A classification model for group-based learning

J.W. Strijbos

Educational Technology Expertise Centre (OTEC), Open University of the Netherlands, PO BOX 2960, 6401DL Heerlen, The Netherlands

Abstract

Most group-based pedagogy is based on two theoretical perspectives towards group learning: co-operative learning and collaborative learning. Quite often this reflects a subjective choice, based on teaching or research preferences. Moreover, a continuing debate upon the premises of the distinction or similarities between both perspectives perpetuates. In this paper, it is argued that a 'group' should be regarded as a distinctive 'learning environment', by which both perspectives can be identified as approaches to 'group-based learning'. However, regarding the amount of pre-imposed structure, task-type, learning objectives and group size, differences become apparent. A classification-model is developed to illustrate, not only, differences between both perspectives, but also, between various types of computer support for group-based learning.

Keywords: group-based learning, co-operative learning, collaborative learning, CSCL, CMC

Introduction

Groups for educational purposes are intensively researched since the 1970's, mostly at the elementary level. Rapid development of computer support for communication and collaboration stimulated its use for pedagogical practices in higher and distance-education. At present, however, there are no clear guidelines to determine what group-based learning method should be applied. Quite often it seems a subjective decision, based on either teaching pedagogy preferences or the prevailing theoretical research paradigm. Also, many researchers indicate a lack of theory and guidelines for the use of Information and Communication Technology (ICT) to support working and learning in groups (Brush, 1998; Hinssen, 1998).

This paper will focus on the main perspectives towards groups for educational purposes: 'co-operative learning' and 'collaborative learning'. Specifically two questions will be addressed: 'Is there a common basis for both perspectives?' and 'What are key elements for a process-based classification of (computer supported) groups for educational purposes?'. Past research has mainly focussed on the quality of collaborative products. The outcome, however, is mediated by the quality of intra group processes (Shaw, 1981). A process-based classification identifies crucial elements of group-based pedagogy design for face-to-face, as well as, computer supported learning environments.

Group-based learning

Co-operative learning versus collaborative learning?

Research literature of the 1970s and 1980s is dominated by co-operative learning as the generic term for group-based learning. Since the beginning of the 1990s the concept of collaborative learning came into fashion. In recent literature researchers do distinguish between these two generic terms of group-based learning (Panitz, 1996; Slavin, 1997; Lehtinen, Hakkarianen, Lipponen, Rahikainen & Muukkonen, 1998; Kirschner, 1999), but on the ground(s) of this distinction there is, however, no agreement.

Panitz (1996) regards collaboration as a personal philosophy of intra group interaction and co-operation as a (set of) structure (s) facilitating group performance. However, it rules out any variable that may enhance a group's performance trough structuring group member's activities and, moreover, tends to associate co-operative learning with artificial interaction (as a result of the structure) and collaborative learning with a 'natural' interaction process.

Another ground on which such a distinction could be based are the characteristics of the knowledge domain (Slavin, 1997). Co-operative learning is associated with well-structured domains whereas collaborative learning is associated with ill-structured domains. However, it requires general agreement on criteria that distinguish between well and ill-structured domains. Also, most domains contain both well-structured and ill-structured knowledge. Both are problematic issues.

Lehtinen et al. (1998) focus on individual group member's 'role' regarding group performance: co-operative learning is associated with division of labour, whereas during collaborative learning each member equally contributes whilst problem solving. Like Panitz' (1996) distinction, it rules out any use of 'structure' to facilitate group performance. Yet, several researchers have pointed out that effective

collaborative skills are not spontaneously acquired (Johnson, Johnson & Johnson-Holubec, 1992; Cohen, 1994). Some amount of structure may help students learn these specific skills for effective collaboration.

Some overall remarks can be made. Firstly, all described clarifications distinguish between co-operative and collaborative learning on a single ground. Secondly, often it is stressed that more similarities than differences, between co-operative and collaborative learning, exist (Kirschner, 1999). In sum, both may be considered more effectively as approaches to 'group-based learning': emphasising the 'group' as their common ground.

