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Mark Smith [a], Giles Polglase [b] & Carolyn Parry [c]

[a] Institute of Geography and Earth Sciences, Aberystwyth University, UK

[b] Centre for the Development of Staff and Academic Practice, Aberystwyth University, UK

[c] Careers Advisory Service, Aberystwyth University, UK

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# Construction of Student Groups Using Belbin: Supporting Group Work in Environmental Management

MARK SMITH*, GILES POLGLASE** & CAROLYN PARRY†
*Institute of Geography and Earth Sciences, Aberystwyth University, UK, **Centre for the Development of Staff and Academic Practice, Aberystwyth University, UK, †Careers Advisory Service, Aberystwyth University, UK

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ABSTRACT *Belbin team role self and observer perceptions were applied to a large cohort (145) of Geography, Earth and Environmental Sciences undergraduates in a module assessed through two separate group projects. Students self-selected groups for the first project; for the second, groups were more 'balanced.' Results show slight improvement in group performance compared with that of previous years, with a significant increase in first-class grades. No evidence was found linking group balance to performance; however, students recognized the value of their Belbin report when entering the job market. Belbin usefully contextualizes regularly occurring group work issues and provides students with ways of managing these issues.*

KEY WORDS: Group work, team role analysis, employability, Belbin

## Background

Geographers regularly encounter group work situations, be it on fieldwork or as teams addressing broad multi-disciplinary problems which form a central theme for environmental management. There is a longstanding recognition of the need to incorporate group work projects in higher education curricula (Springer *et al.*, 1999), reflecting the requirement of graduate recruiters for work-related or transferable skills. Both in the UK and internationally, there has been increased recent effort to develop employability statements, generic graduate attributes or personal development plans that clarify the role of education offered to students, beyond disciplinary content knowledge (Bowden *et al.*, 2000; Barrie, 2006, 2007; CBI/UUK, 2009). These core outcomes of higher education are often produced by individual institutions seeking to demonstrate the quality of their graduates, or they may be developed at a national or international scale to ensure comparability and compatibility of education systems (e.g. the European Higher Education Area). A common theme of graduate attributes worldwide is inclusion of the ability to work flexibly in a team, to communicate, to collaborate, to listen seriously to the insights of others and to compete in the future economic environment (e.g. Kuh, 2008; WAG, 2009). Wheatley (1992) reports the anticipation by managers in the UK that more of their work will be conducted in teams and that possession of good team-working skills is becoming increasingly necessary. Recent

*Correspondence Address*: Mark Smith, Institute of Geography and Earth Sciences, Aberystwyth University, Aberystwyth, SY23 3DB, UK. Email: mark.smith@aber.ac.uk

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evidence suggests that team working is now the structural norm in high-performance organizations seeking to react and adapt to dynamic pressures of markets and shareholders (Partington & Harris, 1999).

The formulation of group work activities is driven by any of a wide range of motivating forces, including those directly aimed at addressing the employability agenda (Gedye, 2009), encouraging enterprise skills (Healey, 1992), implementing a problem-based learning exercise (Spronken-Smith, 2005; Pawson *et al.*, 2006), efficiently deploying teaching resources (Gibbs, 2010) or may be part of a broader tradition of group work, in fieldwork projects for example. Livingstone and Lynch (2002, p. 218) note that group projects "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."

Yet, several observers have noted that group work at undergraduate level can be problematic (Gold *et al.*, 1991) and may reduce individual student motivation (Kerr & Bruun, 1983). Perceived difficulties include issues of high workload associated with group work exacerbated by unproductive time in group meetings (Healey *et al.*, 1996), freeloading group members and the 'sucker effect' where hardworking students reduce their effort in response to such freeloaders (Houldsworth & Matthews, 2000). Personality clashes are reported frequently suggesting that students lack group management and facilitation skills. Rather than reflecting on inherent weaknesses in the concept of group projects, such problems emphasize the importance of designing group projects carefully and supporting students throughout the process (Gibbs, 2010). Reported problems may be down to insufficient opportunities to develop or rehearse group work skills at university level; such unfamiliarity may manifest itself as anxiety and disorientation upon encountering a group work situation for the first time (Gibbs & Dunbar-Goddett, 2007).

Given the current competitiveness in graduate recruitment schemes, the focus on project-orientated employment and emergence of 'portfolio' careers (Henderson & Robertson, 1999), it seems appropriate that the benefits of existing group work projects should be maximized and some opportunity for student reflection on transferable skills be incorporated into project design. Reflection need not be particularly onerous or time consuming; it can be accomplished relatively easily. Bradshaw (1989) points to the use of team role classifications as a way of making more of group work in higher education and developing the inter-personal and team skills understood in employment. Moreover, a well-balanced team, which works well together, should experience an enhanced learning opportunity as the focus is on the task at hand and not on personalities.

