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PEER TEACHING IN HIGHER EDUCATION: A REVIEW*

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ABSTRACT

In the last decade, peer teaching has gained momentum in higher education. Socio-psychological, pedagogical, economical and political considerations have all contributed to this recent interest. A number of peer-teaching models including discussion groups led by undergraduate students, proctoring (PSI), student learning groups, the learning cell, and student counseling of students *(parrainage)* have evolved. Several issues and problems may confront the instructor who wants to use undergraduates as teachers: selection of student partner, functions of student teacher, cooperation vs. competition, the structure of the learning situation, preparation of the student teachers, benefits of peer teaching, the role of the professor, financial aspects and instructional facilities. The evidence reviewed suggests that peer teaching, best used in conjunction with other teaching and learning methods, has great potentials for both student "teacher" and student "learner", especially if one seeks to enhance active participation and develop skills in cooperation and social interaction.

A student's colleagues often represent the least recognized, least used and possibly the most important of all the resources available to him.
(Mackenzie et al., 1970).

I. Introduction

As the quotation above suggests, students themselves have long been neglected as a potential instructional resource in higher education. During

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the last few years, however, the concept of "peer teaching" has gained momentum in college and university education. Although the meaning of the term "peer teaching" seems clear and the procedures alluded to simple, i.e., students of similar age and/or educational level teach each other, a review of the literature illustrates the complexity of the issue and also points to a variety of teaching and learning methods that may be thus called, but which carry other labels.

Historically, "peer teaching" or tutoring has probably been in existence for as long as we have had schools accessible to a wider section of the population. At first, though, its raison d'être was based on strictly financial grounds. Masters of understaffed village schools were obliged to ask their best pupils to assist those with lesser abilities and slower comprehension. It appears that one of the first successful attempts to formalize this kind of peer teaching was made in 1798 by Joseph Lancaster, who directed a school for the poor (Schirmerhorn, 1973).

On the university level, tutoring has long been a tradition with the British, most notably at Oxford and Cambridge where student groups of 3 to 6 participants are guided by a supervisor (an assistant professor or graduate student). In addition, each student may have a "tutor" (i.e., an established university teacher). However, this approach does not correspond to the concept of peer teaching as used here, since it relies heavily on tutors of much more advanced age and educational level. Teaching by peers of similar age and education has been introduced in higher education much more recently (at the Free University of Berlin, in 1951, for example; Huber, 1972) and explored on a wider basis (informal, formal, and experimentally-controlled programs), most notably in North America, but only during the last decade.

The purpose of this review is to describe important factors which have contributed to the recent interest in this form of instruction, survey different types of peer teaching, and finally indicate some of the issues and problems that this educational strategy presents. While most of the examples and research are drawn from the literature on higher education, a few findings at other educational levels have been added where they seemed relevant.

II. The Context of Recent Developments in Peer Teaching

Peer teaching has not evolved in a vacuum, but is the result of a number of concurrent developments. It is important to understand this wider context if one wants to judge its value and applicability in a given educational situation.

The reasons for the interest in peer teaching in higher education today

may be classified as socio-psychological, pedagogical, economic, and political. We shall discuss each of these factors in turn.

1. SOCIO-PSYCHOLOGICAL FACTORS

Particularly on large campuses, today's students are isolated from each other and quite often from their families and other adults as well. Their personal contacts with the faculty are distant, if they exist at all. Objectives and possible applications of the courses and curricula are not always well defined, neither are the student's vocational goals. It would therefore be natural for the students to seek contact with their peers (Taylor, 1969).

After more than 45 years of research (Newcomb, 1967) on small and large universities, Newcomb (1974) has come to the conclusion that professors have little effect on their students. Rather, "the most important source of influence for a student, then or now, is the reference group" (p. 73). Unfortunately, Newcomb has observed a split in college between the peer-group experience and their intellectual life: "Peer-groups have strong effects on students, but too often there is no connection between the interests they generate or support and the academic objectives that college typically proclaims" (p. 74).

Bain and Anderson (1974) have also shown the importance of peer influence on adolescents. For example, personal friendships with middle-class students may strengthen the desire to attend college in lower-class students, and thereby counterbalance or even outweigh the latter's relatively low self-perceived scholastic ability. Peer teaching can increase and intensify these relationships, and thus achieve positive affective results beyond mere intellectual gains.

A large survey at Cornell University (Heitowit, 1974) revealed that the three major concerns to students were career questions, course work, and course and major selection. Despite wide-ranging counseling facilities and faculty advising, fellow students were the most frequently cited source the students turned to for help with these problems.

Zander (1974) has shown that teamwork and team spirit are often more important than individual achievement. The group achievement motivation in contrast to individual achievement develops in particular situations. Zander argues that most organizations and schools do little to enhance the group motives, that they are designed for individual achievers. Rich contributions by group efforts and teamwork are thus lost to society. One way to increase the group motive is to "shift control downward wherever possible, giving those who do the work more real say about how much they do and how they do it" (p. 68).