Common basis for co-operative and collaborative learning

In general there is agreement upon five characteristics of 'group-based learning' (Lamberigts, 1988; Sharan & Sharan, 1992; Johnson, Johnson & Johnson-Holubec, 1992; Slavin, 1997).

First, groups are composed of either a minimum of two up to six participants. Second, group-based learning is characterised by 'positive interdependence' that refers to the level of group member interdependence for group performance. It can be stimulated through the task (group task), resources, goals, rewards, roles or the environment (Brush, 1998). A third characteristic concerns the task: it has to be a genuine group task, i.e. the effort of all group members is needed to accomplish this shared task. Yet, not all researchers hold the same interpretation of a 'group task'. A fourth aspect is 'individual accountability' that refers to each student's individual responsibility for a specific aspect of either group process, group performance, or both. Individual accountability is enhanced through grading students for their individual effort or performance, as well as the group's performance. The final characteristic is a shift in the role of the teacher. Whereas whole-class settings are 'teacher-centred', during group-based learning the teacher becomes a coach and more autonomy ('student centred') is granted to the students. Although not a characteristic, it is often advised to assess whether students already have effective group processing skills, and if not to develop these through some sort of team building exercise (Sharan & Sharan, 1992; Slavin, 1995).

Among these general characteristics two stand out. Both were introduced in the early 1980s and counter, although not likewise articulated, possible negative effects of group-based learning. Individual accountability (suggested by Slavin) was introduced to counter the 'free-rider effect': some students would not invest any (or little) effort into group performance. Assigning individual responsibilities ensures each student's participation. Actually, the 'free-rider effect' is a synonym for what is known in group dynamics research as 'diffusion of responsibility' (Shaw, 1981; Forsyth, 1990). Positive interdependence (suggested by Johnson & Johnson) was introduced to enhance intra group interaction. This aspect aims at promoting group cohesion and a heightened sense of 'belonging' to a group. Social dynamics research has revealed group cohesion as an essential element for effective group performance (Shaw, 1981: Forsyth, 1990).

Since both 'individual accountability' and 'positive interdependence' relate to well known aspects group dynamics, it supports our claim that the group should be viewed as a common ground (hence 'group-based learning'). Moreover, it is a learning environment with specific characteristics that affect individual group members and subsequent intra group processes during group-based learning. Social dynamics research and specifically small group theory may reveal other variables that affect group interaction and performance. Although proponents of collaborative learning emphasise that students are required to regulate their own learning, they implicitly assume that students have these skills or that they spontaneously develop from collaborative interactions. Yet, how should we proceed if we assume that students do not possess these skills (or at least not all necessary skills)? Perhaps some amount of structure may be beneficial for students to learn effective skills for collaborative learning. The use of 'positive resource interdependence' does not necessarily contradict the process of 'scaffolding' (often regarded as a key element of 'collaborative learning'). What needs to be determined is the extent to which 'individual accountability' and 'positive interdependence', comprise some amount of pre-composed structure facilitating interaction processes and the development of collaborative skills. A lack of structure may very well impede individual effort into group performance (Brush, 1998).

As discussed, several distinctions between 'co-operative' and 'collaborative' have not clarified the difference satisfactorily. Moreover, from a group dynamics perspective both can be classified as two sides of the same coin: approaches to group-based learning. However, characterising them as 'approaches' indicates that a difference does exist. It may be fruitful for further theoretical as well as practical insight, to differentiate group-based learning along several dimensions of concepts closely related to group interaction and performance. The next section will suggest three major dimensions of group-based learning.

Dimensions of group-based learning

One dimension comprises the amount of structure, in terms of prescribed procedures for effective collaboration, provided to students: 'high amount of structure' versus 'low amount of structure'. An issue that needs to be addressed is when and how structuring elements are used to support group interaction, learning of subject matter and skills for effective and efficient group performance. Although, too much structure may create artificial interaction, no structure may result into fragmented, situational and optional interaction.

