Using Cooperative Learning to Integrate Thinking and Information Technology in a Content-Based Writing Lesson

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Abstract

Cooperative learning can be defined as a range of concepts and techniques for enhancing the value of student-student interaction. The article begins with separate discussions of how cooperative learning promotes effective instruction of thinking skills and creativity, and of information technology. Thinking skills and creativity are promoted when students interact with their peers to brainstorm, explain, question, disagree, persuade, and problem-solve. Cooperative learning offers many tools for structuring this type of thinking interaction. Educational applications of information technology are enhanced by peer interaction in cooperative learning groups, as students can engage in peer tutoring, model effective behaviours, communicate electronically, and take on a range of roles while working at the computer.

Next, the authors describe a content-based writing lesson for secondary school students in Singapore in which cooperative learning is integrated with thinking and creativity, and with information technology. Explanations are provided of how key cooperative learning concepts are embodied in the lesson. Materials used in the lesson are made available.

Introduction

In this article, we present a blending of three important trends in education: cooperative learning (CL), thinking and creativity (TC), and information technology (IT). Elsewhere, authors of this paper have considered the integration of cooperative learning with TC (Lee, Ng, & Jacobs, 1998) and with IT (Jacobs, Ward, & Gallo, 1997). Below, we briefly review key elements of cooperative learning and then describe some of its links with thinking and creativity and information technology. The main part of the article consists of a description of a Singapore secondary school Geography/English lesson taught by the first author in which cooperative learning, thinking and creativity, and information technology were woven together.

Singapore has a bilingual education policy in which from primary school the medium of instruction is English, with students studying their mother tongue (usually Malay, Mandarin, or Tamil) as a subject. The secondary school at which the lesson was used is what in Singapore is called a neighbourhood school. This is the type that most students attend, rather than autonomous or independent schools that are more selective as to whom they admit. Students attend secondary school from approximately 13-16 years of age. Class size is normally about 40 students. The normal period lasts 35 minutes.

Cooperative Learning

Cooperative learning can be defined as a variety of concepts and techniques for enhancing the value of student-student interaction. In one well-known operationalization of cooperative learning (Johnson, Johnson, & Holubec, 1993), key concepts include:

1. Positive interdependence - the feeling among a group of students that they sink or swim together, i.e., that what helps one helps all, and that what hurts one hurts all.
2. Individual accountability - the feeling among a group that each member is responsible for their own learning as well as that of their groupmates.
3. Collaborative skills - these skills, that students need to cooperate successfully, often must be explicitly taught.

4. Processing group interaction - time spent for groups to think about how well they have collaborated and how to enhance their future collaboration.
5. Heterogeneous grouping - students working with groupmates who are different from them on such variables as sex, past achievement, ethnicity, and diligence.

Research on cooperative learning (Bossert, 1988-1989; Cohen, 1994; Johnson & Johnson, 1989; Sharan, 1980; Slavin, 1995) across a wide range of academic subject areas and age groups suggests that the use of cooperative learning may be associated with gains on the following variables:

1. Achievement
2. Liking for school
3. Inter-ethnic relations
4. Thinking skills
5. Self-esteem.
6. Enjoyment

Cooperative Learning and Thinking and Creativity

Cooperative learning is believed to promote thinking and creativity in many ways (Hythecker, Dansereau, & Rocklin, 1988; Qin, Johnson, & Johnson, 1995; Webb, 1989), including:

1. Compared to a whole class format, in cooperative learning, students have more opportunities to talk and to share ideas. This interaction with groupmates encourages students to restructure their ideas. For instance, they may need to summarize, elaborate, exemplify, defend, and explain their ideas.
2. Disagreement, if carried out constructively, pushes students to clarify and rethink their ideas, potentially leading to cognitive restructuring.
3. By working in groups, students enjoy more opportunity to see how their peers think and create new ideas. Witnessing this process can provide useful models.
4. Discussing, creating, and thinking in a group, rather than in a whole class context, can provide a less anxiety-producing context. If groupmates feel positively interdependent with one another, a supportive atmosphere can develop. In such an atmosphere, students may feel more free to try out new ideas.
5. The multiple perspectives of others in their heterogeneous groups may spark new ideas in students' minds.
6. The greater achievement that cooperative learning can foster provides students with a stronger knowledge base from which to explore concepts.

