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Group Project Work and Student-centred Active Learning: two different experiences

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ABSTRACT *This article compares two experiences of group-based student projects in a Geographical Information Systems (GIS) degree and in Geography degree modules. The two authors adopted group projects from similar motivations, and used available materials to guide them through this process. Subsequently, they have come to reflect on the experience and to examine the theoretical dimensions of such an approach in more detail. There seems to be a discrepancy between the literature, which emphasises a growing interest in the socio-educational value of group-based and active learning, and the concerns voiced by both students and academics regarding the practical implications of such approaches. Analysis of grades and questionnaires tends to support the literature and belie the criticisms, which the authors see as 'myths', possibly motivated by a defensive attitude to the whole learning process. The conclusions are that, if care is not taken in the design and execution of such projects, then the problems that may ensue can reinforce the 'myths'. However, if carefully and appropriately designed and managed, team-based learning is a valuable experience.*

Introduction

Educational Perspective

There has been a growing interest in the use of team- or group-based learning at all levels of education and training. Forman (1994) suggests two analytical perspectives on group learning:

- individualistic—emphasising cognitive performance and considering the social or group context as an environmental variable which may influence cognitive learning; and
- sociocultural—emphasising the difficulty of separating group and individual learning experience, and being 'situated' and therefore of wider social benefit. Learning is part of an initiation into a community of practice.

Forman (1994) notes that the first, individualistic, perspective dominated early research into peer collaboration, since such a perspective lends itself well to an experimental research approach. Lately, a sociocultural perspective has gathered credence among practitioners, but this is far more complex to research. Forman's observation that 'learning is a process by

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which a newcomer is integrated into a community of practice' (p. 5) characterises this perspective, and presents a challenge for higher education. Liber (1994), in an article reviewing resource-based learning, argues that 'teaching involves the management of complexity' (p. 183), and later that 'the variety of learning needs must be balanced by the learning opportunities … the two sides of this equation must be balanced' (p. 183). Liber suggests that traditional 'chalk and talk' teaching is a low variety method of teaching which makes 'the students' expression of their complexity as difficult as possible' (p. 185). One of the arguments put forward in this article is that team-based learning can be a method of increasing complexity in the learning experience, which thus strengthens students' preparedness for the complex environments into which they move after completing their degrees.

> It is becoming generally believed that a real contribution can be made to the country's long term economic regeneration and competitiveness by developing students with particular cognitive, communication and personal/interactive skills, which are felt to have relevance beyond those made explicit within discipline-based degree programmes and in recognition of the world of work. (Committee of Vice-Chancellors and Principals, 1998, p. 16)

There is a growing interest in the literature in building into university courses more opportunities for students to combine their learning of discipline-specific knowledge and approaches with practical skills which may be of use in the workplace (Gold *et al.*, 1991; Holmes, 1995; Dearing, 1997). There is also an established literature on successful techniques for using team-based learning exercises in a variety of settings (Kolb, 1984; Argyris, 1993; Gibbs *et al.*, 1996; Burkhill, 1997), as well as a long tradition of team-based fieldwork in geography. However, this is not necessarily accompanied by a growing empirical basis in the literature. As Abson (1994) asserts:

> Much is claimed for its [group work] power in helping cognitive gain, stimulating deeper, more critical evaluation of material, changing attitudes and increasing students' tolerance of others. However, none of these presents any substantial evidence that the use of groups is always and inevitably beneficial to the student. (p. 153)

This negativity manifests itself in inaction on behalf of lecturers, group work being a relatively unimportant component of total coursework, or through a resistant attitude from students. Gold *et al.* (1991), whilst they do present some suggestions for appropriate use of group work (pp. 61–64), give relatively little coverage to it, tending to concentrate on individual-centred learning approaches. In addition, the discussion of group work is cautious in its nature: 'the issue [group work] remains controversial' (p. 155).

Much of the literature in favour of team-based learning is presented from a tutor's, potential employer's or national policy-maker's perspective. There is a relatively small body of research on the impact of team-based learning on students, as assessed through their experience or their grade performance. This may partly explain why there can still be strong resistance among some academics to take up this approach. Some of the resistance also appears to be based on well-founded concerns about the management of such activities. These concerns are articulated in the literature (Healey *et al.*, 1996; Parsons & Drew, 1996), and paralleled in the authors' experience of both formal and informal student feedback. It is proposed that these concerns can be regarded as a kind of mythology (Table I) that exists amongst both staff and students and is not necessarily supported by the empirical evidence. This mythology may well be founded on a defensive attitude, categorised by a tension

TABLE I. Myths of group work providing an impediment to choosing it as an approach (After Healey *et al.* [1996], Parsons and Drew [1996])

1. 'Clever' students do not get sufficient credit for their work.
2. Unequal contributions from team members unfairly affect grades.
3. Lazy students can 'hide' from staff members.
4. Group work slows down the learning process due to unproductive time, e.g. meetings.
5. Group work impacts on other work due to the extra demands on student time.
6. Group composition unfairly affects one group over another, e.g. skills make-up, personality clashes.

between social learning or 'double-loop learning' (Wildermeersch & Jansen, 1997) and a more traditional closed-loop learning approach.

The 'double-loop learning' concept has been used to attempt to understand better the way in which communities and groups operate within the wider society. Wildermeersch & Jansen (1997) apply it to group learning in adult education. They divide the process of social learning into four key principles:

1. *action and experience directedness*. They suggest that experiential learning is mostly being developed via group work activities. They do not explain why, but we would suggest it is because of workplace experience. Few professions do not involve a considerable component of group-based working.
2. *critically reflective activity*. They suggest a hierarchy of what they call learning loops (see Fig. 1), beginning with a learning-from-regularity loop, which tests understanding against reality. Second, they suggest a value system learning loop questioning goals of learning. Finally, they suggest a third learning loop which involves critical reflection in an ethical and political context. They suggest that focusing on learning loop 1 leaves students unprepared for 'the uncertainty, complexity, uniqueness and value conflict' (Schön, 1983, quoted in Wildermeesch & Jansen, 1997) one might expect beyond education. They imply that group learning situations can provide a context where such issues can be more easily raised, as they force students to reflexively discuss their activities. Our experience suggests that critically reflective activities can go on long past closing time and long after the exercise is complete!
3. *dialogical principle*. Based on the work of Argyris (1993), they suggest that learning in everyday contexts is characterised by defensive group-process, self-concealing practices, single-loop learning and limited effectiveness. A way out of this is presented through

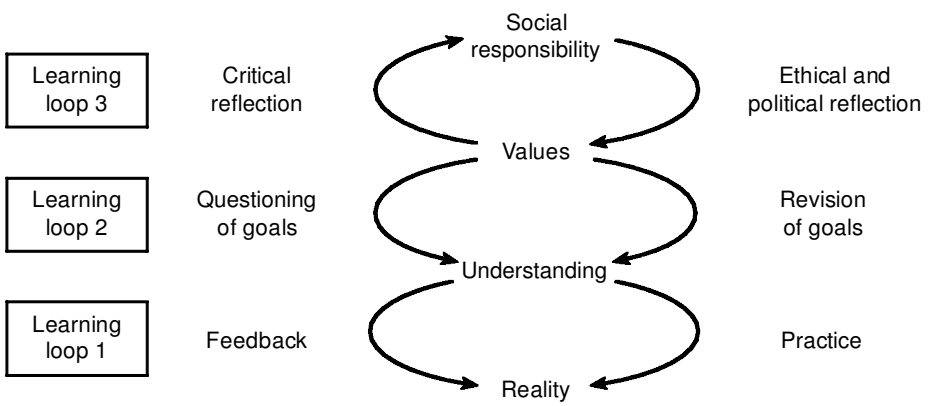

FIG. 1. Hierarchy of learning loops after Wildermeersch & Jansen (1997 p. 466).