Another dimension comprises the learning objectives: 'lower level skills' versus 'higher level skills'. According to Slavin (1995) co-operative methods (e.g., STAD, TGT, TAI, CIRC) are "most appropriate for teaching well-defined objectives" (p. 5), or rather 'lower-level skills' (Cohen, 1994). However, giving and receiving conceptual feedback (lower level skill) is only one aspect that stimulates learning. Argumentative discussion, consensus generation and conflict resolution (higher level skills) may be stimulated through group-based learning as well.

The third dimension comprises task-type. Cohen (1994) stresses that it is essential to use 'group tasks' instead of individual tasks that all students must master. In general, groups tend to be more effective when the task requires a variety of information, consisting of several subsequent steps and can be solved by adding individual contributions (Shaw, 1981). Apart from 'additive', group tasks can be 'disjunctive' and 'conjunctive' as well (Shaw, 1981). Group performance on disjunctive tasks depends on its most competent member, whereas performance on conjunctive tasks depends upon the least competent member. Kumar (1996) identifies different task-type categories: concept-learning tasks, problem-solving tasks and designing tasks. He regards 'concept learning' as fact-based tasks and the latter two as analysis and synthesis tasks. Most group-based learning procedures (e.g. STAD, TGT and LT) typically use 'additive and/or disjunctive' or 'concept learning' tasks which can be typified as 'well-structured tasks'. Whereas

group-based learning in higher and distance education use 'conjunctive' or 'analysis and/or synthesis' tasks which can be regarded as 'ill structured tasks'. Concept learning can be seen as a lower-level skill, whereas analysis and synthesis can be regarded as higher-level skills. Cohen (1994) argues that no explicit pre-imposed structure(s) is needed if the task is ill structured. Yet, according to Kumar (1996) analysis and synthesis tasks involve rigorous task-division which is, however, only one possible approach to promote effective interaction during group problem solving. Moreover, rigorous task division will result in an 'additive' group performance product (A+B+C+D). Whereas 'synthesis' should reflect a shared group performance product (A) through extensive collaboration during group problem solving or a design task. Figure 1 illustrates all three dimensions and the respective positions of both approaches at the extremes.