Cooperative Learning and Information Technology

The use of groups (most of the cooperative learning literature recommends groups of 2-4 students) is advocated for information technology-based learning by several educators (Beauvois, 1998; Braine, 1998; Chang & Smith, 1991; Johnson & Johnson, 1985; Warschauer, 1996, 1997). Potential advantages of student collaboration during IT lessons include:

1. Computers can isolate students -- think of the stereotype of the computer nerd, locked alone in a room all day staring at a computer screen, whereas cooperative learning brings a social element to information technology-based learning.
2. Because computers offer a variety of engaging, multi-media ways for obtaining large amounts of information, e.g., CD-ROMs and web sites, students are now less dependent on teachers for information, and instead can work together to find and share knowledge. All the same benefits of cooperative learning presented above in the normal classroom apply equally in information technology -based lessons.
3. Cooperative learning helps students learn with computers, and, at the same time, computers furnish students new ways to collaborate with others, such as email, networked computers, and sharing of diskettes.

Student-student collaboration can take place at four points during Iinformation technology -based lessons.

1. **Prior to working with computers**, students can discuss concepts in the lesson and plan what they will do.
2. **While using computers,** students can discuss - either orally or via computer - what they are working on and can take

different roles, e.g., keyboard captain and navigator, if they are at the same computer. Also, while one or more group members is at a computer, others can be engaged in aspects of their group's work that do not involve IT.

3. **During a pause in computer use**, students can analyze what they have learned and done, share information with others, and plan their next steps.
4. **After using computers**, students can again analyze and share what they have learned and done, as well as what they need to do next.

Lesson Plan - Using the Internet for Pre-Writing

Subject / Focus : Geography/ English Language / Narrative Writing
Level : Secondary 3 Express
Topic : Endangered Species (Various Issues)
Duration : 8 periods (four of which are computer-based)
Grouping : Groups of 4 mixed in terms of past achievement and sex
Prerequisites:

1. Pupils should be familiar with word processing software (MS Word), web browsers, and WWW search engines.
2. Pupils have studied the first person narrative genre - including setting, characterisation, and plot development - and the teacher and class have looked at model texts and jointly constructed a text in that genre.

What is K-W-L

K-W-L (Ogle, 1986) is a three-step reading technique that fosters active reading, used mainly for expository texts.

1. K - what I **K**now - the teacher leads students in brainstorming what they already know about a topic and how they have acquired this information. The teacher then helps students to put these ideas into more general categories.
2. W - what I **W**ant to know - As the students think about the topic and the general categories of information, they generate questions about aspects of the topic about which they would like to know more.
3. L - what I've **L**earned - The students read a text (print or electronic) to find answers to their questions. During reading, students record the new knowledge that they have learned in the respective categories. They can continue to find answers to unanswered questions after the lesson via further reading or other forms of research.

Learning Environment

1. Room with about 20 computers for individual research
2. Multimedia computers and one projector

Lesson Procedure

Pre-Writing

Starter

The teacher explains to the class that in this unit they will write a first person narrative essay from the point of view of an endangered animal. Students will each write using one of the following frameworks:

(a) A day in the life on an endangered animal

(b) My most memorable experience as a (name of endangered animal, e.g., juvenile panda, etc)

(c) My most frightening experience as a (name of endangered animal, e.g., Bengal tiger)

(d) Any other suitable first person narrative framework suggested by students

The teacher then explains that in pairs the students will make use of the WWW to do research on an endangered species of their choice (Each pair will work on an animal they agree upon.) During their research, they are to search for relevant information pertinent to the setting, characters, and plot of their stories)