TABLE II. The four stages of team building

Stage	Interactions	Effectiveness
Forming	Guarded, civil, destructive unvoiced conflicts	Slow and embryonic
Storming	Factional, entrenched, poor communication	Unachieved ideas, parts are greater than whole, effectiveness falls
Norming	Compromise, cooperation, better communication, security	Increased contributions, establishment of working practices, effectiveness rises
Performing	Satisfying, productive	Whole greater than parts (synergism), effectiveness peaks

Source: after Tuckman (1965).

experience of multilateral control, cooperative approaches and collaboration, leading to 'double-loop learning' and better results.

4. *multi-actor orientation*. This principle is based on participatory approaches to learning, which emphasise a wide range of backgrounds in the learning community. This is paralleled in the rise in profile of participatory management practices in business, and in approaches to rural development which elevate so-called indigenous technical knowledge and participatory development approaches (Chambers *et al.*, 1989). We suggest that, as students increasingly have varied backgrounds and experience, and as degree programmes are increasingly multidisciplinary, such inclusive learning contexts are required.

The subject of this article is the authors' experiences with two group-based student projects. Their intention in designing both exercises, though they had not articulated it as it is presented by Wildermeersch & Jansen (1997), was to create a learning experience which was challenging, promoting critically reflective activity by confronting students with their colleagues in teams. It was hoped the exercise would put students in situations that would encourage them to consider not only the skills they required for completing the tasks, but also the context in which those skills were likely to be used in their future work environments. However, as part of our preparation, we sought out experiences of teamwork which were both negative and positive. We realised that our project design would require careful structuring in order to avoid many of the pitfalls, which reinforce the kind of myths we had been confronted with (Table I). In effect, using Robson's (1994) model (Fig. 2), the aim was for a high challenge–high support design that encouraged a questioning and participatory environment for the exercises (Gibbs, 1995a, 1995b). Research into the evolution of team skills within similar exercises by Blair (1991) indicates that groups pass through four key stages (Table II), as defined by Tuckman (1965).

Political Perspective

Between 1989/90 and 1996/97, full-time student numbers increased by 71% (Department for Education and Employment, 1998), and by 100% over a 20-year period (Dearing, 1997). Meanwhile, public funding over the last 20 years in the higher education sector rose by only 45% (Dearing, 1997). Consequently, there has been a 40% decline in available funding resources per student and a considerable increase in class sizes (Gibbs *et al.*, 1996). Concurrently with this, and partly as a result of these developments, a number of changes in approaches to teaching have come about. Callaghan *et al.* (1994) list these as including:

- a move towards group projects as a way of deploying teaching resources

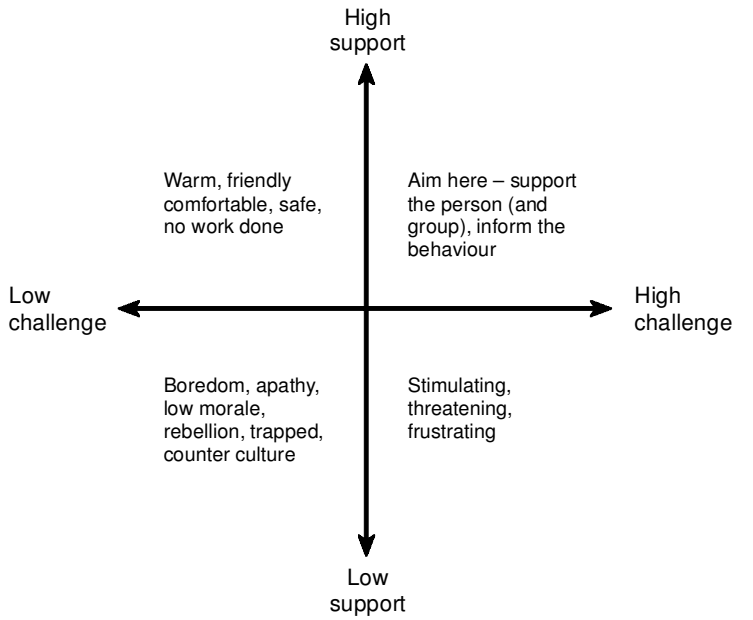

FIG. 2. Challenge–Support learning environments after Robson (1994 p. 381).

- a movement from traditional teaching methods which have emphasised passive learning approaches towards more active student-centred learning
- a growing awareness that learning experiences are not only cognitive, but also influence personal growth
- group learning is seen as enhancing creativity
- group based learning is also seen as a means of enhancing social skills

Appendix II of the Dearing Report attempts to construct a teaching model based upon current and future resource constraints. Fig. 3 shows the result of this analysis based upon the criteria outlined in Table III.

The group project work described in this article does not easily fall into any of the categories used by Dearing. The 'groups' teaching method (Table III) refers to small group teaching such as seminars and tutorials. A group project may use some of these techniques, for example, in briefings and meetings with a coordinating tutor. However, a group project may also require resource-based learning approaches (RBL), for example, the provision of team skills learning materials. The Dearing Report infers that in-house resource-based learning materials have been developed by universities as an attempt to overcome pressure on

TABLE III. A comparison of the resource implications of methods of teaching

Teaching method	Preparation + presentation	Time per hour of learning time
Lectures	3 hours prep. + 1 hour presentation	4 hours
Groups	0.5 hours prep. + 1 hour presentation	1.5 hours
Resource-based learning (external)	2 hours prep.	2 hours
Resource-based learning (internal)	20 hours development	20 hours

Source: Dearing (1997, Appendix 2, para. 9).

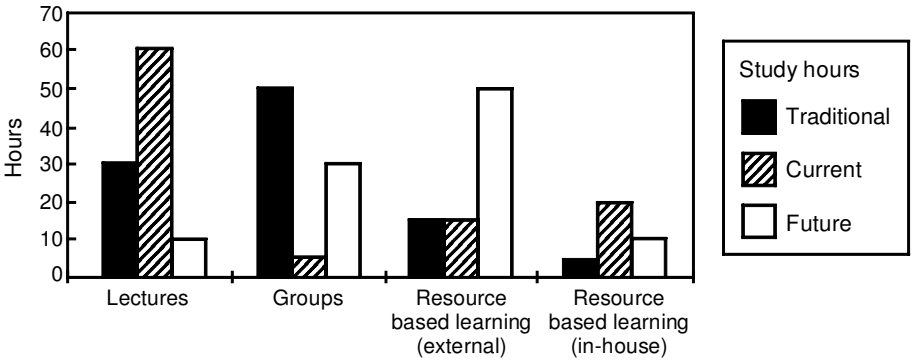

FIG. 3. Alternative teaching models after Dearing (1997, Appendix 2, para. 4).

resources, and in line with technological trends such as computer-based learning and the earlier Follett Report (1993). It implies that the large overhead on development time for these materials has resulted in a reduction in small group learning, and a reliance on large group teaching methods such as lectures. Team-based learning can be a good answer, both in the educational and political context, as long as it is not overreliant upon RBL (in-house) materials. If suitable external resources, for example, library materials, team skills materials and the Internet, can be used to support group project work, then this approach may be able to meet the future criteria demanded by Dearing.