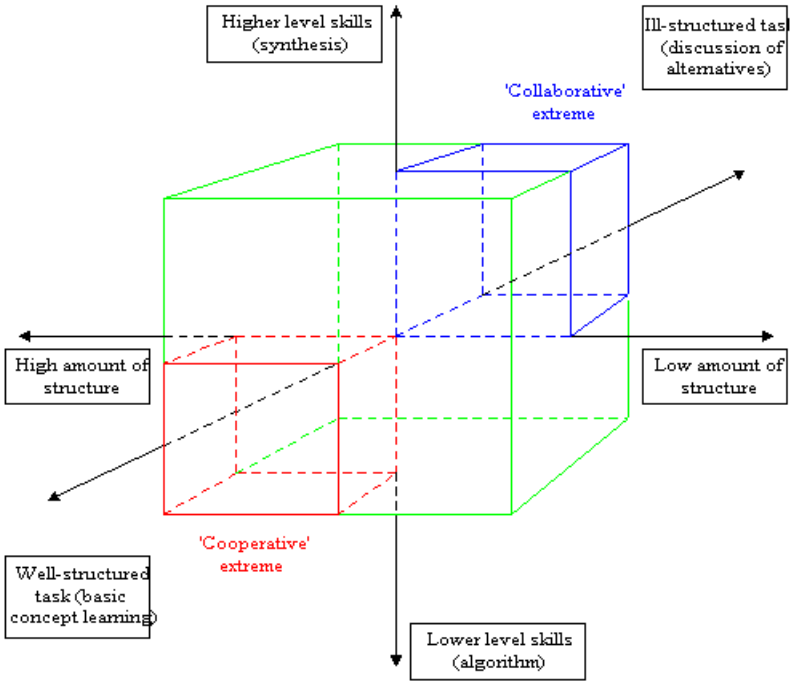

Figure 1. Three dimensions of group-based learning

Relationship between group size, interaction and group-based learning dimensions

A final aspect that affects a group's functioning is its size. Group performance effectiveness depends, as group size increases, on the one hand upon the groups' use of increased resources and alternate opinions and on the other hand upon the handling of increased co-ordination and group management processes (Shaw, 1981). Group performance on additive/ disjunctive tasks increases as group size is expanded, but decreases on conjunctive tasks with increased group size (Shaw, 1981). Often no explicit distinction is made between dyads (two member groups), small groups (three to six members) and large groups (seven or more members) and research that compares different group sizes is virtually non-existent (Fuchs, Fuchs, Kazdan, Karns, Calhoon, Hamlett & Hewlett, 2000). Fuchs et al. (2000) argue that group size likely affects equality of interaction and contribution to a shared product. The effect of group size on interaction can be related to a typology of student-student interaction. Figure 2 illustrates four types of student-student interaction.

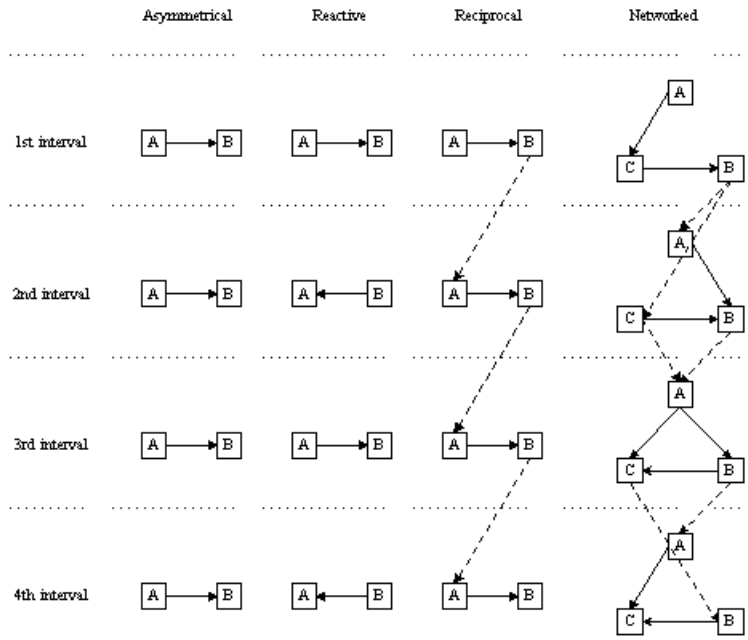

Figure 2. Four types of student-student interaction

Figure 2 is an extension of Rafaeli and Sudweeks (1997) distinction between three modes of communication: 'one-way communication', 'two-way communication' and 'interactive communication'. The intervals represent temporal communication sequences: plain arrows represent 'unrelated' messages, whereas dotted arrows represent 'related' messages that, not only, build forth on preceding messages, but also, constitute the input in the next interval.

Asymmetrical interaction refers to 'one-way communication' (e.g. a sixth grade student who corrects a fifth grade student's work). Reactive interaction refers to 'two-way communication' in separate intervals (e.g. two fifth grade students, working individually on the same problem, exchanging suggestions). Reciprocal interaction refers to 'interactive communication', spread across intervals (e.g. two students, working as a dyad, on the same problem). As a supplement to Rafaeli's (1997) modes, which all refer to dyadic interaction, a forth communication mode can be distinguished. Networked interaction refers to 'networked communication' in small groups (three to six members): messages potentially affect other group members and they, not only, build forth on preceding messages, but also, constitute further communication input (e.g. a small group of three students writing a collaborative research proposal). If equal participation, interaction and effort investment is an aim, group size should not exceed six members. In a group of seven or more members, 'free-riding' is more likely to occur and equality is difficult to assure. Although interaction processes in large groups (seven or more members) can be referred to as 'whole group interaction', it does not constitute a fifth interaction type. Whole group interaction is composed of reactive, reciprocal and networked communication patterns; it is, however, often unstructured and/or optional. Table I illustrates the relationship between interaction type, task-type and group size.

