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Effects of Verbal Participation in Small Group Discussion

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Research into small group learning has flourished during the past few years, and has been conducted from an interactional and a cognitive point of view.

Recent research from the interactional perspective has generally shown that the achievements of students working in cooperative settings are superior to those of students in competitive and individualistic settings. In particular, those models of small group learning in which decentralization of authority and clear cooperation reward structures were implemented have proved to lead to superior performance (see, for example, the extensive reviews by Sharan (1980) and Slavin (1980)).

Research that systematically investigates the effects of group interaction variables on achievement has been executed by Webb (1980a, 1980b, 1982a, 1982b) and by Peterson and Janicki (1979). These researchers demonstrated that some interaction variables are more beneficial to the learning of individual members of a group than others. Those that turn out to be the most beneficial are 'giving help' and 'receiving help'. Both show a positive relation with achievement. Students who give help, that is explain difficult subject-matter to their peers, learn more than students who do not. The effect on achievement of receiving help depends on (a) whether the help is given in response to a student's need, and (b) whether the help includes explanations as well as the correct answer. Receiving no help when asking for it appears to be markedly detrimental to achievement.

Research by Webb (1980a, 1980b) has further shown that the amount of off-task behaviour in a group is negatively but non-significantly related to achievement while the amount of passive behaviour, defined as a lack of any discernable involvement in the group task, also shows a negative relationship with achievement. Thus, merely observing other students' working activities and listening to others' explanations appears not to be sufficient for learning the material.

In their conclusions Webb (1980 a, b) and Peterson and Janicki (1979) stress two points: (a) students have to be actively involved in the learning process, and (b) the mere act of giving or receiving help is not a sufficient condition for learning. It is the way in which this is done by the students that is important. Giving or receiving help consisting of explanations has a greater effect on learning than does help consisting only of a correct answer.

Although these results are interesting, they do not explain what kinds of cognitive processes mediate between the interactional behaviour and the superior learning results. In other words, *how* do students learn while giving or receiving explanations. To get a deeper insight into these processes we have to turn to the cognitive perspective on group learning.

Bargh and Schul (1980) have shown that students who have to learn subject-matter with the aim of teaching it to another student score higher on an achievement test than students who learn the material only for themselves. Their findings indicate that people studying for a teaching role perform better both on peripheral detail items and on items measuring the central message of the material. Bargh and Schul suggest that students preparing to teach someone else construct a more highly organized cognitive structure than students trying to learn the material only for themselves. They further suggest that the former students may reorganize the material not only when preparing for its presentation, but also while teaching.

The mechanism that could be responsible for this cognitive restructuring is elaboration on existing knowledge. Elaborations are subject-produced inferences that describe previously unseen or un-understood relationships between concepts or real-world phenomena. According to Anderson and Reder (1979) information is better understood, processed and retrieved when students are given an opportunity to elaborate on that information. Elaborations provide redundancy in the memory structure. Redundancy can be looked upon as a safeguard against forgetting and an aid to retrieval.

If one accepts this explanation for the findings of Bargh and Schul (1980) one might hypothesize that the same mechanism underlies the superior learning of students who are actively engaged in small group discussion. A study by O'Donnel, Damsereau, Rocklin, Hythecker, Lambiotte, Larson and Young (1985) provides support for this hypothesis. They investigated the impact of the frequency of elaboration on the text processing performance of dyads using technical text. Students in the frequent elaboration group were requested to elaborate four times while studying the passage; students in the infrequent elaboration groups elaborated once. The amount of elaboration engendered by small group discussion had a clear effect on the learning of the students.

Of particular significance to the present study is research done by Schmidt (1982). Schmidt investigated the role of elaboration of prior knowledge during discussion by presenting a problem description to a small group of students. The problem described a set of phenomena which can be observed in reality. Students were asked to explain these phenomena in terms of underlying processes, principles or mechanisms. Subsequently, they processed a problem-relevant text, which aimed at clarifying any ambiguities that turned up during the initial analysis of the problem. Schmidt found that groups of students working to this problem-analysis approach showed superior recognition and transfer of information as compared with control groups which had not been presented with the same sort of problem. These effects were attributed to the activational and restructuring properties of the problem-analysis procedure. Schmidt concluded that elaboration of prior knowledge through small group discussion in general has a positive effect on subsequent text processing. Recent research by De Grave, Schmidt, Beliën, Moust, De Volder and Kerkhofs (1984) confirmed these results.