Finally, as has often been pointed out, a general malaise about modern materialist society has led the young to turn increasingly to values which

"have to do with hedonism, interpersonal relations, self-development, and ideas. (Since) the schools frustrate the students in the latter two areas, only the first two are available to the individual" (Bloom, 1968). They are only offered on a limited basis, however, since the lecture, the instructional method most frequently used at university, "notoriously neglects (social interaction)" (Bligh, 1972).

These findings would seem to justify the belief that peer teaching – quite apart from the cognitive gains it may achieve – can, through its emphasis on close personal contact, contribute significantly to satisfying the students' socio-psychological needs.

2. PEDAGOGICAL CONSIDERATIONS

From a pedagogical point of view, the crucial variable in peer teaching is *active* involvement of the learner in the learning situation as opposed to his passive exposure to material. A typical university course (be it an introduction to a field or a seminar) consists of one person who presents and imparts orally *ex cathedra* facts and concepts to the students whose own "participation" is often limited to note-taking. In contrast, as we shall see in the next section, peer teaching situations require total involvement of "tutee" and "tutors" alike.

Second, as everyone who teaches himself knows, it is not only the tutees but also the tutors who learn, even though they may be teaching someone far below their own educational level (Bruner, 1972; Gartner et al., 1971).

Third, important "side effects" of peer teaching – for both tutor and tutee – include: an increase in cooperation, accompanied by a decrease in competitive behaviour; an increase in motivation, and an increase in self-confidence and self-esteem. These and other specific issues will be taken up again in the fourth part of this review.

Today's perhaps best-known advocate of the quest for active learning is Piaget, who in many of his writings underlines the need for "an education which is an active discovery of reality, as opposed to one that consists merely in providing the young with ready-made wills to will with and ready-made truth to know with. Though, even if one is setting out to train conformist minds that will keep to the already mapped out paths of accepted truths, the question remains one of determining whether the transmission of established truths is more efficiently carried out by using processes of simple repetition or by a more active form of assimilation" (Piaget, 1971, pp. 26–27).

He answers by referring to a recently established assumption "which has revolutionized our concepts of intelligence" (ibid. p. 28), namely that "knowledge is derived from action, not in the sense of simple associative responses, but in the much deeper sense of the assimilation of reality into

the necessary and general coordination of action. To know an object is to act upon it and to transform it, in order to grasp the mechanisms of that transformation as they function in connection with the transformative actions themselves. To know is therefore to assimilate reality into structures of transformation, and these are the structures that intelligence constructs as a direct extension of our actions" (pp. 28–29).

Translated in a very general manner into the context of peer teaching, "action" occurs on the part of the one who assumes the *teacher's* role. He is forced to transform knowledge (facts, concepts) in such a way that it may be assimilated by his partner. (It goes without saying that this transformation of "content" applies to any teacher, peer, or other.) It may therefore be concluded that the most profitable peer teaching situation would be one where roles of "teacher" and "student" are alternated, such as is the case, for instance, in the "learning cell" (which is described in the next section).

As for active involvement on the part of the *"learner"* in a peer teaching situation, it is favored by the small (often one-to-one) student-teacher ratio which allows for immediate feedback (factual as well as social). Students find out immediately if their response to the offered stimulus is appropriate or inappropriate. Frequent testing or simple questions designed to prompt the right answer, on one hand, and informal dialogue, on the other, engage active learner participation while allowing for direct input (from the student) with respect to the goals and the structure of the learning situation. The possibility of actively "shaping" the learning environment is of considerable motivational importance (Mager and Clark, 1963).

When comparing traditional schools with the new, "active" ones, Piaget distinguishes 2 critical processes: *a*), the constraint exercised by the adult; and *b*), the cooperation of the pupils with each other. In "new" educational theory, there are efforts to "supplement the deficiencies of externally imposed discipline (which may lead to all sorts of distortions) with an internal discipline based upon the social life of the children themselves" (Piaget, 1971, p. 179).

The students' adherence to the unspoken rules of their own system may thus be successfully used for the sake of learning. Indeed, cooperation among students may very well be as or even more important than the direction imposed upon them by the teacher. "From the intellectual point of view, it is such cooperation, which is to say, all the forms of behavior capable of developing the critical attitude of mind, objectively, and discursive reflection. From the moral point of view, it results in a real exercise of the principles of behavior, and not solely in a submission to external constraint" (Piaget, p. 180).

3. ECONOMIC FACTORS

Economic considerations for implementing peer teaching programs are obvious: students fulfilling functions normally assumed by a faculty member (whatever their remuneration) represent a saving to the administration. Given today's high student-faculty ratios, particularly in the larger universities, an increase of the number of teachers appears highly desirable. At a time of financial constraints, indeed of budgetary *cuts*, however, such a proposition would be totally unrealistic.

In this context, it should perhaps be underlined that peer teaching represents one of the few instructional innovations which does not call for an immediate additional investment. Most proposals for educational improvements, particularly those relying on technological means, have almost automatically been followed by demands for supplementary budget allocations.