Group size does not only have a strong relationship with the three dimensions of group-based learning, but also with computer support for education. Crook (1994) distinguishes three categories: interaction with computers, interaction at computers and interaction through computers. Interaction with computers refers to individual interaction with a computer simulation or an intelligent tutoring system. In that interaction is individual, it will not be further discussed. Interaction at computers represents a group of students interacting with a computer program or tutorial. Communication is mainly face-to-face (F2F), between a dyad or small group of students that are seated behind a computer. Interaction through computers refers to interaction between group members via networked computers (e.g. e-mail, newsgroups, CSILE, WebCT). Table II illustrates the importance of group size with respect to different forms of computer support during group-based learning.

	'Co-operative' extreme	**'Collaborative' extreme**
Dyads (2 members)	Students of unequal ability work on different tasks. Each student has an individual goal. Student performance is individually graded. Interaction is a-symmetrical (dominated by the most able student). Students (of equal ability) work on the same well-structured (disjunctive) task. Both students work on the same 'individual' goal. Student performance is individually evaluated. Interaction can be typified as reactive and 'feedback oriented' but need not be equal (students react on each other in successive stages).	Students (of equal ability) work on a joint ill-structured task (conjunctive). Students work on a shared goal and create a shared artifact or knowledge base. Group performance, as well as, individual contribution is included in the evaluation. Interaction and participation are equal during work on the joint task and can be typified as reciprocal.
Small groups (3 up to 6 members)	Students are distributed across groups according to ability and they work (usually) on well-structured and additive (or disjunctive) group tasks. Students	Students are not distributed across groups on individual student characteristics. Mostly students compose the groups themselves and select their own

	work individually on subtasks (content focussed task division). Students receive a grade for their groups' performance and individual contribution. Group performance is evaluated in terms of each individual's improvement score on test. Interaction is mainly reactive and 'feedback oriented' due to task-type (well structured and/ additive) and rigid (content-based) task-division.	'research' topic. They work on ill-structured joint group tasks (analysis and synthesis). Students plan and divide student's activities for group performance and group interaction (process focussed task division). Students work on a shared goal and create a shared artifact or knowledge base. Group performance and each individual's contribution is included in the evaluation. Interaction and participation are equal during work on the joint task and can be typified as networked due to extensive communication and co-ordination that is required.
Large groups (7 or more members)	Students work in large groups on the same task (disjunctive). Often students are required to comment on each other's drafts or final papers or to discuss a teacher presented proposition. The first instance results in reactive interaction ('feedback oriented'), the second results in optional unstructured whole group interaction. Students determine their own participation and interaction rate.	Students work in large groups on ill-structured joint tasks (conjunctive). Students work to create a shared knowledge base that reflects their understanding as a group ('learning community') on a specific topic. This type of group-based learning (mostly in CSCL) is named knowledge-building. It results in unstructured whole group interaction but each student must contribute to the knowledge-building process.

Table I. Difference between group-based learning extremes for various group sizes, in terms of task-type and interaction-type.