Clearly, there is growing interest in team-based learning in the higher education sector. However, the Dearing Report also reported that 'many staff still see teaching primarily in terms of transmission of information, mainly through lectures' (Dearing 1997, para. 8.14).

Aims

The foregoing discussion demonstrates that, although there are sound educational and political perspectives to indicate a firm basis for group work being an important component of undergraduate courses, there is still some scepticism as to whether the theoretical advantages are borne out in practice. This article addresses these issues through quantitative and qualitative analysis of two case studies. The starting assumptions are drawn from the authors' subjective experience and the following general observations:

- both students and staff have certain suspicions and objections to group work: the 'myths' (Table I);
- group work is not considered the normal teaching practice in academic institutions;
- good teaching practice is desirable and beneficial in the long term; and
- approaches to teaching within higher education are increasingly being constrained and influenced by external factors.

The case studies consist of two undergraduate modules, where team-based learning was introduced to reinforce the students' learning of both module content and transferable skills. The courses are contrasting, in that one, a BA/BSc in Geography, has a more traditional approach, and the other, a BSc in Geographical Information Systems (GIS), is more applied and vocational. This contrast is reflected in the presentation and structure of the group work. The GIS group work is more closely allied to the situation that these students are likely to find in their future jobs, and is presented as a simulation of such a situation. As a result, a

more prescriptive approach was taken to team selection and direction: each group member 'applies' for a well-defined role that they will take within their group. In contrast, the Geography group work is more theoretically based, and is more of an academic exercise than a simulation, and the groups are chosen by a random process. The analysis attempts to identify trends that might be attributable to this difference in approach. The differences in the approaches and contexts of the case studies are examined in the light of social learning concepts, to see if there are any practical lessons to learn about how to structure and present group work.

Finally, the article will analyse the performance of the students, comparing their team and individual performances, to address specific concerns of both academics and students about the effects of team-based learning on grade performances. We were surprised to find this last element missing from all of the literature we examined in the preparation of this article.

Discussion of Case Studies

General

The introduction of team-based learning in both courses was prompted by the following:

- too many individual items of marking (which results in increased staff workload and therefore lengthened turnaround time) with consequent poor feedback for the students;
- hectic computer practical sessions with large discrepancies in the pace of working. Some students were lagging and needed special attention, whereas others were progressing too fast and needed their interest engaging;
- sterile lectures introducing concepts divorced from their contextual situation, again resulting in some students being bewildered, with others finding them trivial;
- 'losing' students who felt that they were not suited for programming, in much the same way that some students feel that they are not suited for mathematics; and
- positive experiences of group learning as participants and as field course leaders.

We believed strongly (though without strong intellectual argument) that team-based learning had to work, because groups work in all walks of life in the 'real world'. We were convinced (naively perhaps) that such problems as 'freeloaders', assessment and distribution of marks could all be worked out.

We sought advice and experience from colleagues and from former students who had both good and bad experiences of group projects, and consulted a number of texts and guidelines for designing such a learning activity. The 'Learning in Teams' resources produced by Oxford Brookes University (Gibbs, 1995a; 1995b; 1995c) were particularly useful, both in preparing students for the projects and in designing their format (see Table IV).

Case Study 1: a GIS project at Kingston University

The GIS undergraduate degree started at Kingston University in 1989. Linsey & Wood (1994) observed that since that time it has allowed the students to:

1. gain the technical and vocational skills needed for a career in information technology or, more specifically, geographical information handling; and
2. get a broad educational base in both social and scientific disciplines, coupled with taking part in the 'undergraduate learning experience'.

The GIS Algorithms and Development module was designed and first run in October–

TABLE IV. Summary of the two case studies

	Case Study 1	Case Study 2
Module	GIS Algorithms & Development	Development and Change in Africa
Course	BSc Geographical Information Systems	BA/BSC Geography
Level	1st Semester–2nd Year	2nd Semester–3rd Year
Topic	Preparation of a tender and simple prototype application for a GIS in a local authority department	Preparation of proposal for a new NGO on an aspect of African development
Selection procedure	'Job' selection	Random—using alphabetical list
Activities	Analyse application requirements Develop application Present proposal in written and oral format	Research and synthesise literature on chosen issue Formulate organisation Present proposal in oral and written format
Support	Practical training in programming package Weekly meetings with project management team Weekly problem-solving seminars	One seminar on team skills 'Two hours' timetabled workshops and by appointment
Assessment	20-minute presentations and written report All team members receive equal marks Mark weighting can be modified by negotiation with colleagues for members not 'pulling their weight'	10-minute presentations, written proposal document and progress report forms All team members receive equal marks Members not participating receive zero and are required to negotiate with colleagues and tutor

January 1995/96. Practical computer skills, particularly in programming, development and customisation, were emphasised in response to feedback from external examiners and consultation with the GIS industry. Initially, no group work was included in the module due to perceived time constraints. In hindsight, this previous assertion turned out not to be entirely true:

- group work can be defined as consisting of 'two or more students working together on a task' (Healey *et al.*, 1996), and, due primarily to the finite nature of computer resources and room availability, all GIS practicals consist of two or more students; and
- later experience has shown that the individual lecture approach and the blanket setting of standard items of coursework for all students may have been the normal, but not the correct, response to this time pressure.

On the second running of the module, a group project was introduced, which comprised the following:

- groups of 4–6 students;
- their task was to be a group of consultants designing a pilot project to introduce a GIS into a department of the local borough council;
- the project ran for half of the module (4 weeks);
- the assessment was based on oral and written presentations, as well as a component based upon team meetings and project management.

The qualities of group work that this approach was intended to harness came from both a teaching perspective and a learning perspective (Table V).

TABLE V. Qualities group work approaches were intended to harness for GIS degree

Teaching perspective	Learning perspective
Groups could use the computer teaching resources simultaneously without the need for repeat practicals. Lectures can be used sparingly for an overview and to provide points of information. Contact is dominated by problem-solving sessions and small group interaction. Group work requires less marking than individual work, almost in proportion to the size of the group Group progress can be monitored, goals can be set and feedback obtained in a way that would be almost unfeasible with individuals.	Group members with skills in certain areas, e.g. programming, applications etc. can pass these on to other members. Groups can provide all members with tasks suited to their skills and abilities, preventing students from falling behind or getting bored. Groups can allow students to specialise in areas that they are strong in. Groups can make it harder for a student to 'hide in the crowd'. Group work is predominantly problem-centred, and the knowledge obtained should be applicable to other situations and systems.