The investigations summarized here can be used to explain why students who actively participate in small group discussion show superior learning. Their participation can be interpreted as elaboration on prior knowledge which contributes to the construction of a richer cognitive structure of the topic. But what happens to those who participate less actively in the discussion? Large differences in the amount of active involvement among students in tutorial sessions are no exception, as anyone who attends such groups may confirm. Do students who elaborate less learn less? This question was investigated in the present study, using the activation-of-prior-knowledge approach developed by Schmidt (1982). A problem was presented to several groups of students, which they were asked to discuss. The discussion was recorded on tape. Subsequently, the students read a problem-relevant text. Learning was assessed by achievement on a recall and a completion test. The relationship between achievement and participation in the discussion was assessed.

Method

Subjects

The subjects were twenty female and two male first-year students from two schools for health sciences. All subjects had enjoyed the same type of secondary education, their final examination including biology. The average age was 18.9 years, with a standard deviation of eleven months.

Procedure

The students were randomly assigned to discussion groups: four groups of about six students. In each of the groups a male experimenter was present. He briefly explained the problem-analysis approach by means of a written example describing a plant releasing oxygen in daylight but not in the dark. In a hand-out of one and a half pages, the phenomenon was analysed from a few viewpoints, and a number of more or less elaborate explanations were offered. The experimenter actively involved subjects in order to check their understanding of the way they were to proceed with the next problem. He emphasized that they were to brainstorm on possible explanations for the problem and to analyse the explanations coming up while discussing them with each other. This briefing took five to ten minutes.

The experimenter then announced that the next problem-analysis should not take longer than fifteen minutes, and the problem was given in writing. It read: 'A red blood cell is placed in pure water. Under the microscope we can see it swell very quickly and burst finally. Another blood cell is placed in salt water and begins to shrink'.

When students had finished reading the problem, the discussion started. The experimenter acted as a discussion leader, asking questions, paraphrasing answers and summarizing. It was essential that, while leading the discussion, he did not provide new information. The discussion was recorded on tape.

After discussion time was over all students were given a text of six pages on the topic of osmosis and diffusion. The text contained no formulas, tables, figures or other didactic features on the subject. Students were instructed to study the text for fifteen minutes.

After this, they were told how the experiment would carry on. Since no time limits were set for the next phases, students were allowed to raise a hand after completion of a phase and to proceed to the next phase. When this was clear to students, they received a booklet (the free-recall test) consisting of three blank pages and a front page with the following instruction: 'Write down everything you remember about osmosis and diffusion. Write in sentences, do not use single words or drawings'. When students indicated they did not remember anything more than they had written down, they were given a second booklet. This contained a cued recall or completion test consisting of forty-four items related to the text, such as: 'Diffusion proceeds quicker when molecules are ...' (answer: smaller); and 'When two concentrations possess the same maximum osmotic pressure, they are called ...' (answer: isotonic).

Alpha reliability of the completion test was calculated at 0.73. Inter-rater reliability for the scoring of free recall, calculated for a number of randomly selected, free recall protocols, was 90 per cent and higher, counting only the number of correctly recalled propositions.

A verbatim transcription was made of every tape-recording of the problem-analysis, which was then analysed. The following independent variables were constructed:

1 The *number of propositions* every group member produced during the problem-analysis. (According to Mayer (1985) propositions are subject-predicate units which express one single idea.)

2 The *number of clauses* every group member produced. Every *new* contribution of a group member in relation to the subject-matter under discussion was counted as a clause. This is a useful alternative measure of participation because one person may contribute to the discussion only once by means of a long monologue, consisting of many propositions, while another may produce a large number of short interventions, also meaning many propositions. Without measuring the number of clauses produced these two categories of students could not be distinguished.

3 The *relative number of propositions*. Since the amount of discussion time in every group was variable, a measure was needed to compare the relative contribution of each group member. The relative number of propositions was computed by dividing the number of propositions produced by individuals by the total amount of propositions produced by their group.

These three independent measures are expected to be interrelated. Dependent variables were a) the number of correct propositions every group member produced in free recall, and b) the amount of correct answers in the completion test.

Results

Table 1 shows the means and standard deviations of the variables of interest. Looking at those of the discussion variables, one can conclude that the participants' contributions vary widely. Variance in achievement is less.