It has long been recognized that the performance of a group, as a mix of individuals, is influenced by the combination of personality styles within that group. Attempts to design ideal teams through categorization of individuals into team roles date back over 60 years (Benne & Sheats, 1948; Bales, 1950). In recent decades, the team role categorization scheme of Belbin (1981, 1993a) has built up considerable momentum with management development professionals (Partington & Harris, 1999). Based on extensive observations of the behaviour of managers during training courses during the 1970s, Belbin (1981) hypothesized that team balance was more important for success than combined intellect, focusing on the emergence of informal, functional roles during training exercises. Rather than considering collective team behaviour, Belbin (1981) categorized individual behaviour within the team into eight types, later expanded to nine (Belbin, 1993a). These

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are described in Table 1. Since different people interact in different ways, successful teams are characterized by the compatibility of the preferred roles of their members.

An individual's natural team role preferences are rapidly identified through the Belbin self-perception index. There is a general acknowledgement that the Belbin scheme's intuitive appeal, ease of application, empirical support and widespread use in many organizations including government bodies, FTSE-100 companies and multinational agencies render it a useful tool for managers (Parkinson, 1995; Aritzeta *et al.*, 2007). The central claim of the Belbin team role theory is that a 'balanced' team, as judged by a spread of high-scoring individuals in each team role, has a greater propensity to perform highly. However, a variety of different group balance metrics (GBMs) have been reported previously (e.g. Senior, 1997; Partington & Harris, 1999). The Belbin theory also recognizes that behaviours are contextual and will change over time in response to new circumstances.

While some studies have questioned the psychometric properties and reliability of the Belbin team role self-perception inventory (Furnham *et al.*, 1993; Fisher *et al.*, 1996), Belbin (1993b) emphasizes that it is not a psychometric instrument. Team roles measure behaviour rather than personality (one of several factors that influence behaviour). A recent review by Aritzeta *et al.* (2007) identified mixed evidence on the convergent validity of the self-perception index. Indeed, more support exists for the Belbin team role model (e.g. Fisher *et al.*, 1994; Dulewicz, 1995; Fisher *et al.*, 2000), which assesses the potential for team role contribution of individuals based on behaviours and clusters of characteristics (Belbin, 1981). The main criticisms of Belbin question the identification of an individual's preferred team roles based on self-perception alone (Parkinson, 1995; Senior, 1996). The latest version of Belbin, administered through the *e-Interplace* computer program, offers the additional option to integrate observers' assessments into the analysis. When the observers are familiar with the individual, this offers a good opportunity to increase the robustness of the analysis. Broucek & Randell (1996) found significant correlations between self- and observer assessments; however, Senior & Swailes (1998) and van Dierendonck & Groen (2011) note that little research has been conducted using these observers' assessments.

This paper documents the inclusion of both the Belbin team role self-perception index and observer assessments into a large second-year undergraduate geography module. The aim of this project is to introduce team role analysis to support the student learning experience and provide students with a greater understanding of the roles of individuals within groups. It is hoped that this experience will encourage students to engage with employability issues and focus on the transferable skills they have acquired during their degree. Moreover, the implementation of the Belbin analysis on such a large student cohort permits empirical assessment of the central argument of the Belbin scheme: that more 'balanced' groups are more successful. This study is novel in that it documents a Belbin analysis using both self- and observer assessments on a large number of student groups (42) within the standardized assessment of an undergraduate module, thereby controlling for many variables confounding workplace empirical tests (e.g. differences in group tasks, environments and experience).

Two main research questions are addressed:

(1) Does the performance of student groups support the underlying assumption of the Belbin scheme that more differentiated groups function better?

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**Table 1.** Individual roles in teams

| Team role | Team contribution | Allowable weaknesses |
|---|---|---|
| Plant (PL) | Creative, imaginative, unorthodox. | Ignores incidentals. |
| | Solve difficult problems | Too pre-occupied with own thoughts to communicate effectively |
| Resource investigator (RI) | Extrovert, enthusiastic, communicative. | Over-optimistic. |
| | Explores opportunities. Develop contacts | Can lose interest once enthusiasm has passed |
| Co-ordinator (CO) | Mature, confident. Clarifies goals. | Can be seen as manipulative. |
| | Brings people together to promote team discussions | Offloads personal work |
| Shaper (SH) | Challenging, dynamic, thrives on pressure. | Prone to provocation. |
| | Has the drive and courage to overcome obstacles | Liable to offend others |
| Monitor-evaluator (MI) | Serious minded, strategic and discerning. | Can lack drive and ability to inspire others |
| | Sees all options. Judges accurately | |
| Teamworker (TW) | Co-operative, mild, perceptive and diplomatic. | Indecisive in crunch situations |
| | Listens, builds, averts friction | |
| Implementer (IMP) | Disciplined, reliable, conservative in habits. | Somewhat inflexible. |
| | A capacity for taking practical steps and actions | Slow to respond to new possibilities |
| Completer finisher (CF) | Painstaking, conscientious, anxious. | Inclined to worry unduly. |
| | Searches out errors and omissions. | Reluctant to let others into own job |
| | Delivers on time | |
| Specialist (SP) | Single-minded, self-starting, dedicate. | Contributes on only a limited front. |
| | Provides knowledge and skills in rare supply | Dwells on specialized personal interests |

*Source*: Belbin (1981) and Belbin (1993a)

(2) Is Belbin team role analysis a valuable tool to support the implementation of effective undergraduate group work projects?