TABLE VI. Job titles and responsibilities for the GIS team project

Job	Major responsibilities	Minor responsibilities
Project Manager	Project management and teamwork Project presentation	Project design
Project Coordinator	Project management and teamwork	Project presentation
Graphics Designer	Project design Project outputs	Project presentation
System Analyst	Project design	Project management and teamwork
Analyst Programmer	Project outputs	

Since the group project was relatively short in duration and it was intended to simulate a work-like environment, it was decided that working structures needed to be created within each group as soon as possible. A set of jobs with responsibilities for components of the group project was presented to the students (Table VI), and the students were given a description of each job and the kind of practical and personal skills required for that job. They then filled in a self-perception questionnaire, based upon Belbin (1981), and a short application form for two of the jobs. On the basis of the questionnaire results and the job applications, the groups were created—all students ended up doing one of the two jobs that they applied for. This procedure replaces some of the elements that may occur in the first three phases of group evolution (Tuckman, 1965).

Case Study 2: a geography project at Kingston University

The School of Geography at Kingston University sets out to teach the discipline with a strong emphasis on instilling transferable skills through the application to real world problems. This case study concerns the development of a third-year group project as part of a module focusing on aspects of the geography of Africa.

The project comprised the following:

- groups of 4–6 students;
- their task was to research and develop an idea for the setting up of a new non-governmental organisation to tackle a problem in an African context. The proposal had to be justified by researching available academic and other resources on the topic the group identified. However, the clear intention was a practical proposal rather than an academic one;
- the project ran for the duration of the module (11 weeks);
- the assessment was based on oral and written presentations, with a nominal mark award for completion of progress report forms. Each member of the group received the same mark. The total mark counts for 20% of the module assessment.

The intention of developing a team-based learning assignment was to 'break out' of the normal format and encourage 'active' learning. The first cycle was well received by students, although a number of problems were encountered and comments made by students, suggesting that a revision of the approach was necessary. The revisions included the following.

- The introduction of the project aimed more towards reassuring the students that the volume of work was in their control. Emphasis was given to the fact that the mark, although significant, was a relatively small component of the module mark. Also, in a workplace they would be assessed in teams or departments, so this was a valuable and positive experience for them.
- A separate individual assessment was made in preparation for the group presentation. The individual coursework became a preparatory paper for discussion in the teams, rather than a separate academic essay.
- A seminar was timetabled to cover team-building, and classes were timetabled for the team projects where the tutor was available for consultation if required.

Reflecting on the experience of 2 years of team assignments, a number of issues have arisen:

- concern over the arrangements for marking;
- each year a number of students complain that they have less control over their module marks at such a late stage in their academic career; and
- the effect of dampening the discrimination function of the marking of student work by assessing groups of students. The team marks tend to compress the range of marks.

Results and Discussion

Does the student performance and evaluation in the relevant modules tend to support or deny the myths identified in Table I?

The Impact of Group Assessment on Individual Student Marks

The collection of the data assessing the two case studies has been mainly in retrospect, but one of the key areas requiring analysis is the relationship between the marks students attain carrying out individually assessed work and team-assessed work. Although it is clear that any assessment is bound to influence a student's final mark, either negatively or positively, the main concern of the student is whether this influence is unfair.

Firstly, an analysis of the existing and past results of the groups of students was carried

out. The data sets are relatively small, but, as this is the only evidence available to assess these relationships, it is important to review the data as they stand alongside the comments the students provided in their feedback questionnaires. While this analysis is tentative, there is very little which directly addresses this issue in the literature. The data were interrogated for relationships between the structure of the individual marks in each team and the team's overall mark. Simple descriptive statistics (maximum, minimum, mean and range) were derived from individual performances in the other assessments in the module. These statistics were then investigated as predictors of group performance (Figs 4, 5, 6). The marks are derived from 50 students in 9 groups for case study 1 (GIS groups), and 40 students in 10 groups for case study 2 (Geography groups). These numbers are too small to reach any definite conclusions, but the patterns do encourage a number of observations.

Figs 4 and 5 investigate the possibility that the performance of individuals in other parts of the module is some kind of predictor for their performance in the group. If individual performance is a strong influence on the performance of the group, then this throws doubt upon the 'fairness' of group work from the perspective of the individual. For instance, it may be the case that a poor individual performer in the group could be a critical factor in the group's performance or, conversely, that the presence of an exceptional member can bring up everyone's performance. If the performance of group members in their individual work is an insignificant factor in how they perform as a group, then other factors such as group dynamics may be much more significant. Whether assessed group work is 'fair' then depends only upon its learning value and relevance to the course. Different patterns emerge for the GIS groups and the Geography groups (Fig. 6).

The most striking pattern comes from the analysis of the Geography case study, where the relationship between individual and group performance exhibits negative trends. This is most clearly the case with the minimum individual performance (low mark—$R^2 = 0.58$) (Fig. 5). This is counter-intuitive. A possible explanation is that the wide diversity of individual abilities is a positive factor towards group performance. This appears to be supported by the weakly positive trend between Geography mark range and group mark ($R^2 = 0.27$) (Fig. 6),

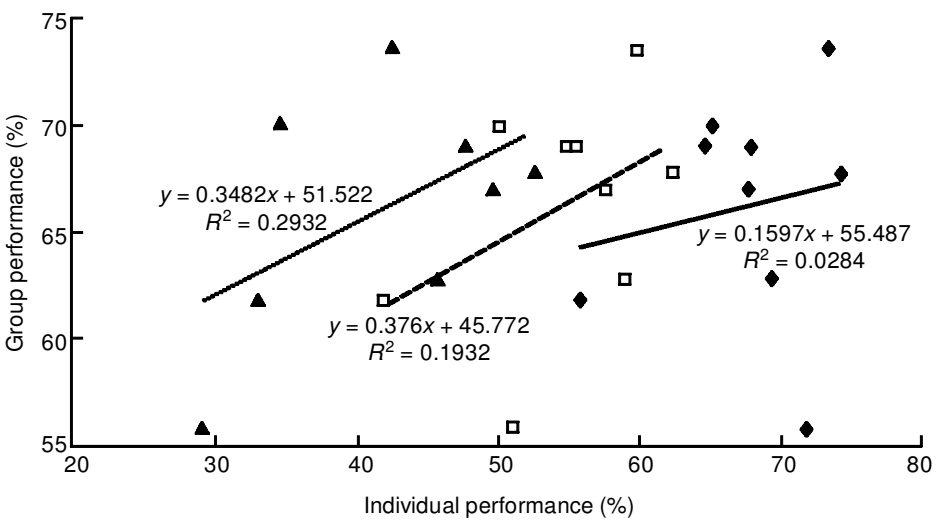

FIG. 4. Individual performance as a predictor for group performance—GIS groups. (Key—◆ high mark; □ mean mark; ▲ low mark.