	At computers	**Through computers**
Dyads (2 members)	Students discuss face-to-face, while seated at the same computer, a simulation or they construct a shared representation of their knowledge. Computer Based Collaboration (CBC). Belvedere.	Students are seated at separate computers. They discuss a shared topic or construct a joint representation of their knowledge. Computer Mediated Communication (CMC) which can be: Synchronous: Belvedere, Sherlock, Covis Asynchronous: E-mail
Small groups (3 up to 6 members)	Small groups of students work behind a computer. Sometimes they interact at turns individually with a tutorial or simulation program (interaction mainly with computers). Sometimes they interact at turns with the software and others advise, give feedback or comment on the work (feedback, suggestions) (interaction mainly at computers). Integrated Learning Systems (ILS), Computer Based Collaboration (CBC), Computer Supported Co-operation (CSC).	Students are seated at separate computers and discuss a shared topic, construct a joint represen-tation of their knowledge (artifact) or create a shared knowledge base. CMC via 'dicussiongroups' (e.g. these are similar to so-called 'Internet newsgroups') or groupware (e.g. this type of software supports not only discussion but also a sense of a shared workspace). Synchronous: Netmeeting. Asynchronous: Newsgroups, WebCT, Learning Space, eRoom.
Large groups (7 or more members)		Computer Conferencing (CC) lets students usually discuss a shared topic, comment on draft and final versions of papers, and/or offers students a shared workspace: for example document-archive. In Computer Supported Collaborative Learning (CSCL) systems students collaboratively construct a shared knowledge base on a learning topic (KB). CC: E-mail, BSCW, WebCT, FirstClass, TopClass CSCL: CSILE, Knowledge Forum (KF).

Table II. Different types of computer support for group-based learning, based on group-size.

In sum, group size may be strongly related to group interaction and an important determinant for group performance. In contrast with the current tendency, researchers should treat dyads, small groups and large groups as distinctive categories. Moreover, research evidence on performance (and group interaction) should be handled accordingly. Appendix A illustrates the complexity of group-based learning. Five examples of group-based learning are described. Specifically, problems are addressed that arise if key aspects are not elaborated or the chosen combination of task-type, group size and amount of structure is not appropriate with respect to the chosen learning objectives.

Conclusion

The starting-point of this paper was a perpetuating discussion upon the ground(s) of the distinction or similarity between group-based learning perspectives. Also, in contrast to most outcome-oriented research on group-based learning, the premises for a process-oriented focus were investigated. Specifically two questions were addressed: 'Is there a common basis for both perspectives?' and 'What are key elements for a process-based classification of (computer supported) groups for educational purposes?'.

In the last decade of the 20th century researchers either regarded 'co-operative' and 'collaborative' as identical concepts or distinguished between them on a single ground. For educational design of group-based learning practices these provide little hold. However, as argued, a shared basis does exist, which can be traced back to group dynamics research. Co-operative and collaborative learning should be regarded as approaches to group-based learning. Moreover, a group should be treated as a 'learning environment' with specific characteristics that affect intra group interaction and group performance, as opposed to a 'black box' approach.

A process-oriented perspective reveals three key dimensions for educational design of group-based learning: both approaches relating to the 'extremes' of these dimensions. Group interaction, group performance and subsequent individual learning depend on the chosen learning objective, task-type and the amount of pre-imposed structure upon group interaction. Another factor that needs further consideration is group size. Amongst few studies that have investigated a possible relationship between group size and intra group interaction, Fuchs et al. (2000) compared dyadic and four member groups' performance on a complex task ('ill structured'/ several possible solutions). Although not significant, a trend was observed favouring dyadic compositions with respect to participation equality, especially in favour of low achieving students. However, (small) group compositions elicited more cognitive conflict (more disagreement and negotiation) and appeared better suited for average and high achieving students. Even though Fuchs et al. (2000) study was conducted at the elementary level it suggests a possible relationship between group size, interaction and performance. Research on group-based learning in higher and distance education should take group size into account as well.

In distance education, computer mediated communication (CMC) is increasingly used to support group-based learning of geographically dispersed students. During computer conferencing mostly large groups are deployed (Harasim, 1993; 1995; Hiltz, 1994) and CMC based group-tasks often consist of commenting on draft/final products in dyads. Recently a tendency seems to develop in favour of small groups to increase student participation and reduce 'free-riding'. Students are required to solve an ill-structured problem through extensive interaction and create a shared artifact. Especially, if one aims at higher-level cognitive gains (Brandon & Holllingshead, 1999), complex tasks requiring extensive interaction and communication, are most applicable. However, it requires on the one hand that students are dependent on each other, but on the other hand that they are held accountable for their contribution to group interaction and performance. Several evaluations of courses at the Open University of the Netherlands (OUNL), that rely on computer mediated communication support for group-based learning, reveal that groups need some amount of structure to co-ordinate their activities. Such a group-based method could be located in the upper left quadrant of figure 1, and may consist of assigning each student a specific role, comprised of activities that are important for successful group interaction and performance.