4. POLITICAL CONSIDERATIONS

Political reasons for introducing peer teaching programs are complex. Depending on one's own position, they might be viewed "negative" or "positive". Let us take the process of socialization, for example. Peer tutoring is frequently and successfully used to facilitate first-year students' success at university by familiarizing the young people with "the" system, i.e., by making them in a most efficient way an effective part of it. It is evident that critics of "the" system (whatever it may be) would be opposed to this process. In Germany, for example, tutorials are regarded by some as instruments to direct and supervise the individual student's university education more closely, and thereby increase the institution's "hold" on the young (Huber, 1972).

Another political consideration is the prevention of student unrest. Great Britain, for example, has had relatively minor student revolts; "partly because of the predominant form of tutorial education perfected at Oxford and Cambridge and adopted by many of the new institutions" (Mayhew, 1973, p. 294). Although here "tutorial" does not refer to peer teaching, because it implies close personal interactions, the argument is relevant. It has also been made with direct reference to peer tutoring. Huber (1972), for example, has observed that in Germany, the increase in subsidized peer tutoring has not been caused by the quantitative expansion of universities, predictable long beforehand, but by student unrest. By consciously supporting programs in which fellow students teach each other and thereby benefit from greater interpersonal interactions, Germany followed the example of the United States, where small "experimental" and "cluster"

colleges as well as tutoring had been used effectively to prevent or overcome student unrest.

In conclusion, we hope it has become evident that each of these factors, especially in their cumulative effects (i.e., in their totality) has significantly contributed to the development of peer teaching.

III. Types of Peer Teaching

Most peer teaching programs have been developed and are being carried out in elementary or secondary schools, as are most experiments designed to render learning and teaching more effective (see Gartner et al., 1971). In the following, we shall describe some of the peer teaching models which have evolved in higher education. Those presented are by no means an exhaustive list,* but they serve to illustrate the wide range of objectives which are being pursued with this instructional strategy.

1. DISCUSSION GROUPS, SEMINARS OR "TUTORIA" LED BY TEACHING ASSISTANTS

In Europe as well as the United States, it is common practice to supplement large (often introductory or survey) lectures by a weekly one- or two-hour seminar. Mostly these events are directed by a teaching assistant, i.e., a graduate student who is further advanced in his course of study than those enrolled in the course. The purpose of such a seminar (also called tutoring group, or in German "tutorium") is multiple: to provide a link between the professor in charge of the course and the large student body, to assure comprehension of the material presented in the lecture, and to allow students to ask questions, receive feedback, voice their opinion, etc. The reasons for using graduate students to accomplish all of the above include the fact that the work of graduate students is cheaper than that of instructors or professors, and it is hoped that the experience of teaching at university will better prepare him for his future academic career. His graduate training, furthermore, should assure a high level of content mastery. Finally, it is also believed that having a teacher who is closer to the students in age and educational attainment will be beneficial for the learners, as they may be more ready to ask questions and admit to not having understood something, etc., than in the presence of their professor.

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* For example, Weingarten et al. (1970) developed the so-called *ABSTRAT*, a low-cost performance-oriented training model for use in military training, and Thiagarajan (1973) created the similar MADRAS system (Mutual Achievement through Didactic Role Alternation Strategy).

The last assumption, however, may be incorrect: many investigations (McLeish et al., 1973) have shown that student behavior in a seminar largely corresponds to that in a lecture class, i.e., the learner remains passive most of the time and the assistant is seen *not* as a peer but as another authority figure. In an extensive survey conducted in first- and third-year experimental physics courses at the University of Ulm (Germany), for example, it was found that the students attributed many of the same negative and positive elements to both the lecture and the tutorium (Krähe and Sund, 1973).

It should also be pointed out that graduate studies can be a very stressful period. Often new family obligations and financial worries, advanced course work and thesis research, make it difficult for the graduate student to devote sufficient time and energy to his instructional duties. In most universities, furthermore, they are neither specially trained for instruction nor supervised in their teaching.

As a result of this, and especially in view of the financial considerations, a number of universities have experimented with undergraduate teaching assistants. We believe that the following example is fairly typical of this kind of approach.

A large peer teaching program in an introductory psychology course with an annual enrollment of 1200 freshmen has been in existence for over six years at Cornell University (Maas and Pressler, 1973). Students who have previously completed this course with a grade of A may apply for an undergraduate teaching assistantship, which requires the teaching of two to three seminar groups per week. The original purpose of the seminars was to provide students with opportunities for discussing lecture and other materials, but now student teachers are free to choose their topics and instructional methods. In addition to their teaching responsibilities, they help prepare and correct exams, are available for consultation and attend a weekly seminar on teaching. They receive academic credit the first time and a stipend the second time they teach. A high selection ratio of about 1 to 15 allows the professors to pick "the cream of the crop", based on a variety of criteria (grades, recommendations, major, etc.). The importance attributed to the seminar and the confidence placed in the undergraduate teachers can be judged by the fact that one third of the final grade depends on the freshman's performance in the seminar.

The results of this program have been very positive: using video playbacks and questionnaires, faculty and students have rated undergraduate teachers as high as, or higher than graduate teaching assistants. The student teachers themselves have benefited a great deal intellectually, emotionally and vocationally from this experience.