## Method

Belbin team role analysis was integrated into a large group level 2 undergraduate module entitled *Environmental Management*. Student enrolment on the module was 145, an increase from 116 in 2010. Summative assessment entails two separate group work projects. The first of these requires student groups (of 5–6) to prepare a management report. Several formative assignments are set within the 5-week period of this project to encourage groups to work to internal deadlines including the preparation of a draft for anonymous peer review. The second project is less structured and more challenging. Larger student groups (of 8–9 members) are required to pitch for a grant at an end-of-module conference. They must prepare a 2-min video, 3-min oral presentation, A0 poster and five sides of project details for the conference handbook. Students must also defend their poster in a Q&A breakout session during the conference. Many of these are 'live' projects created in discussion with the local council, several of whom attended the conference to informally judge the submissions. Further details of this pitch assessment are outlined in Smith (in press).

The second project is more challenging in that it consists of four separate elements that need to clearly deliver the main selling points of the proposed projects to the conference attendees in an appropriate and professional manner. Many activities required in this second project are unfamiliar to most level 2 Geography, Earth and Environmental Science undergraduates. To work effectively, groups need to form sub-groups that have to be co-ordinated. The project is designed to be sufficiently large to require co-operation and cannot be completed or dominated by an individual. The formative steps and weekly internal deadlines of the first project were not enforced, although students were encouraged to arrange this internally.

Previous feedback suggested that the biggest challenge in the assessment was not the unfamiliarity of the tasks, but rather the difficulties of working in groups. In 2011, the Belbin team role analysis was introduced with the aim of encouraging greater reflection on general group work skills and to promote a greater understanding of individual strengths and weaknesses. The first project proceeded, as in previous years, with self-selected groups. In the final week of the first project, 143 students completed the nine-role version of the Belbin team role self-perception index (Belbin, 1993a). Students distributed 10 points between 10 statements according to the strength in which they felt the statement reflected their own behaviour. This was repeated for seven categories of statements. For each student, this generated a score between 0 and 100 for each team role presented in Table 1.

Given the concerns over the validity of the self-perception index discussed earlier, observer assessments were also conducted by the members of each project group. Observers must distribute points on a two-part checklist split between positive and negative traits; if a phrase describes the person's behaviour in the team, then it can be ticked or even double-ticked. In total, 557 observer assessments were made. Thus, the overall team role assessment of each student was based on a self-perception index and up to five observer assessments. Both self-perception and observer assessments were administered independently through the Belbin *e-Interplace* computer program.

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Since one aim of this project was to familiarize students with the ideas underlying team role assessment, a lecture was given outlining the concept of Belbin, including how to recognize and work more effectively with individual Belbin types. The lecture also supported correct interpretation of individual reports. After the first project, students completed a short questionnaire on their perceived effectiveness of their group and their thoughts on the Belbin team roles.

For the second project, students were asked to use their preferred team roles to select a more 'balanced' team. They were initially divided based on choice of project and wrote their preferred team roles on a card. While groups remained self-selecting, they were required to state their Belbin team role preferences on a group submission form before their group could be approved. After the second project, students were asked to fill in the same short questionnaire on their group's effectiveness and their thoughts on the Belbin scheme.

To test statistically whether the balance of teams was reflected in their performance and address the first research question, objective criteria for both elements are necessary. Group performance was quantified through two different metrics: the mark awarded for the summative assessment and students' perceptions of their effectiveness as a group. Students graded their perceived group effectiveness on a scale of 1 (perfect) to 5 (disjointed). Group balance (based on Belbin team roles) must also be quantified through the calculation of objective metrics. Following Partington & Harris (1999), four GBMs were calculated to represent different elements of a balanced group. The four GBMs differentiate balanced and unbalanced groups based on different criteria:

GBM1: Distribution of strong examples of team roles (following Senior, 1997). This metric represents the presence of at least one very strong example of each role in a group on a scale of $0 - 100$ with a score of 0 representing a team with no strong examples of any role and a score of 100 representing a team with a strong example of each role. GBM1 is defined as

$$\text{GBM1} = 100\frac{r}{B},$$

where $B$ represents number of Belbin team roles (in this study, following Belbin, 1993a, $B = 9$) and $r$ denotes number of roles strongly represented by an individual in the group (i.e. a Belbin score of $>80$ per cent).