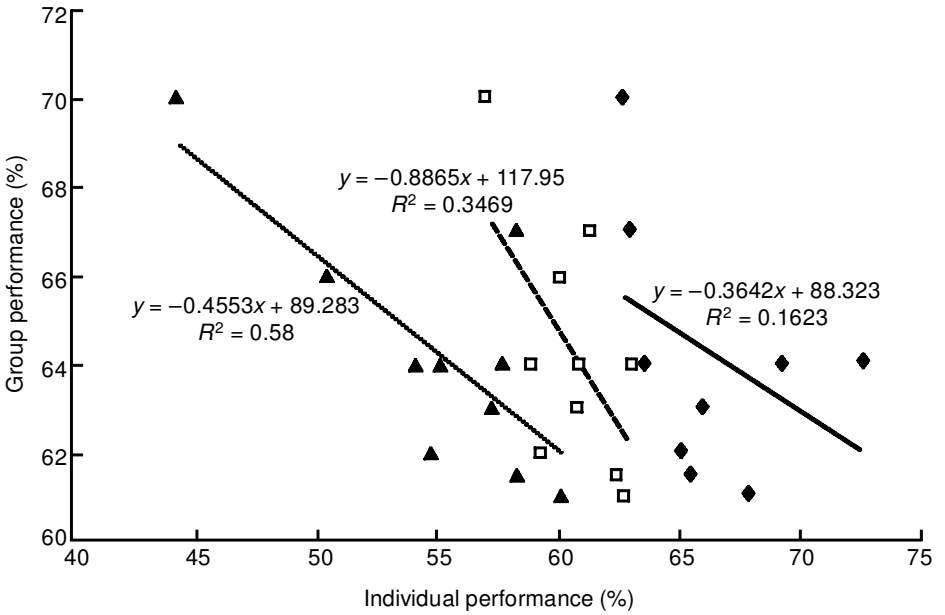

FIG. 5. Individual performance range as a predictor for group performance—Geography groups. (Key—◆ high mark; □ mean mark; ▲ low mark.

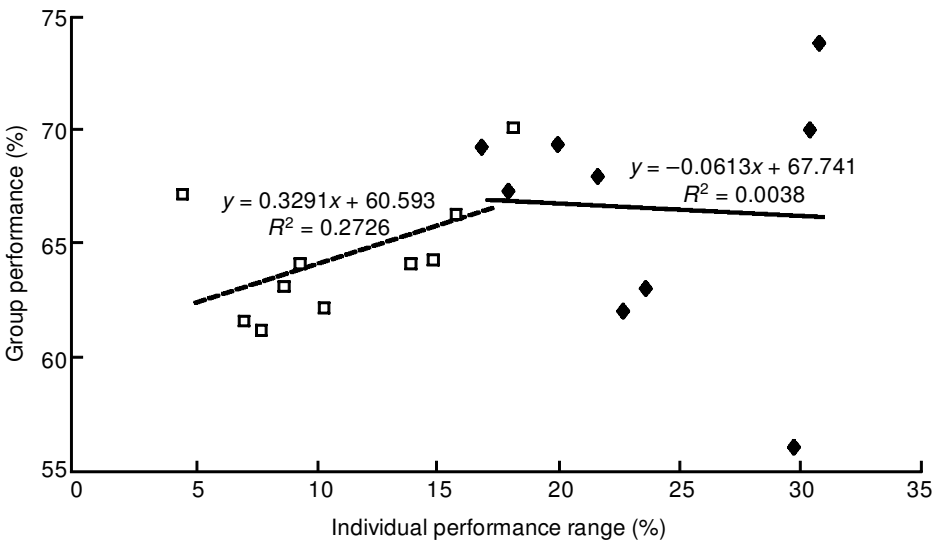

FIG. 6. Individual performance range as a predictor for group performance—GIS and Geography groups. (Key—◆ GIS range; □ geography range.

and the fact that the best performing Geography groups had the widest ranges (Fig. 7—case study 2).

It is also noticeable that the relationship between individual performances and group marks for the GIS case study (Figs 4 and 6) weakly positive. The positive relationship is strongest for minimum individual performance ($R^2 = 0.29$). Group diversity, indicated by the

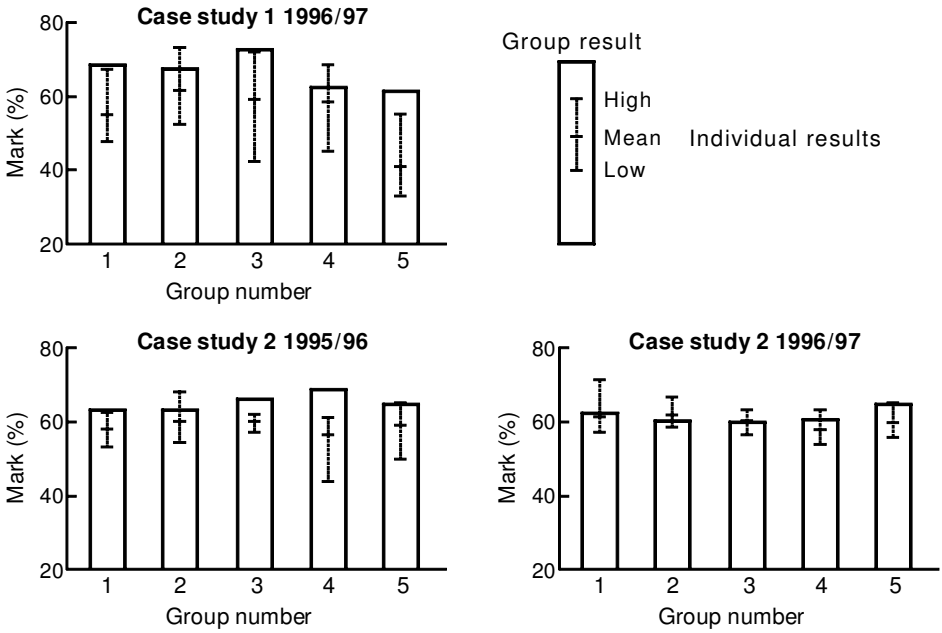

FIG. 7. Comparison of ranges and means for individual marks with corresponding group results.

range of marks against the group mark (Figs 6 and 7), is also different between the case studies. Whilst the best performing group is the most diverse (Fig. 7), there is no real trend (Fig. 6). The GIS groups tend to be made up of individuals with a greater diversity of marks, possibly due to the selection procedure.

This leaves the possibility that the different patterns might be due to fundamental differences between the two studies. If it is assumed that an individual who performs weakly in other areas of the module should tend to have a negative effect on group performance, then could something be happening to either nullify or reverse this influence? There are two contrasting explanations, although clearly there may be others:

1. group members who perform below average in individual work thrive in group work;
2. group members who perform below average in individual work are compensated for in group work.

The second possibility again raises the question of 'fairness'. Both of these possibilities are further considered in a later section.

More comprehensive datasets or a controlled experiment would be needed in order to draw stronger conclusions. However, if there is a strongly positive correlation between individual and group performances, then it has been masked by the group membership in these studies. One other question can be addressed though; even if other students influence the marks of an individual, is this influence actually unfair? To test the scale of this effect, the weighting of the group mark as a percentage of the total module mark was varied, and the change to the module grade profile was graphed (Fig. 8).