At Colorado State University, Kitchener and Hurst (1974) have developed a highly structured approach based on Hill's (1969) work, the Education Through Student Interaction (ETSI), to render student-led discussion

groups more effective. A Student Manual (Kitchener and Hurst, 1972) guides the students through three phases of the discussion: In the *Overview*, the student is asked to define essential terms and state the main theme of the assignment or the lecture which is to be discussed. The *Discussion* includes the following four steps: content analysis; critique of the material; integration; and application. The last phase consists of an *Evaluation* of the group discussion with respect to the content (task orientation and understanding material) and the process (responsible participation; climate of relationship, communication of feelings).

For the first two phases, each student must do the necessary preparation before the session by completing a study guide, which in fact constitutes his admission "ticket" to the group discussion. The evaluation takes place after every session. For each session, three students are designated as discussion guides; the first is responsible for the overview, the second and the third for the discussion and evaluation phase respectively.

A recent study by Arbes and Kitchener (1974) demonstrated the effectiveness of this approach. Groups using the ETSI structure performed better on subsequent tests of content mastery and evaluated the discussion groups more positively than two control groups which discussed course content without a specific procedure. ETSI groups, furthermore, were more effective when they had undergone workshop training on the ETSI method prior to the group sessions and when a specially trained student Facilitator participated in the discussion.

A number of other investigations (Churchill and John, 1958; Diamond, 1972; Vattano, et al., 1973; Wrigley, 1973; Hockenberry-Boeding and Vattano, 1975) have also concluded that discussion groups led by undergraduates represent a valuable supplement to large lecture courses.

2. THE PROCTOR MODEL

Much has been written about PSI, the Personalized System of Instruction (Keller, 1974); another description of its salient features does not therefore seem necessary. Here, we only intend to crystallize those traits which justify PSI's mention in the context of peer teaching.

One of the key elements in the "Keller Plan" are the undergraduate student-teachers or "proctors". It is argued that they will have acquired many skills appropriate to their area of specialization which are absolutely necessary for successful completion of a chosen course of study, but which need not be taught by a professor. The work of the "proctor" consists of working "individually with the students taking the course", i.e., assisting students in mastering the course material by administering tests on the numerous units they have to work through individually and by giving constructive feedback on the test results. Ideally, it is hoped that "a

proctor becomes a tutor, a counselor, an advisor, and in most cases a good friend of the student with whom he works" (Born, 1971).

The proctor's responsibilities towards the course instructor are of equal importance and include an obligation "to make each of his students excellent if possible, and to provide feedback to the instructor about the progress of his students and information about aspects of the course materials and course procedures which are presenting difficulties for the teachers" (Born, 1971). Thus, proctors practice and rehearse the skills they have acquired during the preceding years of study, while at the same time making a significant contribution in rendering impersonal instruction personal, and helping to assure mastery of the subject by all course participants.

3. STUDENT LEARNING GROUPS

Beach (1974) has recently described his own research, and reviewed the pertinent literature on instructorless or self-directed student-groups. He points out that we "need to know more about how students learn *from each other* and from learning experiences in which they have an active part and assume responsibility for their learning" (p. 188). He cites the results of an earlier study (Beach, 1960) in which independent study groups did well on course examinations; furthermore, within these groups the more sociable students achieved better results than the less sociable ones. In another study, as hypothesized, no significant differences in achievement emerged between an experimental group (students who worked through and discussed the course materials in small groups once a week, but did not attend the lecture) and the control group (traditional lecture course). However, the experimental group completed more required and non-required readings and consulted more books in writing papers for the course. This and other studies reviewed by Beach demonstrate several educational potentials of independent student groups (including a more positive attitude toward a continuation of learning beyond the course, critical thinking, seeking applications and implications, and learning group interaction skills) without loss of subject matter mastery. By observing small study groups in progress, Beach was able to pin-point some factors which interfere with, prevent, or facilitate learning. He cites preoccupations with one's own knowledge or viewpoint and the inability to lead another person to a new insight, for example, as inhibiting factors. Group members, on the other hand, who are more other-oriented and contribute intellectually or affectively, enhance the learning process. Another advantage of self-directed student groups cited by Beach is their relatively low cost, but he concludes that we need to look beyond content mastery and cost of instruction to the total results in the *learner:* "What else happens to the learner besides exposure to and a certain degree of absorption of information? What else do we want to see happen? Is the student learning

how to approach, define and solve problems; is he learning how to formulate questions and find their answers?" (p. 198).

A more directive approach to student groups has been developed by Berman (1974; 1975). In his Media-Activitated Learning Groups (MALG), an audiovisual program (e.g., transparencies and audio-cassettes) produced by the instructor serves to orient and structure the activities of the students, who also meet without a teacher.

Besides an optional phase of individualized study for a pre- and re-view of the material, the six phases of group work include:

1. An orientation phase (outline, objectives, reading assignments, and oral introduction).
2. A stimulus phase (minilecture, and presentation of a problem requiring a group response).
3. A response phase (evaluation of solutions alone or in groups).
4. A confirmation phase (audio-visual presentation of the teacher's solution).
5. A validation phase (program deficiencies are referred to the teacher for revisions).
6. A review phase with the teacher present (analysis of the group's comprehension and interpretation).