GBM2: Duplication of roles. Since Belbin (1993a) suggests that, with the exception of the team worker and implementer, team roles should not be duplicated, this metric represents duplication of strong team roles on a scale up to 100 with a score of 0 representing a team where each member is a strong example of the same role (and no others) and a score of 100 representing a team with no duplicated roles. Since an individual can be a strong example of more than one team role, a negative GBM2 can be observed in some circumstances. GBM2 is defined as

$$\text{GBM2} = 100\frac{(n-1)-d}{(n-1)},$$

where $d$ represents the total number of duplicated strong examples in any role in a team (i.e. for a team with just three strong examples of 'Plants' and no other duplicated roles, $d = 2$ as the role is duplicated twice) and $n$ represents the number of group members.

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GBM3: Average Belbin score (out of 100) of the weakest two roles measured by the highest scoring individual in that role.
GBM4: Average Belbin score (out of 100) of the weakest two roles measured by the group average score

Thus, a group that contains strong examples of each Belbin team role with no duplicates will be more balanced according to Belbin team role theory and will score highly on each GBM. In addition, to examine the influence of each team role, the number of strong examples of each team role in a group was also compared with the group performance indicators.

## Evaluation and Discussion

First, the assumption that more balanced groups perform more effectively was tested quantitatively. Overall group marks were compared against a baseline data-set from 2010 as both cohorts met identical entry requirements. Group performance was compared with GBMs to assess whether more balanced teams led to a better overall group performance. Second, to establish the usefulness of Belbin as a method to encourage student focus on group work, feedback from the first project was analysed to establish commonly occurring group work issues. The ways in which students planned to alter their approach to group work in the second project after being exposed to the Belbin team role theory were examined. Post-project questionnaires assessed students' perceptions of working in each group, which were examined alongside Belbin team reports to identify a broad typology of student groups and problems encountered. Student and instructor reflections on Belbin were also compiled.

### *Testing the Belbin Group Balance Assumption*

Figure 1 displays the number of students with strengths in each Belbin team role. 'Plant' was the dominant role of a large number of students, although in the wider population the prevalence of this role is thought to be rarer (Belbin Associates, 2009). This may reflect the fact that the existing assessment structure of the undergraduate degree often requires students to work as individuals and encourages the development of this behaviour. Other common roles were 'Implementer,' 'Teamworker' and 'Co-ordinator.' Several roles were poorly represented in the student group: students preferring 'Resource Investigator,' 'Monitor-Evaluator,' 'Shaper' and 'Specialist' roles were rare. Kneale (1996) suggested that such behaviours may become more developed later in life as Belbin role preferences change with age. Inspection of Belbin team reports confirmed that the groups were indeed more balanced in the second project than in the first based on three of the four GBMs. The groups for the second project scored lower on the duplication of strong roles metric; however, this is to be expected as the group size was larger.

In previous years, as students became more practiced at group work, the average mark improved for the second project when compared with the first (Figure 2(a)). The average mark increase in 2010 was 2.7 per cent. After implementation of the Belbin team role analysis in 2011, the average increase improved slightly (3.6 per cent; Figure 2(b)) and proportionately fewer students recorded a mark decrease for the second project. More significantly, the increase in the number of first-class grades between the two projects in each year was 44 per cent in 2010 and 138 per cent in 2011 (Figure 2(c)) suggesting that

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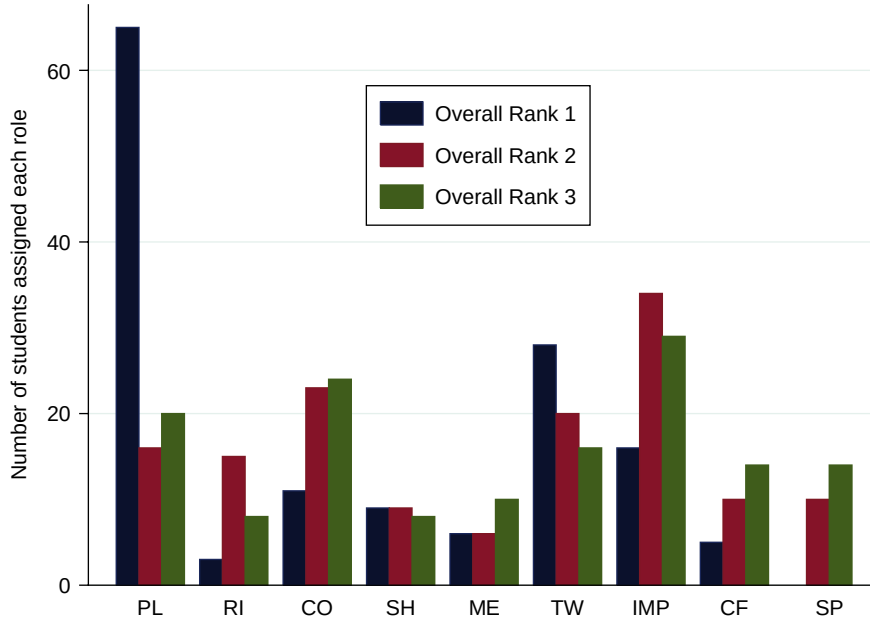


**Figure 1.** Top three overall Belbin team role ranks of 143 level two geography and environmental science undergraduates (based on both self-perception and observer assessments). For a description of the Belbin team roles, see Table 1.

students at the top end of the mark range were responding well to this implementation of the Belbin analysis.