Fig. 8 shows that, if the group project is no more than 25% of the total module mark, then the impact on individual student grades is negligible. At 30–35% the impact is still slight; however, there is a tendency to broaden the upper second class grade band—in only one case is this due to a fall in grade from a first class degree. If the the weighting is increased

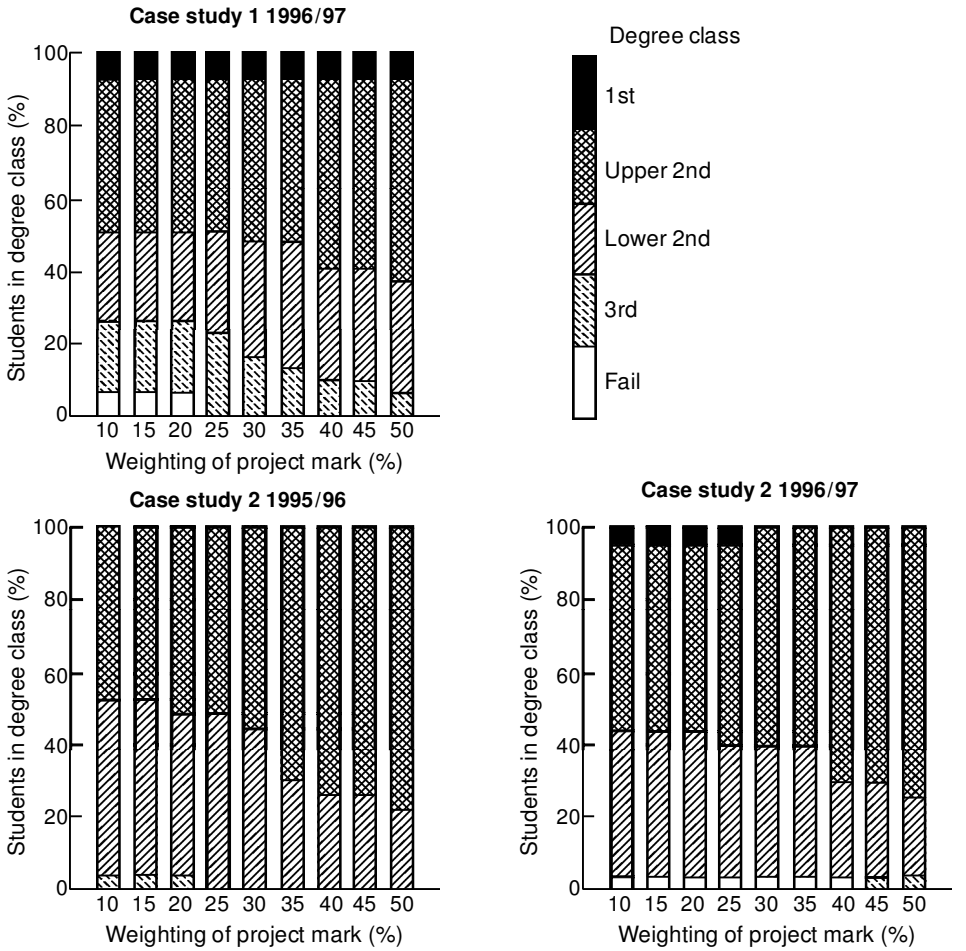

FIG. 8. Effect of changing weighting of team project on overall module grade.

to 50%, again, the major change is to improve the results of lower performing students by widening the upper second band and reducing thirds and fails. In general, students with lower individual performances benefit more, but it is also the case that there are more positive than negative impacts on grades.

Concerns over whether group work has an adverse effect on individual performance should be at least partially allayed by these results. Higher performing students appear to believe that they have the most to lose from group work. Clearly, there is an indication that some higher performing students could have had their grades affected by the group work, thus reinforcing one of the myths. This returns us to the question of whether the group work *should* have had this effect; that is, is it fair? There are a number of factors that may influence a judgement on this.

1. The individual performance of a student is the major determining factor on group performance.
2. The skills required to produce good group work are different to those required to produce good individual work.
3. The skills required to produce good group work are a valid component of an individual's university assessment.

The data available are unable to address (1) conclusively, but there is other evidence from the studies that throw some insight on (2) and (3). If group work offers a different type of learning experience for students that is at least as valid and as measurable as individual work, then there is no problem in justifying any effects on student grades, up or down.

The Effectiveness of Teamwork as a Structure for Learning

Evidence from questionnaire responses indicates differences between the case studies in the assignment of tasks within the group. This may have resulted from the design of the exercise in each case, specifically the method of team selection. In the case of the Geography team selection process, the students were assigned a team without reference to their role in that team. They were encouraged to discuss this as part of their early activities in team-building. By contrast, the GIS students were given a series of job descriptions relating to specific roles they would fulfil in their teams, for which they must apply.

As part of an ongoing review, each module leader collects feedback from students. In this case, the feedback was sought through both informal seminar discussion and a questionnaire survey. The results are summarised in Table VII and will be discussed mainly in the form of extracted quotations from the student responses.

The main design aims were to create a realistic scenario, a well-defined team structure and a clear set of goals. The presented structure was generally well received in both examples, even including the potentially controversial team selection process, which was only mentioned by one student—'Could we choose the groups we work with?'—and scored well above average in the GIS groups module questionnaire. Indeed, in 11 out of 14 cases in one GIS project, students said that the job that they did for the group was the one that they would wish to do if the project were about to start again. The responses show that not only did the

TABLE VII. A selection of subjective comments by GIS and Geography students about their experience of working in their group

Positive
Efficiency of discussing ideas and separate individual research before the project content was finalised.
We worked well together.
The people in it all took it seriously and worked hard to get results—we didn't give up.
Kept to the rules well and chipping in to get urgent jobs done under pressure.
When someone couldn't work out how to do something we all had a go. We all put forward suggestions in meeting.
Reflecting situations that we will most likely encounter in full employment.
Negative
Un-cooperative … people not doing what they were asked to do. Trying to organise everybody.
Not everyone turned up for the meetings.
Everyone else was too clever.
Large amount of work expected, compared to other modules.
The worst thing about the module was … 'working in groups'.
General
When dividing tasks, aware that overall mark/grade given depended on everyone rather than yourself, however, this was overcome to a large extent though teamwork and planning.
Everybody having a say, but only two people doing the work. Didn't really matter, though, because they gave plenty of moral support.
Difference of study to other modules.
I think it was a very good exercise … if we had a little more time I'm sure we could have done a better job.
It took over my life.

students value the group-based project, but they valued it highly relative to other forms of course delivery.

The students recognised the differences in approach of this mode of study compared to other modules. In general, they recognised the value of this difference for such things as future employment prospects and different learning perspectives; for example, 'a very good learning exercise, reflecting situations we will most likely encounter in employment'; 'learning different perspectives than those used by the media'. Some of the responses of the students to the problems of pressure suggest that the intensity of the project was appreciated after the event; for example, 'stimulating', 'enjoyable', 'imaginative', 'we didn't give up'.

The positive comments appear to focus on the occasions when individual and group interests coincide. Given the demand among employers for graduates who can operate successfully in teams, it is important to engender a positive response from students for team working. It is also necessary that students can reflect on and take away a coherent understanding of their group work experience, if they are to be equipped for dealing with such situations in their future lives. Well-structured and managed group work provides students with a set of transferable skills and a vehicle for critically examining their subject, both of which are important components of modern courses.