An evaluation in a computer systems course at the Technical University of Denmark revealed that content mastery in MALG was comparable to that obtained in the traditional lecture format. A survey of student opinion by means of a questionnaire indicated overall satisfaction with MALG. Probably due to group pressure and the dependence of the program on the text, a large majority responded that they read at least part of the text before the group session. This is an important factor, considering that many learner-centered groups have failed because students were unwilling or unable to prepare themselves for the group sessions. The fact that a teacher was not available in the group itself was criticized by some, but most indicated a preference for MALG in combination with lectures, rather than lectures alone. It should be noted, finally, that the new Roskilde University in Denmark has constructed its entire educational program around student-centered learning groups and sees members of its faculty not as instructors, but as consultants to these groups.

In order to increase student participation, a system similar to Berman's was designed in a large public-speaking class at Michigan State University (Davis, 1967). Besides attending weekly televised lectures on the principles of public speaking, students took part in a recitation group where they gave several speeches. Some were given in the presence of the instructor who also evaluated them. Others were given in his absence and graded by the students. A student chairman presided at all recitation sessions. An assessment of this

approach revealed that the students were happy with this procedure, that their course attendance did not suffer when the instructor was absent, and that instructors and students generally agreed on their evaluation of student speakers.

An analogous model – the creative dialogue – was developed by Tighe (1971) in his literature class. After writing several questions on the blackboard which serve to orient the discussion, the instructor leaves the classroom. The students then form several small groups, and discuss the assigned topic and questions under the direction of an elected spokesman. Towards the end of the hour, the professor returns and the class reassembles to listen to the spokesmen's reports. Tighe has found that these creative dialogues help focus the discussion on the students and permit a more open exchange than typically occurs in the "normal" classroom.

Finally, we should like to refer to the work of McLeish et al. (1973), who have done extensive research on the learning group and provided a comprehensive review of the relevant literature.

4. THE LEARNING CELL

The "learning cell" or student dyad refers to a cooperative form of learning in pairs, in which students alternate asking and answering questions on commonly read materials (Goldschmid, 1971). Similar to PSI, the learning cell must be highly structured for success (i.e., effective learning) to occur:

1. To prepare for the learning cell, students read an assignment and write questions dealing with the major points raised in the reading proper or other related materials.
2. At the beginning of each class meeting, students are randomly assigned to pairs and one partner (A) begins by asking (B) his first question.
3. After having answered and perhaps having been corrected or given additional information, B puts his first question to A, and so on.
4. During this time, the instructor goes from dyad to dyad, giving feedback, asking and answering questions.

A variation of this procedure consists of having each student read (or prepare) different materials. In this case, A "teaches" B the essentials of his reading, then asks his prepared questions, whereupon they switch roles.

The effectiveness of the learning cell was first explored (Goldschmid, 1970) in a large psychology course (250 students) where four learning options were compared: seminar, discussion, independent study (essay), and learning cell. Students in the learning cell option performed significantly better on an unannounced examination and rated their ongoing learning

experience significantly higher on a "morale barometer". A final comprehensive course evaluation also indicated the superiority of the learning cell method over the other three options. A more extensive "field test" was subsequently conducted to evaluate the usefulness of the learning cell in a number of other disciplines at the university (Goldschmid and Shore, 1974). The findings demonstrated the learning cell's effectiveness and revealed no apparent restrictions on the size of the class, its level, or the nature of the subject matter.

A third more experimental investigation served to evaluate the learning cell across three age groups (Schirmerhorn, Goldschmid and Shore, 1975). Fifth- and ninth-grade pupils as well as university students studied probability at their respective intellectual levels for two class periods using the learning cell. Subjects served as their own controls with learning being measured by differences between a pre-test, a test after reading and question formulation, and a third test after discussion with their partner. A separate control group at each level, which did not participate in the learning cell, showed no significant difference between scores on the three test forms.

All age groups showed significant learning after reading and formulating questions, and after discussion with their partners. These results indicated that when working in dyads, pupils as young as ten years of age can learn basic probability principles with no help from the teacher except in the initial choice of instructional materials.

In a different kind of comparison, Leith (1973) found that the learning cell was more effective than individual study for extroverts – provided their partners were also extroverts; introverts did well in both conditions; and mixed pairs of extroverts and introverts were least successful.

Finally, we should mention the ongoing research on the learning cell at Michigan State University (Stone, 1975; Alexander et al., submitted for publication), and several studies which have compared individual performance with learning by pairs in computer-assisted instruction (Noble, 1967; Sutter and Reid, 1969; Simon, 1974).

5. "PARRAINAGE" OR STUDENT COUNSELING

In the examples given so far, peer teaching takes place mostly in the restrictive context of course work. In an ongoing experiment at the second author's institute, it functions in a much broader framework (Audemars et al., 1974; Goldschmid and Burckhardt, 1974). Each of the seniors *(parrains)* in mechanical engineering who volunteered for the experiment was assigned to a group of four to five entering students *(filleuls)* in the same department. They were to act as counselors and tutors and help the freshmen adapt to and succeed in the new environment. Separate meetings at the beginning of the program with first- and fourth-year students served to explain the

purpose and procedures of the *parrainage*. Subsequently, the two professors in charge of the project met regularly with the *parrains* in order to guide them and deal with problems which were beyond the students' competence.