As a direct test of the assumptions of the Belbin scheme, it was hypothesized that the more balanced groups would be the most successful and least prone to internal conflict. However, quantification of team role balance is problematic given the complex relationships between the team roles. Table 2 displays the correlations between the four GBMs and both the group mark for the summative assessment and the group's perception of their effectiveness. Each variable was found to be normally distributed by the skewness–kurtosis test for normality (D'Agostino *et al.*, 1990) except for GBM2 for which Spearman's rank correlation coefficients were calculated.

In common with Senior (1996) and Partington & Harris (1999), Table 2 shows that GBMs have little association with group performance. Only one significant relationship between group performance (measured through summative assessment) could be found: a negative relationship between GBM2 (the role duplication metric) and project mark suggesting that, contrary to Belbin (1981), more than one strong example of a team role can be advantageous to group performance. However, since GBM2 is strongly related to group size which increased for the second project (in which students scored highly; see Figure 2), this correlation may reflect the differences in group performance between projects. Additionally, the prevalence of the 'Teamworker' and 'Implementer' roles in the student cohort (Figure 1), which Belbin (1981) suggests can be duplicated in a successful team, may explain this result.

A significant correlation was found between the average Belbin score of the two weakest roles of any individual and group perception of effectiveness, though the direction

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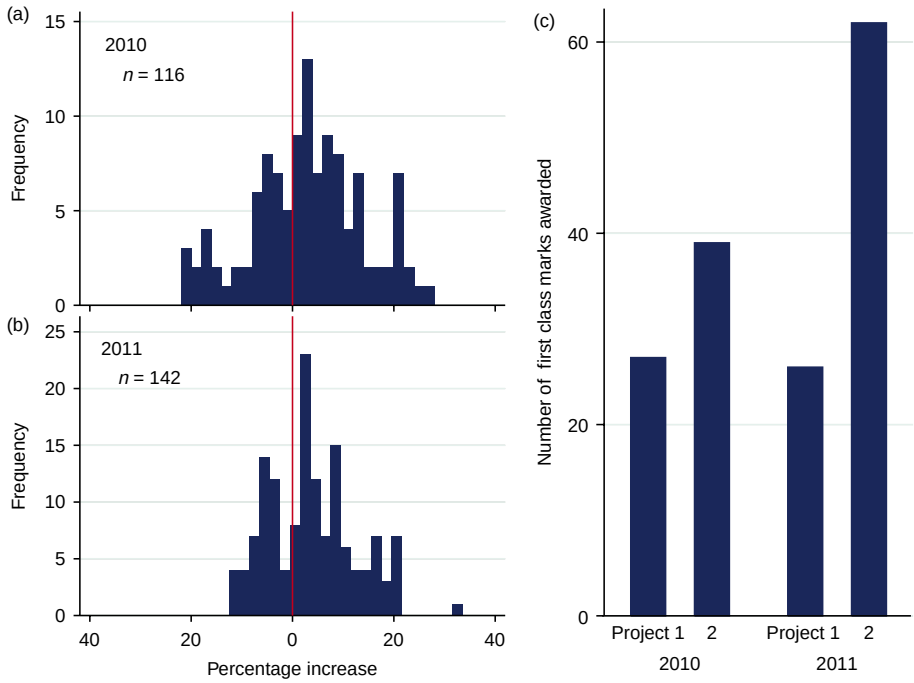


**Figure 2.** Summative assessment before and after Belbin implementation. Distribution of mark increases between the two projects (a) in 2010 and (b) in 2011. (c) Number of first-class marks awarded in each project over 2 years.

**Table 2.** Pearson correlations between group performance and GBMs (Spearman correlation coefficient is presented for GBM2)

| $n = 42$ | Group mark | Group perception |
|---|---|---|
| Distribution of strong examples (GBM1) | 0.157 | 0.054 |
| Duplication of roles (GBM2)[a] | −0.420[b] | −0.092 |
| Lowest individual roles (GBM3) | −0.021 | 0.255 |
| Lowest group roles (GBM4) | 0.047 | 0.427[b] |

[a] Spearman's rank correlation presented (the Pearson correlation value was slightly more negative).
[b] Correlation significant at the 1 per cent level.

of this relationship is such that a more balanced group is related to the student perception of a less effective group. This may represent a greater tendency for deeper discussion and more regular disagreement within balanced groups. To explore this idea further, the number of strong examples of each role was correlated against the two team performance indicators (Table 3). As each of these variables was found to be non-normally distributed by the skewness–kurtosis test, a Spearman's rank test was performed. Again, few significant relationships were observed. Visual inspection of the negative relationship between group mark and number of strong 'monitor-Evaluators' suggests that this significant relationship (at the 5 per cent significance level) is dominated by a single outlier with considerable leverage. However, the strong relationship between group perception of effectiveness and number of 'Shapers' in the group is quite apparent. Perhaps the tendency