The object of the classification-model presented is to stimulate researchers and course developers to consider carefully which group-based learning method will be most supportive to student learning. Educational design of group-based learning should focus on the combination of learning objective(s), task-type, amount of pre-imposed structure and group size. It appears reasonable to assume that this combination determines the nature of the interaction process, or rather the intensity of the interaction process (e.g. reflected through increased communication demands). Table I and table II provide criteria that may guide course developers (and researchers) in making well-considered choices, with respect to group-based learning design, regarding the combination of learning objectives, task-type, group size and group interaction intensity. Currently, some OUNL courses (graduate courses) are being re-designed, using the outlined process oriented approach. Also, existing group-based learning practices can be evaluated using these criteria (Appendix A). Follow-up research is needed to test, verify and sharpen these criteria.

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Appendix

Example 1

A teacher wants to teach students 'long division procedure' through group-based learning. Because of classroom organisation the teacher distributes students over groups of six, so as not having to coach too many groups. He encourages students to help each other. Students will be graded on their individual test score. It appears that only one or two high-ability students provide feedback to other group members.

Analysis

The skill that is being taught can be typified as a 'lower-level skill' and the task is well-structured (e.g. standard procedure for doing 'long division'). All students are required to study the same material. Intensive communication (e.g. discussion) and co-ordination of group effort are not required. Students are not dependent on each other to acquire the skill but they can consult each other and others' feedback; ands no minimum for interaction participation has been set.

Problems

One can question whether the chosen group size is suited for this task. A group of six may not stimulate all students to provide feedback to other students. Dyads or small groups of three students will probably increase low and medium ability students' feedback. In this case high-ability students dominated in giving feedback which may result in a feeling of being a 'teacher-extension'. A group score combined of each members' 'improvement score' (Slavin, 1995) would at least create an incentive for providing feedback.

Example 2

A teacher wants students to 'write a paper on the second world-war' through group-based learning. Students distribute themselves in small groups of four students. They must determine which topic they wish to study, plan the work that has to be done and report in a paper their groups' findings. If any problem or conflict occurs students are first required to solve these themselves. Only if they can not find a solution they make call upon the teacher. All students will receive the same grade for their groups' performance.

Analysis

The skills that are being taught can be typified as a 'higher-level skills' and the task is ill-structured (e.g. no clear solution, depends on the topic). Student must decide upon their topic of study, plan activities, divide tasks and collaboratively write a paper. This skills involves intensive communication (e.g. discussion, choosing between alternatives, negotiation) and co-ordination ('who does what' 'when is what due?). Students are dependent on each other's contributions to reach their goals (and practice several skills e.g. argumentation, negotiation). There is no set minimum for interaction participation.

Problems

Although students are assigned a complex group task, there is a risk of rigid task division. Students may very well divide the topic in four separate parts with each student researching only his/her part. As a consequence there may be little discussion about others' part and the content of the final paper may only consist of added individual sub-reports. If discussion and argumentation are learning objectives, students should be encouraged to critique and question relevance of each other's research findings and writings. Since students are only graded for the groups' performance their individual effort and contribution to the group performance may differ. Apart from a group grade, students should be assessed on their individual contribution to the group performance.

Example 3

A teacher wants to teach students 'how electricity works' through group-based learning at the computer. Students are assigned to groups of three. A computer simulation is used to conduct several experiments on electricity with concepts like voltage, watts, batteries and resistors. Because of classroom organisation each group is assigned one computer. The teacher encourages students to help each other to solve several 'electrical' problems. Students will be graded on their individual score on a test, but a group score will be computed as well. The observers that students, in general work, well together although several times issues of 'keyboard time arise'.