Class Discussion

In the initial class discussion, the teacher seeks to familiarise students with the 'K'; part of K-W-L, particularly how they can generate categories for use later in their Internet research. To do this, the teacher selects one endangered animal - the tiger - and asks students to contribute whatever knowledge they already have on tigers. The teacher then puts these contributions on a MS Word document which is projected on a screen for all students to see. The advantage of carrying out this procedure on a word processor lies in the mobility of the texts - the teacher can 'cut and paste' students' contributions and move them around. Once students have contributed their prior knowledge about the tiger, the teacher helps the students to rearrange their ideas into categories. They should be able to generate at least the following categories:

- (a) Physical Characteristics
- (b) Natural Habitats
- (c) Diet
- (d) Social Habits (Mating, Hierarchy, etc)
- (e) Reasons why they are endangered
- (f) Ways and efforts to save them

(This part constitutes the K of K-W-L)

The teacher explains that these categories can be used as 'handles' in their Internet research, whatever endangered species they choose. Armed with these categories, students can later return to do the 'K'; step for the animal chosen by their pair.

Groupwork (On the Computer)

The teacher provides a list of four endangered animal species. Each student chooses one to learn more about, and the teacher assigns students to pairs so as to create groups that are heterogeneous as to English proficiency, and, if possible, sex. Students then visit the World Wildlife Foundation site, which has a list of endangered species, to survey the range of animals that are currently on the 'threatened' list:

http://www.panda.org/resources/publications/species/threatened/index.htm

See Lesson Handout, Appendix A)

Pairwork (Cooperative Learning Write-Pair-Share)

Using one K-W-L Strategy Sheet per person and the categories generated in the K part of the K-W-L procedure, each member of the pair uses the K column to record their own prior knowledge on the endangered animal their group has chosen. Group members then compare information and generate questions in the W column on whatever else they want to know about the endangered animal. Each member then decides which questions they are most interested in having answered. This develops a personal commitment that will guide the reading. The teacher asks some students to share with the class what some of these questions are.

Groupwork (Research on the computer)

Using these questions, students surf the WWW using the teacher-reviewed WWW URLs to search for relevant information and record this on their K-W-L strategy sheet. (The teacher captured the files using software called Net Attache

Light. This can be downloaded from the web at:

http://www.abdn.ac.uk/tools/ibmpc/attache.) Each member of the pair will search sites different from their partner's to enlarge the coverage of the research (see Lesson Handout - Appendix A). Students record findings under the L column of their K-W-L sheets.

Groupwork (Cooperative Learning Write-Pair-Square-Share):

Students share their findings and answers to the self-generated questions with their partners. Partners find another pair who are studying the same animal and the four students compare their discoveries. Teacher selects a few students to very briefly present some of their findings to the class. Also, students share what questions are still unanswered after their research and encourage whoever might have answers to these questions to share their what they've found with the class.

Individual (Research on the computer)

Using a search engine (e.g., Yahoo, Infoseek), each student does a 'category' search to look for more WWW sites that might provide answers to unanswered questions.

Writing

Homework

Using a sample narrative composition (See Appendix B), the teacher points out how information gathered during research can be integrated into elements of the narrative. Students work on the first draft of their essays using ideas gathered during their research. (Teacher may need to offer additional help to students who still have difficulty relating their research to their essays' setting, characters, and plot.) Students type out their essays. Graphics may be added.

Groupwork (Peer Feedback)

The essays are peer-reviewed by groupmates according to a suggested peer review checklist (See Appendix A). Peer reviewers make use of the 'Tools - Track Changes' and 'Insert Comments' functions in MS Word97 to colour-code whatever comments or revisions they make to their partners' essays. Essays are returned to the authors for revising. When revisions have been made, the same groupmate proofreads.