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**Table 3.** Spearman's rank correlations between group performance and number of examples of strong roles in each team

| $n = 42$ | Group mark | Group perception |
|---|---|---|
| Number of strong PL | 0.062 | −0.108 |
| Number of strong RI | −0.013 | 0.122 |
| Number of strong CO | 0.189 | −0.043 |
| Number of strong SH | 0.083 | 0.422[b] |
| Number of strong ME | −0.380[a] | 0.201 |
| Number of strong TW | 0.223 | −0.003 |
| Number of strong IMP | 0.085 | −0.219 |
| Number of strong CF | −0.004 | 0.067 |
| Number of strong SP | 0.258 | −0.149 |

[a] Correlation significant at the 5 per cent level.
[b] Correlation significant at the 1 per cent level.

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of multiple 'Shapers' to provoke and offend others has a detrimental effect on the coherence of student groups.

### *Using Belbin to Enhance Student Group Work Skills*

The second research question analyses the usefulness of the Belbin scheme to encourage students to focus explicitly on group work skills and to encourage a greater understanding of individual strengths and weaknesses. Since the increase in high-performing groups appears unrelated to their balance of team roles, the use of Belbin as a teaching tool to expose students to the expected problems of group work may be a more appropriate focus of investigation. After the first group project, anonymous feedback highlighted several group work issues that were repeated across the cohort. Five commonly occurring group work problems were identified:

(1) General lack of communication. "Not all of us knew exactly what each other were doing and in the beginning there was quite a lot of overlap with research."
(2) Problematic individuals not completing work. "Limited work provided by individuals, with no possibilities of removing them (like what would happen in a 'real professional' environment)."
(3) Controlling individuals. "Unwillingness of some members to share work, took control over the majority of work and would not listen to suggestions."
(4) Lack of an identified leader. Laid back groups drifting along or procrastinating. "I feel that the biggest problem with our group was that towards the start we were all too friendly and nobody was taking up the role of leader."
(5) Clashes of individuals within the group. "There was a clash with some members of the group, and disagreements did occur."

A lecture on Belbin team role theory and completion of the self perception and observer assessments gave students the opportunity to identify their own group issues within this broad conceptual framework and develop ways of moving forward with their experience to improve teamworking in the second project. Typical responses included:

> Focus will be pushed towards the idea of working together and providing better understanding of individual roles within the group context.

> Take more control in the areas that I am more confident and competent with.

> I can place myself into roles in the team which suit my strengths, and with others who can offer different skills.

> I think that taking time to consider team roles would be a better approach to the "shotgun" style that jobs were claimed during our first project.

Each of the generic group work issues highlighted above can be conceptualized within the Belbin team role theory. Indeed, several students did just that. For example, a member of a group which struggled with keeping to topic on team meetings now thought of this problem in a new way: "Lack of a shaper—so we sometimes drifted off topic in meetings" (this perception agreed with the findings of the Belbin team report). Many students aimed to address the issue of communication through the Belbin scheme; the lecture made them understand why miscommunication can easily occur and how to communicate better with those of different team roles. Overall, it appeared to foster an attitude of tolerance within the groups; however, several individuals were critical of the Belbin scheme and raised some valid points about Belbin team roles changing according to the task at hand (as recognized by Belbin):

> I don't think that we should be placed into groups depending on the Belbin report as in real life I'm not sure that it necessarily works in all situations.

When asked to rate how well the group worked together on a scale of 1 (perfectly) to 5 (disjointed), the average mark improved from 2.41 on the first project to 2.20 on the second. In common with the first project, communication issues and controlling group members were also frequently cited group difficulties.

Based on the preferred Belbin roles of students seen in Figure 1, commonly occurring student group profiles and associated group work problems should be expected. Indeed, analysis of the typical composition of student groups alongside qualitative feedback permits a general categorization to be proposed tentatively. The Belbin scheme provides a framework for dealing with such group problems. Here, three 'typical' student groups are identified based on group average Belbin team roles. Additionally, the profile of a particularly ineffective team is analysed.