Some students, particularly in the GIS project, identified specific negative experiences; e.g. '[it] took over my life', 'pressured workload', 'lacked enthusiasm towards the end due to overwhelming pressures'. Overall, the negative comments focus on the conflicts of interest between individuals and the group, which interfered with the group functioning. Interestingly, the authors observed that in some circumstances where conflicts arise their explanations are focused on clashes between individuals, while in other groups where a working approach is agreed team members are able to 'shelve' their differences in order to keep on task. The implication is that the adoption of roles helps to moderate personality clashes, and makes the individual composition of the group and personal 'histories' less significant.

If the provision of these group structures fails, then the responsibility is likely to fall on the shoulders of individual members of the group. In these circumstances, the abilities of these members may become more important. It may be the case that the apparent inverse relationship between the poorest individual performance and group performance in the Geography groups, discussed earlier, is evidence of this. A tentative explanation for this may be that where members' roles are not defined, groups may marginalise the contribution of members who are not expected to provide valuable input. Thus, task allocation may compensate for expectations of poor individual contributions. Additional evidence for this emerges from after the event confessions from members of the Geography teams.

One 'confession' centred around a team that had a student who was widely expected to obtain a first class degree. The student's team colleagues disclosed to one of the authors that the final preparation for the presentation and the written report was completed by that person alone collating research notes written by the team members. It was argued that this was a suitable arrangement, because it was felt that the student would do a good job since it would give the person control over their own marks. A second disclosure related to two members of one team whose attendance at meetings and contribution to the work was poor. However, the rest of the team recorded them as attending each meeting because they did not want them to get 'into trouble'. These two cases provide evidence—albeit anecdotal—that groups have covered up disharmonies and presented a group front. No such disclosures came from the GIS groups. This is no proof that such events did not occur, but it may be because the students' roles and responsibilities were clearly defined and more transparent to the module tutor, thus making it more difficult for individual students to avoid contributing or for their colleagues to conceal this fact.

As suggested, the positive comments relate to breakthroughs in group work. However, the collection of negative comments on both the Geography and the GIS projects could be interpreted as primarily relating to Tuckman's (1965) storming and norming stages. The positive comments on the GIS project largely correspond with the performing stage. By contrast, the Geography teams' positive comments relate to the norming stage. This may imply that there is some difference between the GIS and the Geography groups in the rate and extent of development through Tuckman's stages.

In attempting to explain the negative relationship between poorest individual performance and group performance, it was earlier suggested that this might either be due to poorer performing individuals thriving in group work, or to other group members somehow compensating for them in the group work. The feedback evidence seems to suggest that if group evolution does not progress quickly to the final stages, then individual abilities are likely to be a more dominant factor than if the group is performing at its maximum efficiency.

This suggests that group work myths (Table I), which highlight concerns about conflicts, may be managed and that students *should* have experience of this. Team skills are arguably as important as the subject content of the group project. As argued earlier, this may account for the lack of correlation between group and individual marks. Getting the group roles and the group structure clarified could compensate for individual differences. This is shown in that, despite the initial protests, only one feedback comment highlighted the desire to allow teams to self-select. This is not to ignore the potential dangers of using group projects, which include allowing group conflicts to occur, students to become isolated from the project and differential learning to go on within the project. These can be avoided by the structuring of the project, and through facilitating the exchange of information and learning amongst and within the groups.

The hypothesis, which would have to be tested further, is that, if the group is working well together, then individual performance is not a good discriminator for group performance. However, if the development of the group is not far advanced, then individual student performance may become more important. The student responses suggest that some of the groups may not have 'normed' effectively in the Geography project. In contrast, the GIS group's comments seem to indicate that this was less of a problem. Such an approach may be arguably more appropriate in the GIS degree, where there is a greater vocational element to the degree programme. The validity of this approach could be tested by following up the ability of the students, from both courses, to be aware of, and apply, team skills in different contexts. Would the GIS students use the same roles defined in their project? Would the Geography students be better able to develop team roles and contribute to the development of role identification?

The clear provision of tasks may have the following advantages:

- simplifies or removes initial group formation problems or hurdles;
- tends to prevent the exclusion of individual members from contributing either by their own or other members' designs;
- reflects the skills and the career aspirations of the students;
- gives the students a feeling of influence over their role in the exercise even if they cannot chose their team.

By contrast, the advantage of random selection is that a mix of team members is approximated, with limited effort on the part of the tutor, and the groups are more responsible for shaping the process. However, if group selection is done using names or students' codes, then the same group memberships are likely to occur time and again throughout a course—it is debatable whether this is a good thing or not.

Place of group work in the curriculum

It is important for students to reflect and learn from their experience of teamwork if they are to extract maximum value from the experience, particularly with a view to learning for future work environments. In order for students to assess their role in their teams, and the learning they have been able to gain from the exercise, and place this in a positive reflective framework, it is important for tutors to provide them with a forum where they can evaluate the experience.

The concept of social learning and learning loops may have some relevance here. These arguments suggest that the conflict and difficulties which can arise from team-based learning, and which have been the basis of suspicion and criticism of such approaches, are symptomatic of the complexity which Liber (1994) and Wildermeersch & Jansen (1997) consider a key element of the team learning experience. These aspects of teamwork are as difficult as they are likely to be when encountered in real work situations, and could therefore be used creatively as positive learning experiences. Conversely, it could be argued that if students do not encounter such situations in their education they will graduate deficiently prepared for work situations.

Conclusions and Further Work

Students' concerns about the influence of the mark on their overall grade may well be more pronounced with group work than for other types of assessments, due to the perception that this influence is beyond their control. A student may be relatively poor at a particular kind of assessment due to their particular skills, such as essay writing or mathematical calculations, but they can come to terms with this as being entirely down to themselves. The suspicion that they would have got a better mark if others had worked harder, if they had been in a better group or if they had been doing a different task can manifest itself in a feeling of injustice. A previous bad experience, an apocryphal tale or a pessimistic outlook may be enough to put students off before the project even starts, whilst staff may feel disinclined to attempt to overcome the inertia caused by these feelings or may agree with the criticisms.

When the concept of the group project is introduced to the students the response is generally unenthusiastic. Afterwards, the response of the students to the group work is usually much more positive. Perhaps surprisingly, there is little explicit mention made of any perceived inequalities surrounding group selection or allocation of marks; nor do any students dwell on their loss of control over responsibility for their final mark, rather they concentrate on how working in a group enhanced their learning experience. The authors believe that these are crucial observations that are at odds with some of the literature (Gibbs, 1995a, 1995b, 1995c) and 'myths' of group work (Table I). Analysis of the distribution of marks and comparison with individual performance also tends to supports these observations.

The effectiveness of group work as a learning structure is likely to be affected by the composition of the group. Allowing students to select their own group membership emphasises individualistic learning approaches, while random or structured selection emphasises the sociocultural. It seems to be important that group work exercises include a reflective component to allow students to reconcile their individual contributions and interactions with the final group achievement.

Only by empowering each student so that they can exert an influence on one or more components of the group's work can their feelings of limited control be overcome. A bad experience is likely to confirm any prejudices a student has and engender a feeling of injustice. This may permanently put the student off future group work, and make them adopt

a defensive attitude towards it, which is likely to inhibit social or double-loop learning from taking place. By structuring group work well, such pitfalls can be avoided and positive learning experiences can be an antidote to the group work myths.