Students, next, are to find one person not in the class to read their story. The goal here is to provide feedback on the clarity and affective impact of the text, as well as to educate others about endangered species. Readers' reactions are reported to groupmates. Afterwards, further revisions can be made. Together with the K-W-L strategy sheets, the essays are submitted for marking. Reviewers' names are listed on the essays as editors.

Positive Interdependence and Individual Accountability

In this lesson, positive interdependence is encouraged in several ways: in the pair step of Write-Pair-Share, students exchange information which they might later be called upon to share with the entire class; the two members of each pair share roles as they use their one computer to search for information; again, in Write-Pair-Square-Share students are asked to pass on information provided by their partner; and students serve as and are listed as editors of their groupmates' essays. Individual accountability is fostered when students work alone in the Write steps of Write-Pair-Share and Write-Pair-Square-Share, in the Square and the Share steps when they are asked to demonstrate that they understood what their partners have told them, and in the essay writing in which each student must produce their own drafts and give feedback on others' drafts.

Collaborative Skills

The collaborative skill of giving praise is taught in this lesson. The rationale for praising is presented, phrases or gambits to use in praising are reviewed (Appendix A), and the need for praise to be specific is emphasized. It is suggested that during the peer-review of essays, when each reviewer gives feedback according to the peer-review checklist, would be a particular apt time for giving praise

on aspects of good writing or good ideas in the essays they review. Their remarks of praise are colour-coded when they make use of the 'Tools - Track Changes' function of MS Word97.This skill is selected because these students often look only for the negative in providing peer feedback.

Processing Group Interaction

The students are given time to discuss how well their group is working together. This processing of group interaction helps groups learn how to collaborate more effectively. In this lesson, students will be asked to process how well they and their partners have given praise to each other. When the writing task has been completed, they do this by looking again at both the praises they made in their partners' writing and the praises given to them by their peer reviewer. They count the number of incidents where praise was given and assess whether they have been specific in their praising. Their task here is made easier by the fact that they have earlier colour-coded their feedback when peer-reviewing their partners work on MS Word.

Assessment

Each student's K-W-L strategy sheet is marked for evidence of the student's ability to classify knowledge and questions in suitable categories. Essays are marked for evidence of having applied researched information in the development of setting, character, and plot. In addition, essays are evaluated for language use, particularly for one or two grammatical items on which the teacher wanted students to. The checklist below shows assessment criteria used.

Language Items	?	?	?
Descriptive adjectives to show details			
Linking words of time to show sequence			
Appropriate past tenses			
Realistic setting			
Believable characters			
Problem-resolution sequence			
Use of information gathered during Internet search			

Students' grades are not affected by the grades of their groupmates' essays, and peer assessment does not enter into grading, but both these are options worthy of consideration.

Extension / Sponge Activity / Next Lesson

Beyond the narrative writing lesson, students may wish to become electronic activists and write petition or letters on behalf of the animal the persona of which they had taken on to governmental bodies, corporations, etc. urging them, for example, to step up action to stop illegal trading in endangered animal parts. Students' narrative texts can be sent along with the letters. If replies are obtained to the letters, these should be reported to the class.

Places to send such letters or petitions include:

To the Norweigan government -

Sign a petition to protect lynx at:

http://www.lynx.uio.no/jon/lynx/lynxform.htm

To the Feedback Unit, Ministry of Environment (Singapore) -

Email to Feedback_UNIT@MCD.GOV.SG

Students later report whether they have received a response.

Apart from writing these petition letters, students may also search for other ways they can help protect endangered species, especially ways that involve writing. A range of possibilities await at environmental groups' websites, such as the World Wildlife Fund's Homepage.

*Make endangered species a vivid presence in the lives of people. Make it clear that every endangered species has a name, has a million-year history, has a place in the world. Bring us face-to-face with each one of those species. Make us know that they are our companions in the biosphere. They are not just something out there you look at once in a while, but they're a part of our existence ... they are a part of us. ~*Edward O. Wilson (biologist and environmentalist)

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