(a) Typical student group

This represents the most common student group composition found in this project. 'Plants' were the most common category, with 'Implementers,' 'Co-ordinators' and 'Teamworkers' being well represented (Figure 3(a)). 'Shapers,' 'Resource Investigators' and 'Specialists' were rare. Thus, feedback from this group was that although it took them a while to start, "we all were able to contribute ideas evenly with no overburdening leader." Overall, the groups found that they worked well together although several comments suggested that they would benefit from a 'Shaper' to improve the mark, which was otherwise

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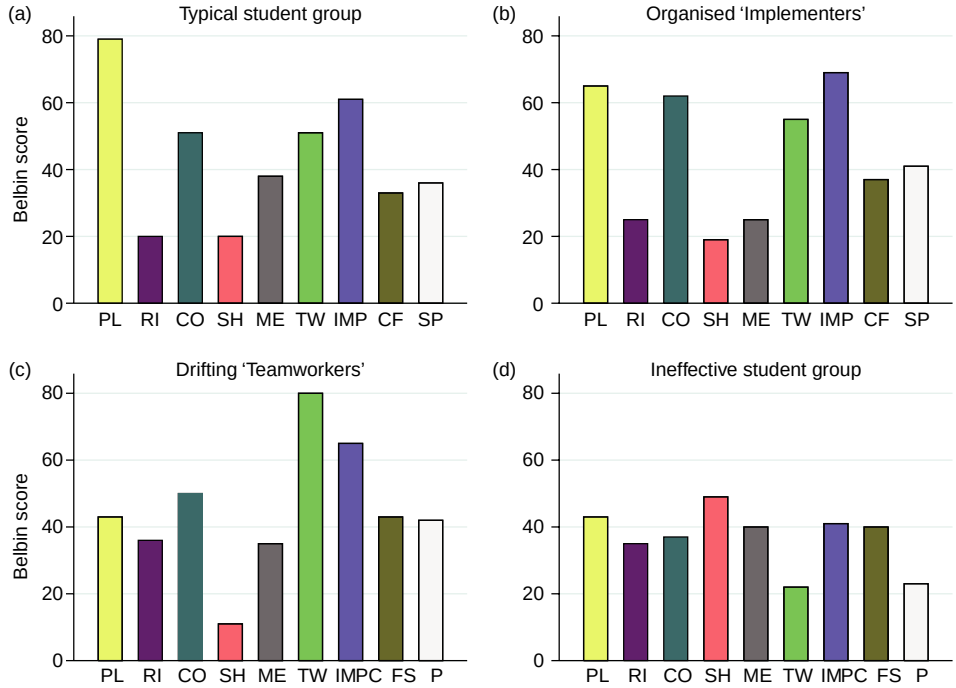


**Figure 3.** (a)–(c) Examples of the composition of Belbin team roles in three typical student groups referred to in the text; (d) composition of Belbin team roles in an ineffective student group.

quite average. Interestingly, one such group had just one example of a very strong 'Shaper.' This caused conflict in the group with feedback suggesting that "There was one individual in the team that wanted everything done their way . . . " (however, there is no firm evidence linking this to the actual 'Shaper'). Despite the seemingly negative effect of 'Shapers' on the students' perception of the group, this group achieved an above average mark. In another variation, groups with more under-represented 'Completer-Finishers' claimed to struggle with editing and finishing the final product and scored a below-average mark.

(b) Organized 'Implementers'

Several groups were dominated by 'Implementers' (e.g. Figure 3(b)). On the whole, these groups did substantially better than average and appeared to achieve this relatively harmoniously. These groups were quick to produce early versions of their work which they then improved: "We produced the first draft very quickly and to a good quality, this gave us longer to make small adjustments to it." These groups kept to time, setting and hitting internal deadlines along the way: "Everyone did exactly what they were assigned to do efficiently and always delivered on time. No one didn't want to do work, everyone was happy with what they did."

(c) Drifting 'Teamworkers'

Despite repeated requests otherwise, a few groups did keep close to their friends, either for comfort or for convenience. Based on student feedback, this may explain the category of teams that had more 'Teamworkers' than

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proportionately represented in the student cohort (Figure 3(c)). These groups typically scored below average. When combined with a deficit of 'Shapers,' these groups were extremely harmonious at the expense of quality control. As students in this example group (Figure 3(c)) suggested: "We were all great teamworkers but sometimes were too relaxed. We had to get motivation to get going with the work while we were distracted by things." This matches the team role type weakness characteristics identified by Belbin (1981, 1993a).

(d) The ineffective student group

During the first project (i.e. before the Belbin analysis), one group almost fell apart through disagreements and internal conflicts. Although they provided no qualitative feedback on their group dynamics, the group achieved one of the lowest marks and suffered heated internal disputes that frequently spilled over into the inbox of the module co-ordinator. The composition of this group was markedly different from the other student groups (Figure 3(d)). While 'Shaper' was one of the least common student roles (Figure 1), it was the *most* common role in this group; 'Teamworker' was the least common. This supports the findings of the statistical analysis above and agrees with Prichard & Stanton (1999) who also suggested that teams mainly composed of 'Shapers' underperform relative to more balanced teams. The statistical relationship between 'Shapers' and perceived ineffectiveness was not unduly influenced by this group and remained significant at the 1 per cent level when this team was removed from the analysis. This group's Belbin team report was remarkably insightful and is worth quoting directly: "The risk is that [the team's] energy can result in internal conflict which is not easily resolved. The problem about this team could be the unwillingness of its members to adjust to each other. There may be difficulty in developing team spirit." Thus, using Belbin profiles to avoid such problematic group structures may ease the administrative burden of group work modules.