For a group project to reach its full potential, not only is the provision of resources, support and academic challenge required, but also the facilitation of group working structures. This enables the group to progress as quickly as possible to the norming and performing stages. This can be thought of as stimulating the production of effective learning environments, both internal and external to the group. It appears that the progression through these later stages is when the students are challenged to reflect upon their learning approaches, as they come into contact with colleagues with alternative approaches or viewpoints. This suggests that team membership be determined in some way in order to maximise the challenge. At the same time, it is important to provide a structure of transparent accountability and support.

The evidence presented in this article suggests a typology of four main types of group-based learning experience:

1. training in generic group skills as a study technique;
2. presentation of group skill materials and selection of roles before the exercise;
3. presentation of group skill materials before the exercise, followed by self-selection of roles; and
4. sink or swim.

The suitability of each of these approaches depends upon the previous experience of the students in this kind of exercise. In general, the more familiar the students are with generic group skills, the less likely they are to have a bad experience in the group work. Blair (1991) suggests that generic team skills are taught before the students use them in their 'academic' modules. At Kingston, techniques are taught in first- and second-year levels of the courses discussed, but at that time did not explicitly include team skills.

Areas of future research should include the following.

- The collection of larger data sets to test more effectively the quantitative evidence. Large institution or discipline-wide surveys would broaden the base of evidence and help to test some of the hypotheses suggested here in a more rigorous fashion. The collection of a wider range of data is required in order to test specific hypotheses, possibly including follow-up studies with graduates.
- The specification of group work approaches in more detail—possibly according to a typology—in order to reflect the experience of the students and to be able to deduce the effectiveness of the different approaches. The adoption of some group work typologies that could help to discriminate between methods adopted in group work would further assist any quantitative analysis.
- Assessing the effectiveness of different models for team evolution and role selection, specifically in an academic context. This includes evaluating the resources that are based upon these theories and recognising that getting the most out of group work requires special skills on behalf of both the tutor and the students.

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REFERENCES

Abson, D. (1994) The effects of peer evaluation on the behaviour of undergraduate students working in tutorless groups, in: H.C. Foote, C.J. Howe, A. Anderson, A.K. Tolmie & D.A. Warden (Eds) *Group and Interactive Learning*, pp. 153–158 (Southampton, Computational Mechanics Publications).

Argyris, C. (1993) *On Organizational Learning* (Oxford, Blackwell).

Blair, G.M. (1991) *Basic Management Skills*, (University of Edinburgh, Department of Electrical Engineering and Piscataway, NJ, Institute of Electrical and Electronics Engineers; http://www.ee.ed.ac.uk/~gerard/Management/).

Belbin, R.M. (1981) *Management Teams—why they succeed or fail* (Oxford, Butterworth Heinemann). See also the Belbin Associates website: http://www.belbin.com/

Burkhill, S. (1997) Student empowerment through group work: a case study, *Journal of Geography in Higher Education*, 21, pp. 89–93.

Callaghan, M., Knox, A., Mowatt, I. & Siam, G. (1994) Empirical projects and small group learning, in: H.C. Foote, C.J. Howe, A. Anderson, A.K. Tolmie & D.A. Warden (Eds) *Group and Interactive Learning*, pp. 165–170 (Southampton, Computational Mechanics Publications).

Chambers, R. Pacey, A. & Thrupp, L.-A. (1989) *Farmers First: farmer innovation and agricultural research* (London, Intermediate Technology Publications).

Committee of Vice-Chancellors & Principals (1998) *Skills Development in Higher Education*, (London, Committee of Vice-Chancellors and Principals).

Dearing, R. (1997) *Higher Education in the Learning Society*, (London, National Committee of Inquiry into Higher Education). Full text available at http://www.leeds.ac.uk/ncihe/

Department for Education & Employment (1998) *The Learning Age: a renaissance for a new Britain* (London HMSO).

Follett, B. (1993) *Joint Funding Councils' Libraries Review Group: Report* (Bristol, Higher Education Funding Council for England, Scottish Higher Education Funding Council, Higher Education Funding Council for Wales, Department of Education, Northern Ireland,). http://www.iprs.ed.ac.uk/reports/follett/

Forman, F. (1994) Peer collaboration as situated activity: examples from research on scientific problem solving, in: H.C. Foote, C.J. Howe, A. Anderson, A.K. Tolmie & D.A. Warden (Eds) *Group and Interactive Learning*, pp. 3–8 (Southampton, Computational Mechanics Publications).

Gibbs, G. (1995a) *Learning in Teams: a student manual* (Oxford, Oxford Centre for Staff Development).

Gibbs, G. (1995b) *Learning in Teams: a student guide* (Oxford, Oxford Centre for Staff Development).

Gibbs, G. (1995c) *Learning in Teams: a tutor guide* (Oxford, Oxford Centre for Staff Development).

Gibbs, G., Haigh, M. & Lucas, L. (1996) Class size, coursework assessment and student performance in geography: 1984–94, *Journal of Geography in Higher Education*, 20, pp. 181–192.

Gold, J.R., Jenkins, A., Lee, R., Monk, J., Riley, J., Shepherd, I. & Unwin, D. (1991) *Teaching Geography in Higher Education: a manual of good practice*, Institute of British Geographers Special Publications Series; No. 24 (Oxford, Blackwell).

Healey, M., Matthews, H., Livingstone, I. & Foster, I. (1996) Learning in small groups in university geography courses: designing a core module around group projects, *Journal of Geography in Higher Education*, 20, pp. 167–180.

Holmes, L. (1995) Competence and capability: from 'confidence trick' to the construction of the graduate identity, for the conference on *Beyond Competence to Capability and the Learning Society*, Higher Education for Capability, University of Manchester Institute of Science and Technology, November.

Kolb, D.A. (1984) *Experiential Learning: experience as the source of learning and development* (Prentice-Hall).

Liber, O. (1994) Managing resource based learning, in: H.C. Foote, C.J. Howe, A. Anderson, A.K. Tolmie & D.A. Warden (Eds) *Group and Interactive Learning* pp. 183–186. (Southampton, Computational Mechanics Publications).

LINSEY, T. & WOOD, A. (1994) A directory of GIS courses in the UK, *Mapping Awareness*, 8, pp. 22–30.

PARSONS, D.E. & DREW, S.K. (1996) Designing group project work to enhance learning: key elements, *Teaching in Higher Education*, 1, pp. 65–80.

ROBSON, M. (1994) Working with groups on sensitive issues, in: H.C. FOOTE, C.J. HOWE, A. ANDERSON, A.K. TOLMIE & D.A. WARDEN (Eds) *Group and Interactive Learning*, pp. 377–382 (Southampton. Computational Mechanics Publications).

TUCKMAN, B.W. (1965) Development sequence in small groups, *Psychological Bulletin*, 63, pp. 384–399.

WILDERMEERSCH , D. & JANSEN, T. (1997) Strengths and limitations of social learning as a key concept for adult and continuing education in reflexive modernity, *paper presented to the 27th Annual Standing Conference on University Teaching and Research in the Education of Adults conference proceedings*, pp. 465–471.