The initial encounters between the older and younger students were designed to assist the latter in solving concrete, material problems, such as housing, transportation, library use, etc. Later on, they discussed the curriculum, vocational goals, taking lecture notes, laboratory work and study methods. "Formal" group meetings at a set hour were soon followed by informal (often individual) encounters arranged on demand by the *filleuls*.

A first evaluation of the experiment revealed that the parrainage meets a real need of the entering students: contacts among new and older students were facilitated and a number of concrete problems resolved. The faculty-*parrain* meetings, furthermore, became a valuable feedback channel with respect to general problems in certain courses or labs and the wider university environment. It was therefore possible, in a number of instances, to find a more global solution on the "system's" level rather than on that of the individual alone.

At the end of the first year of the experiment, the students completed an evaluation questionnaire. *Filleuls* and *parrains* alike rated it overwhelmingly as a success, and practically all recommended that it be continued and expanded. Most *filleuls*, furthermore, indicated their willingness to take their turn as *parrain* in their third or fourth year.

Achievement measures (grade-point-average and number of failures) indicated that the the *filleuls* had performed significantly better than the (untutored) freshmen in the preceding two years, but such comparisons are hazardous because of other possible intervening variables.

It should be added that a number of attempts have been made to broaden the scope of peer-interactions of university students notably by establishing experimental or residential colleges (Newcomb, 1974), student drop-in centers (Goldschmid and Goldschmid, 1973), and learning centers (Goldschmid and Goldschmid, 1974).

IV. Issues and Problems

In the following we shall address ourselves to some practical issues and problems which may arise when one considers implementing a peer teaching model.

1. SELECTION OF STUDENT PARTNERS

As could be seen in the previous section, there are basically two types of peer-teaching situations: one, in which it is assumed that the knowledge

and experience of the student teacher in a particular course or discipline is superior to that of his partner(s); the other, a situation where the level of competence of the student partners is approximately the same. Examples of the former are the parrainage, tutoring, and the proctor model. The latter include student-learning groups and learning cells. It is obvious that the criteria for the selection of student teachers will vary according to the model one wants to use.

(a) "Unequal" Peer Situation

Here, the professors often choose the student teachers on the basis of grades (in a particular subject to be taught and/or overall average). However, as academic achievement does not necessarily coincide with good performance as a peer teacher, one may have to look at additional variables, for example, whether a student relates well with his peers, faculty recommendations, "interest and enthusiasm for helping and having been a tutee oneself" (Reed, 1973). The importance of communication skills has also been stressed (Goldschmid, 1971).

The general characteristics of a good proctor, for example, have been described by Born (1971) as follows: thorough knowledge of the course content; this implies "greater depth and breadth of understanding . . . than will likely result from the course in which he is proctoring"; reliability; courtesy and active interest in helping his fellow students; and the ability to listen.

(b) "Equal" Peer Situation

Here, the question of optimal partner mix is perhaps even more complex. Some studies have addressed themselves to this issue. The variables which have been investigated include introversion–extraversion (Leith, 1973); intelligence and sex (Amaria, Biran and Leith, 1969); IQ and anxiety (Amaria and Leith, 1969); congeniality (Parloff and Handlon, 1966); perceived and actual status of the partner (Kahn and Alexander, 1971); role-taking capacity (Feffer and Suchotliff, 1966); eye-contact (Exline, Gray and Schuette, 1965; Exline and Winters, 1965; Pellegrini, Hicks and Gordon, 1970); intimacy (Breed, 1970); dominance (Smelser, 1960); and finally, sociability and test anxiety (Sutter and Reid, 1960). It is impossible to draw overall conclusions from these studies other than to say that they demonstrate the complexity of the partner interaction and the important differential effects of these variables on learning.

With respect to the number of students in peer-teaching situations, it appears that as a general rule, very small groups (below six members) are more effective and satisfactory (Hare, 1952; Slater, 1958; Thomas and Fink, 1963). The smallest unit, the dyad, has been shown to be particularly advantageous, in part because it permits an easy "teacher" - "student" role

change and prevents passivity of *any* participant. Larger groups experience more leadership problems, facilitate the dominance by some members, and frequently run into practical difficulties (e.g., finding a convenient meeting time and place).

2. CHARACTERISTICS OF PEER-INTERACTIONS

(a) Functions of Student Teachers

They vary considerably and may include:

1. Actually teaching new content.
2. Tutoring, e.g., helping peers assimilate materials they have previously been exposed to.
3. Checking the work done by and counseling with fellow students, assessing the adequacy of course materials.
4. Giving all-round counsel in order to facilitate peers' adjustment to university life at any given point in the course of their studies (task of *parrains*, for example).

The particular functions to be exercised will depend in part on the selection of student partners (see 1. above) and the specific tasks to be accomplished. In any case, they should be clearly defined and well structured (see *(c)* below).