In the post-project questionnaire (58 respondents), 35 students felt that their Belbin role matched their expectations, while 17 did not and 6 were undecided. Final student comments were predominantly positive, although many students raised concerns about the cost of the Belbin scheme. Typical responses are presented in Table 4.

As module co-ordinator, I found the introduction of the Belbin scheme to be a positive development to the module. The use of Belbin in graduate recruitment helped to highlight links between undergraduate group work and reality: a central theme of this module and broader personal development plans. Moreover, the acknowledgement that disagreements and clashes between group members are perfectly normal and not necessarily the 'fault' of any individual helped to de-personalize disagreements and bred an atmosphere of tolerance within the cohort. The description of team roles helped students to reflect on the activities they were best at and place themselves into that role within their group. As such, the implementation of the Belbin scheme was extremely useful for the students' personal development plans. Moreover, they have a professional report to keep for future job interviews. As an unsolicited student email suggested: "...it's a very snazzy piece of software and I think it will be very useful for when I apply for masters/jobs."

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**Table 4.** Qualitative feedback on implementing the Belbin scheme in *Environmental Management*

| |
|---|
| "One of the most enjoyable modules undertaken in University so far. This module seems to be something that may actually be applied in a job once university life is over, unlike most other modules." |
| "The Belbin thing may have helped with the selection of the teams but a random grouping of people would probably have worked just as well." |
| "Overall the experience has opened my eyes and I have enjoyed it; however, I wish I had been able to do the pitch with my first group." |
| "I am grateful to have undergone this module. As suggested, I see it more as "work experience" rather than any other module. Thank you!" |
| "Working with people you don't know and not friends made it a lot better when trying to put the report together." |
| "The module is a great initiative and certainly breaks the monotony of academic style responses to module questions. Although initially I was concerned about the grade outcome from the start of this module due to the group submission and group grade, in hindsight as an individual, attained far higher success than expected. Group work is important in the real world; having worked for 3 years for an national limited company, I can see the merit of undertaking this style of study so that those with little exposure to the working environment, they may experience the highs and lows of employment. Thanks." |

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My initial concern surrounding Belbin was that strict adherence to assigned 'labels' would encourage students to defer their group responsibilities (e.g. "Of course I missed the deadline—I'm a 'Plant' *not* a 'Completer Finisher'"). Macrosson & Hemphill (2001) suggest that although Table 1 displays 'allowable' weaknesses for each team role, the conduct of some team members is often far from allowable. This was flagged in the initial Belbin lecture and fortunately, no evidence of this type of behaviour arose. There is some evidence to suggest that the Belbin implementation eased the administration of the module by reducing frequent and serious group conflicts as exemplified by the 'ineffective' student group of Figure 3(d). I question whether such a large group implementation was the best use of relatively expensive Belbin licenses, and share student concerns over the cost of these (around £24 per student). Perhaps the scheme would be better introduced at Masters level; however, a large group coverage helps address the employability agenda at the departmental level. Incorporating the Belbin analysis across the degree scheme, beyond this single module, would help spread the cost of the project.

I found the team role analysis and most elements of the Belbin report to be an extremely useful analysis tool; however, parts of the report that seemed rather speculative. Specifically, one part of the individual report, a counselling report of personal attribute descriptions based on self-perceptions and several observers' comments read quite like a horoscope, echoing the personal validation experiments of Forer (1949). Indeed, this element was especially unpopular with the students and partially undermined the Belbin scheme in their eyes. In future, I would suppress this section of the report, of which Geography, Earth and Environmental Science students seem naturally critical. However, I should stress that, for the most part, I found the Belbin scheme to be insightful and relevant to undergraduate group projects and a useful tool to direct students to focus on their future employability.

## Conclusions

The Belbin team role analysis was introduced with the aim of improving group performance, encouraging a greater understanding of individual strengths and weaknesses. This was successful in that large mark increases were observed at the top end of the mark scale. The large group two-project study (with a total of 42 different student groups) offered the potential for an empirical test of the central argument of the Belbin scheme: that more balanced groups should be more successful. However, no robust statistical relationships were found to support this assumption. This result requires further testing since the complexity of the team roles and their relationships does not facilitate quantitative comparison. More general observations of the Belbin analysis matched students' perceptions of their groups. In particular, a surfeit of 'Shapers' within student groups (a rather underrepresented role in the wider student cohort) led to increased conflict and, in extreme circumstances (Figure 3(d)), a lower than average group mark on the summative assessment. Overall, students responded well to the Belbin scheme, were able to identify links between group work and employability and recognized the usefulness of such team role models to graduate recruiters. This in itself may explain the increased number of first-class grades awarded. Knowledge of the team role theory appeared to de-personalize internal conflicts and foster a tolerant attitude in the student group as students recast individual differences in attitudes and behaviours onto a broader conceptual framework.

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