		Mean	SD	NP	NC	PP
DISCUSSION VARIABLES	– Number of propositions (NP)	16.05	10.16	–	–	–
	– Number of clauses (NC)	6.67	3.87	0.84	–	–
	– Percentage of propositions (PP)	19.06	11.91	0.99	0.76	–
ACHIEVEMENT VARIABLES	– Completion test	37.23	4.37	−0.30	−0.30	−0.29
	– Number of propositions in free recall	34.07	10.72	0.02	−0.14	–

Table 1

Discussion and achievement variables: means, standard deviations and correlations.

The table also shows the correlations between and among the discussion and achievement variables. First, there are high intercorrelations between elaboration measures, indicating that they are actually all measuring the same construct. Second, it can be concluded that no correlations exist between the elaboration and achievement variables. In fact, slightly negative – although not statistically significant – correlations exist between the amount of elaboration and achievement scores on the recall and completion test.

Discussion

Conceptualizations of learning in terms of an elaboration hypothesis (Anderson and Reder 1979; Reder 1980) predict that the more subjects elaborate while processing information, the richer the resultant cognitive structure will be, or, in other words, the better the learning. Applied to small group learning this theory suggests that the amount of elaborative activity during discussion has a positive influence on achievement.

In the present study this hypothesis was tested. Subjects analysed a problem in a small group. The discussion was recorded on tape and a verbatim transcription produced. Subsequently, subjects read a problem-relevant text and took a free recall and cued recall test. The study failed to demonstrate any relationship between the discussion variables, that were utilized as an operationalization of amount of elaboration, and achievement. These data seem to imply that the amount of elaboration during small group discussion has no effect on learning whatsoever.

Superficially, the result is at variance with previous research in this area. Schmidt (1982) and De Grave et al. (1984), for instance, have found that elaboration of prior knowledge by discussing a problem generally facilitates the processing of new information. O'Donnell and her associates (1985) have shown that the achievements of frequently elaborating dyads were superior to those of their less frequently elaborating counterparts. These studies indicate that the amount of elaboration is indeed a major variable in learning by small group discussion.

The reader should be aware, however, of the differences in design between the investigations concerned. The studies reviewed here were experimental in nature and employed between-groups comparisons in order to investigate the influence of elaboration by discussion. In one case (that of Schmidt and his collaborators) means of elaborating groups were compared with those of non-elaborating control conditions, while O'Donnell et al. (1985) controlled the amount of verbal elaboration by their subjects by means of experimental manipulation. The present study utilized a *between-subjects* approach to the problem. In principle, it is possible that a relationship which exists at the group level might be absent at the individual level.

There is a more plausible alternative explanation, however, for this apparent discrepancy. It is possible that subjects not – or less – participating in the discussion elaborate as much as those who do participate, without *verbalizing their elaborations to the same extent as the latter.* This covert-elaboration hypothesis could explain why no relation could be demonstrated between amount of elaboration, as measured by the number of utterances by group members, and achievement.

An implication of this point of view is that the amount of verbal participation in a discussion may not be such a valid indicator of the amount of elaboration carried out as is often suggested in the literature.

Indirect support for a covert-elaboration hypothesis comes from data provided by Webb (1980a, 1982a), Peterson and Janicki (1979), and recent research by Peterson and Swing (1985). These investigators have shown that not only do interactive behaviours like giving explanations or providing information (the behaviours they usually summarize as 'giving help') have a facilitative effect on achievement, but so also is the mere act of listening to others ('receiving help') beneficial to the learners as compared with off-task behaviours. So not only the talkers benefit from their efforts, but also the listeners, because both groups are cognitively active.

This conclusion that the more silent students may learn as much from small group discussion as the more talkative ones may come as a relief to those who worry about the involvement of the silent in small group activity.

The investigation described here suggests certain avenues for further research. One is to verify the extent to which non-participants in small group discussion are really elaborating covertly. This can be done in several ways, one of which is to utilize a stimulated-recall procedure. By this procedure subjects are shown a videotape of a discussion in which they participated and are asked to stop the tape whenever they recall a thought they had during the discussion. The method has been used with some success in research into clinical reasoning processes (Elstein, Shulman and Sprafka 1978). Another investigation that could be made is into the extent to which the specific nature of the elaborations influences learning. There are some indications that explanatory elaborations are particularly successful in the promotion of learning (Britton and Black 1985), which suggests that learning groups should be presented with tasks that stimulate the production of explanations. More detailed analyses are necessary, however.

Dedication

This paper is dedicated to the memory of Jan J.J. Beliën, who died during the preparatory stage.

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