(b) Cooperation vs. Competition

In a traditional instructional program at college or university, the student has to be ambitious for himself only: he continuously measures himself against his peers and is being taught implicitly that his success is of value only if it compares favorably with that of his classmates. In genuine peer teaching situations, however, cooperation replaces competition (to some extent, of course), as students are becoming responsible for the learning of their partner rather than focusing on "beating" him in grade or score.

(c) Structure

Whatever the particular functions one may assign to student teachers, and whatever the model one may choose to adopt, one key element is the structure.

When students clamour for more freedom, independence, and autonomy and look for alternatives to traditional methods, it may be an understandable reaction on the part of some professors to want to "turn it all over to them". "Since you want to be on your own, do it yourself" is a response one sometimes hears, but one which is hardly constructive. Students have

generally not learned to actively shape their own learning environment. Even in the "equal" peer situation, the teaching staff should help them in organizing and running the new learning situation. Even if students in a particular program wish to be completely free of faculty intervention, one can only recommend to them that they carefully think about the definition of their role, the organization of meetings and tasks, and the maintenance of an appropriate structure. Experience has shown that peer-teaching situations which are initiated – either by faculty or students – with little organization and structure are not likely to survive, nor do they generally offer all the benefits they potentially entail. Not only should peer teaching itself be organized internally, it should also, if at all possible, be integrated in the total learning experience of the student rather than merely being an appendix to his program.

It is difficult to imagine how all this can be accomplished without the full support and active involvement of the faculty. Peer teaching does not mean an abdication of the teacher's responsibility, but rather implies a new role for him (see 5. below).

3. PREPARING THE STUDENT TEACHER

(a) Role of students

For many students, peer teaching will require a new outlook and orientation *vis-à-vis* his fellow-students. Those used to work in a competitive mode – in a sense working against each other – need to shift to a more collaborative form of learning. Such a behavioral change will not be easy after years of competitive learning environments.

Most professors have observed the students' lack of respect for their fellow-students. For example, in classroom-discussions, the students' questions, comments and interventions are often more or less subtly sabotaged by their peers' disruptive behavior (catcalls, conversations) or by their total disinterest. At least in part their attitude is due to the notion, instilled in them long ago, that it is only the teacher who is knowledgeable and worth listening to.

Past experiences have demonstrated that these attitudinal and behavioral changes toward respect for colleagues and cooperative learning can be achieved when the students begin to realize the positive results of peer teaching. An open discussion of this problem may also help alleviate it.

(b) Skills required in peer teaching

Too often students have been trained to become passive recipients of information. They may therefore lack important skills in peer teaching, such as finding good sources of information, asking appropriate questions, giving pertinent feedback, making contact, establishing a relationship which is

conducive to learning, etc. Some training may help overcome these difficulties. For example, comparisons of questions on a specific text, video-taping and playback of peer teaching sessions, workshops on communication problems, and group-dynamic sessions have been used with considerable success.

In some cases, for example in the introductory psychology course at Cornell, in PSI, and the *parrainage*, regular seminars for undergraduate teachers or supervisory sessions with the professor(s) have become an important feature of peer teaching. They serve to prepare the student teachers better, they can deal with all kinds of practical and pedagogical problems, and represent an important feedback channel on the "system" level. They have in no small measure contributed to the success of these programs.

4. BENEFITS OF PEER TEACHING

Many investigations have reported positive results for the tutees and demonstrated the major impact the tutorial experience may have on the tutors themselves (Cloward, 1967; Thelen, 1969; Majors, 1970; Mohan, 1971; Morgan and Toy, 1970; Gartner et al., 1971; Starlin, 1971). Students who tutor other students profit not only on a cognitive level (i.e., become more expert in the subject they are teaching), but also on an interpersonal, affective one: their self-esteem increases and their attitude towards the course and the school or teaching and learning in general becomes more positive.

That those who are being tutored benefit from this form of individualized instruction is to be expected. Here, too, one may talk about a cognitive and an affective gain. With respect to more cognitive variables, students may be more willing to attempt difficult tasks when placed in pairs than when alone (Torrance, 1969), and be more creative (Torrance, 1970). A possible negative result of cooperation could be an increase in problem-solving time. However, problem-solving frequency increases too (Ekman, 1955; Hudgins, 1960). Another important cognitive benefit from peer teaching and learning experiences may be improved retention (Dick, 1963). Conceptual development may also be enhanced by peer teaching as was demonstrated by Murray (1972) for conservation and Cloutier and Goldschmid (1972) for proportion.

On the affective side, students have expressed great satisfaction and enjoyment in the peer teaching situation (e.g., Goldschmid, 1970; Schirmerhorn, Goldschmid and Shore, 1975). Alternating between "teacher" and "student" roles reinforces the idea that students (especially in the university) can be autonomous and assume at least some responsibility for their own instruction. As Taylor (1969) has urged: "What is needed is a conception of teaching and learning which reaches back into the undergraduate student

body and considers undergraduate and graduate students as members of one community, capable of teaching each other. Such an attitude also fosters in the students the belief that he can himself muster resources for his own learning. He will thus be better prepared for life after college than if he depends exclusively on his teachers".