Analysis

The skill that is being taught can be typified as several 'lower-level skills' (learning about different concepts and their relations) and the task is well-structured (e.g. limited number of procedures). All students are required to study the same material. Students are invited to discuss possible solutions and must to co-ordinate turn-taking. Students are not dependent on each other to acquire the skill (since each student could also do the exercise individually), but whilst solving the problem they can consult each other or provide feedback.

Problems

One can question whether a group is suited for this task, it depends on the complexity of the problems. In this case, a group of three students seems a good choice, although already issues of 'keyboard time' arise. A group of more than three students will even more likely face participation issues, not all students may equally contribute to a problem solution. The incentive to make sure each group member understands the solution is increased by giving the students also a grade for their group's members' performances on the final test. Positive interdependence may be even more increased by grading students on their actual group behaviour (or even stimulate students to grade each other (peer-assessment)).

Example 4

A teacher wants students to 'write a research proposal, discuss various issues in thesis writing and comment on others' drafts via text-based asynchronous CMC'. Each group of fifteen students is assigned to a 'newsgroup' during the eight weeks of the course. During first five weeks students weekly discuss an issue in thesis writing. After five weeks each student posts his/her draft proposal to the 'newsgroup'. During the sixth week each student has to comment/ give feedback on at least two draft-proposals selected by the teacher. During the last two weeks each student writes his/her final research proposal. Students will be individually graded for the quality of their research proposal.

Analysis

Here the focus lies on 'higher-level skill' (e.g. discussion, commenting content) and the task is ill-structured (e.g. no clear solution). Student must discuss several issues of thesis writing with no clear solution. The task involves some amount of communication (e.g. discussion) and no co-ordination. Students are obliged to give other students feedback on their research proposal. A minimum is set for draft commenting: each student comments on at least two teacher-selected draft-proposals. Students are not dependent on each other to write their final research proposal.

Problems

Although a group size of fifteen may increase individual differences, which may stimulate discussion, it is not well suited with respect to each discussion's duration (one week). Furthermore, no minimum is set for discussion participation. Some students may contribute each week as much as five messages while others do not contribute at all. Also, each student has to write a draft and final research proposal individually and is graded accordingly. Although students are obliged to give feedback, they are likely to invest little effort in commenting others' draft-proposals since they neither have to give an account of feedback recieved, or give arguments for incorporating or ignoring others' feedback. In sum, they are not dependent on each other's feedback to write their final proposal.

Example 5

A teacher wants students to 'write collaboratively a research proposal' through group-based learning via text-based asynchronous CMC. Students are distributed across small groups of four students. The teacher assigns one student the role of chairman, who is responsible for communication with the teacher. Students must determine which topic they wish to study (discussion of multiple alternatives and argumentation), plan and co-ordinate the work that has to be done and report in a shared paper their groups' findings. If any problems or conflicts occur students are first required to solve these themselves. Only if they can not find a solution they make call upon the teacher. All students will receive at grade for their groups' performance, but also a grade for their individual contribution to group performance, discussion and interaction.

Analysis

The skills that are being taught can be typified as a 'higher-level skills' and the task is ill-structured (e.g. no clear solution, depends on the topic). Student must decide upon their topic of study, plan activities, divide tasks and collaboratively write a paper. This skills involves intensive communication (e.g. discussion, choosing between alternatives, negotiation) and co-ordination ('who does what' 'when is what due?). Students are dependent on each other's contributions to reach their goals (and practice several skills e.g. argumentation, negotiation). There is no set minimum for interaction participation.

Problems

Although students are assigned a complex group task, there is still a risk of content-based task division. Students may very well divide the topic in four separate parts with each student researching only his/her part. As a consequence there may be little discussion about others' part and the content of the final paper may only consist of added individual sub-reports. If discussion and argumentation are learning objectives, which in this case is not made clear, students should be encouraged to critique and question relevance of each other's findings and writings. Although one students is assigned the role of chairman, which may simplify student-teacher communication, this student will experience a heavier workload and will invest more time than other group members

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