research*, Vol. 49, pp. 51-70.

and

Johnson, R.T., Johnson, D.W. and Stanne, M.B. (1986) Comparison of Computer Assisted Co-operative, Competitive and Individualistic Learning, *American Educational Research Journal*, Vol. 23, No. 3, pp. 382-392.

and

Johnson, D.W. and Johnson, R.T. (1987) *Learning Together and Alone: Co-operative, Competitive and Individualistic Learning* (2nd ed.), New Jersey: Prentice-Hall Inc.

The ideas put forward in the section **Conflict and conflict-resolution** can be followed up in

Webb, N.M. (1982) Student Interaction and Learning in Small Groups, *Review of Educational Research*, Vol. 52, pp. 421-445.

The quotation there is from

Webb, N.M. and Lewis, S. (1988) The Social Context of Learning Computer Programming. In R.E. Meyer (Ed.) *Teaching and Learning Computer Programming*, Hillsdale, New Jersey: Lawrence Erlbaum Associates, page 181.

That cognitive progress is low when two learners have the same strategies is discussed in

Mugny, G. and Doise, W. (1978) Socio-cognitive Conflict and Structure of Individual Performances, *European Journal of Social Psychology*, Vol. 8, pp. 181-192.

One value of computer mediated instruction is motivational: see

Cosden, M.A. (1988) Microcomputer Instructions and Perceptions of Effectiveness by Special and Regular Education Elementary School Teachers, *Journal of Special Education*, Vol. 22, pp. 242-253.

Another value for computer mediated instruction is that through it you can do the otherwise impossible: see Bruner in

Mayer, R.E. (1987) *Educational Psychology. A Cognitive Approach*, Boston: Little, Brown and Company.

Another value for computer mediated instruction is more peer-interaction: see

Johnson, Johnson and Stanne, above.

That the resolution of conflict among ideas is not a necessary condition for cognitive progress (**Conclusion**, 5) can be found in

Bell, N., Grossen, M. and Perret-Clermont, A. (1985) Sociocognitive and Intellectual Growth. In N.W. Berkowitz (ed.) *Peer Conflict and Psychological Growth: New Directions for Child Development*, Vol. 29, San Francisco: Jossey-Bass.