Peer teaching, just like other forms of teaching, must be subject to continuous evaluation. Individually, students can and must evaluate their own progress. Behavioral objectives and the increasing availability of self-instructional materials which usually provide means for self-assessment (exercises, tests, etc.) make this task a great deal easier. In addition, students can check the performance of their peers as well as provide constant feedback to their teachers with respect to the instructional materials and learning environment.

5. THE ROLE OF THE PROFESSOR

It should not be concluded that in peer teaching students teachers can or should totally replace the professors, but rather that their role changes. They no longer primarily "dispense" information, but become partners in this cooperative venture themselves. They search for, or if necessary, develop materials suitable for individualized instruction (Goldschmid and Goldschmid, 1973; 1974), help arrange optimal peer teaching situations, consult with and guide their students and assist in resolving problems which arise for academic or affective reasons. They thus contribute significantly to the quality of learning. As already noted, it is in fact highly doubtful if a peer teaching program can succeed and be maintained without the full support of the teaching staff.

Needless to say, such a new role will not easily be assumed by all professors. Some might even be repelled by the concept of partnership. Yet some may also feel relieved in finding partners who will assume co-responsibility for their students' learning.

Nor should it be concluded that peer teaching should replace all other forms of instruction. Rather, as the description of the various models has amply demonstrated, it should be used in conjunction with other instructional approaches, and ideally, be integrated in the student's total learning experience.

6. FINANCIAL ASPECTS AND INSTRUCTIONAL FACILITIES

Possibilities for savings have already been mentioned when we considered the reasons which have contributed to the interest in peer teaching. Although some student teachers, particularly those who are more advanced than their partners (e.g., *parrains* and proctors), have been paid, such costs

are considerably below those which would be incurred if *new* assistants or professors were hired to provide more assistance and feedback to the learners.

Even those minimal costs could perhaps be saved if one imagined a generalized system of tutoring in which in principle all students participate in peer teaching. For example, first- and second-year students would receive tutoring and other help from third- and fourth-year students, and in turn would offer their services in their later college years to the newcomers and less advanced students. In such a system, financial remuneration would seem less of a necessity since sooner or later potentially all students would either offer or receive peer-assistance.

Other student teachers (e.g., in the learning cell or student learning groups), on the other hand, receive no financial remuneration. They contribute and receive help and participate as "equal" partners at any given level or year. Thus, no new costs to the university are involved at all.

Another reward may be academic credit. Most importantly, though, one should not forget that besides credit or money, remuneration takes many forms. There is the opportunity for close contact and work with faculty as well as fellow tutors; the possibility to use or apply some of the skills acquired in previous academic training at university; and the fact of undoubtedly thorough knowledge of the course content which may serve as a preparation for examinations to be taken later (Born, 1971).

Instructional facilities

Many experimenters in peer teaching have run into space problems. Most universities simply do not seem to have adequate classrooms for this type of teaching. Small rooms with movable tables and chairs are usually in short supply, often forcing students into unsuitable, noisy quarters. Planners of future universities should be mindful of the evolution of higher education practices and provide for more adequate instructional facilities.

V. Conclusions

As Schirmerhorn (1973) has pointed out, peer teaching may represent the ultimate in individualized instruction: potentially every student would have his own "teacher," responsive to his specific needs and providing him with continuous and personally relevant feedback.

Many parallels to the approaches (particularly the learning cell) referred to here and confirmation of the effectiveness of peer teaching can be found in the book-length description of Rosenbaum's (1973) system of Peer-Mediated Instruction (PMI) which he developed for use on the elementary and secondary level: "A probable cause for the apparent potency of PMI is

the simple fact that the two roles, teacher and student, force a multi-mode engagement with the subject matter in such intensity as has not heretofore been achievable under conventional classroom communication structures" (p. 150).

Despite its many advantages – including its low cost – peer teaching is not a panacea for all instructional problems. In fact, it is best used together with other teaching and learning methods. It may be particularly relevant when one seeks to maximize the students' responsibility for his own learning and active participation in the learning process, and to enhance the development of skills for cooperation and social interaction.

Considerable research efforts and experimentation will be required to find solutions to some of the problems listed in the preceding section of this review. Many of the questions could perhaps be inserted in an ATI research orientation to determine the optimal interaction between "treatment" and "aptitude". Identifying the organizational features which will facilitate peer teaching and its insertion and integration in the formal educational environment appear, as Rosenbaum (1973) has also pointed out, to be particularly relevant research objectives.

It is perhaps fitting to end this review by citing Bruner's (1972) view of peer teaching:

> It has long been obvious that children learn from their peers, but a more significant observation is that *children learn from teaching other children.* From this a major educational strategy follows: namely, that every child must be given the opportunity to play the teaching role, because it is through playing this role that he may really learn how to learn . . .
>
> The experience of the 1960's seems to indicate that the key to learning is individualization, and the use of the student or pupil as a teacher is one way to increase this individualization.
>
> The concept of learning through teaching appears to be one of those basic ideas which do work, and it is finding a place in an enormous variety of settings . . .,. where the entire school is directed toward becoming a "tutorial community".

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