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INDUSTRIAL MODELS OF TEAMWORK: LESSONS FOR EDUCATION

Taylor A

Loughborough University of Technology

The introduction of the National Curriculum has called for more collaborative group work within education, for example the Design and Technology report of June 1989 (1) makes several mentions of group work.

This article intends to contrast the developments in group work in education with the development of group work in industry. The terminology of this area is confusing, for example it is difficult to distinguish between terms such as collaborative group work, cooperative team work and self directed group work. Hence for the purpose of consistency and clarity within this article, group work and teamwork will be used synonymously, and will be defined according to the definition of teamwork provided by Douglas (2), as 'a number of individuals, held in dynamic and functional relationships over short periods of time by agreement to their mutual and combined benefit'.

The first part of this article will examine the tendency for education in this country to emphasise individual endeavour. This will be followed by an examination of teamwork at an industrial level, particularly looking at teamwork at Rolls Royce. The final section will discuss some of the lessons for education that can be learnt from industry.

Historically secondary and higher education has promoted individual learning and has determined success through rigorous individual examination. Bradshaw (3) argues that the use of group work is gradually increasing but, particularly within higher education, is still not widespread. One of the reasons being that there is a tendency for unauthorised cooperation to be considered suspect, even to the point of being seen as plagiarism.

According to Belbin (4) students who are 'top of the class' at school, are continually being judged in terms of their scholastic pre-eminence. He observes that coming second is regarded as failing and beating the next man is the name of the game. Difficult problems tend to excite rivalry therefore destroying the bonds of mutual cooperation and complementary functioning on which the success of the team ultimately depends. The basic argument here being that concentrating on coming top of the class provides an unconscious training in anti-teamwork.

This provides one explanation for why group work, although established as a teaching method for many years, has to date, been relatively little used. Another explanation being concerned with the difficulties associated with group work assessment.

Buckle (5) focuses on the problem of reliability versus validity. Reliability refers to consistency of measurement, validity that the object of the measurement is actually assessed. He identifies the problem within education that what is often spoken as laudable aims - appreciation, understanding, creativity etc. are all difficult to measure and what can be measured reliably i.e. recall of facts has little educational validity. Teaching only that which can be measured limits the curriculum to fairly low level objectives, omitting many higher order cognitive skills that are difficult to define. An example of such skills are those outlined by HMI in Curriculum Matters 9 (6) where it is suggested that team members should be able to demonstrate the following: a readiness to listen to others points of view, cooperation, responsibility to other members, supporting the view which seems to carry best hope of a solution, lead or follow as appropriate, and perseverance.

Objectivity is another problem associated with assessing group work. Cattells Group Syntality Theory (7) distinguishes between Population Traits i.e. personal characteristics of individuals that exist independent of the group, and the Internal Structure, i.e. the relationships among group members, their roles, status, positions etc. Miles (8) notes the danger of being tempted into looking at the personality characteristics, or population traits when assessing group members, rather than looking at the internal

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structure i.e. the needed skills, for example communication, thus inhibiting real learning about better group behaviour.

(1) At 3 Level 4, Key stage 1 PoS p23, 24, Key stage 2 p27, 28, Key stage 3 p34, Key stage 4 p35.

The consideration of personality within assessment is a very complex area. Mann (9) in reviewing the literature found that researchers had used over 500 different measures of personality. It is doubtful that meaningful results or theories can be achieved by subdividing personality into so many parts, as very often the same characteristics are given many different names and different measures have been devised to measure it. Practically this also makes assessment in an industrial or educational setting difficult.

Along similar lines, Broadfoot (10) studies the issue of subjectivity in terms of assessment of an individual, stating that inevitably we are all influenced by our own prejudices and attitudes to life.

Collaboration in work settings it is said, both increases the morale of employees and improves the quality of work. Adair (11) writing about effective problem-solving techniques for project groups in industry, describes the positive effects which the organisation of people into work groups has on individual satisfaction and on productivity.

According to Bradshaw (3) in the last decade, not only in Britain but throughout the western world, there is a growing recognition that employers expect knowledge and intellectual skills to be harnessed to positive personal qualities, for it is a combination of all three which makes for effectiveness in working life. Although described in various ways, the personal qualities most commonly sought are a commitment to solving real problems, ability to communicate effectively and the ability to work in teams. A view shared by Peacock the Research Director of Philips (12). Bradshaw goes on to argue that employers will not only be expecting these qualities, they will also be expecting education to develop them.

This expectation is highlighted by the authoritative statement provided by the Council for Industry and Higher Education. "Employers will increasingly expect education to give a grounding in personal skills, communication, problem solving, teamwork and leadership. In many instances this will be achieved by changing the learning process from passive absorption to active participation" (13) p56. This will certainly have implications for teamwork/group work which put an emphasis on active participation.

Increasingly at an industrial level, changes are taking place that are receptive to the application of teamwork strategies. Saba (14) the chairman of Toshiba pointed out that cooperation and group orientation are key features in the success of Japanese industry. In the hope of competing with the Japanese and Europeans, the team concept is spreading rapidly in the United States in industries such as autos, aerospace, electrical equipment, electronics etc. Gupton (15) notes that it is increasingly being recognised that companies must be able to produce in small lots, customising products to increasing demands. This calls for flexible working practices and workers who are willing to move from job to job. Teamwork facilitates this because employees are usually cross-trained to perform all tasks, they can fill in for absent co-workers and respond quickly to changes in models and production runs. This type of cooperative working practice also makes for better use of company resources.

This issue of rapid change in industry was also emphasised by Peacock (12) at the DATER 89 Conference. He outlined how over the last 10 years, the boundaries between different work activities within companies have become increasingly blurred due to rapid technological change and innovation. The application of new technology has drastically affected the nature of 'work'. While repetitive or arduous tasks have been a clear priority for automation, this only affects a relatively small sector of the community. Wider changes have made demands upon the majority of the population in terms of their skills and abilities. While problem solving skills and an aptitude towards innovation are likely to be of importance in this new industrial environment, it is perhaps the ability to cooperate in teams that will be most sought after by employers.

Buchanan (16) argues, that the boundaries of what management once considered acceptable worker control are being expanded by new pressures. Developments in the 1980s in product markets, trading

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conditions and manufacturing technologies have created the demand for innovative working practices that are compatible with this new industrial context, these include an ability to react flexibly and quickly to rapid changes of demand from consumers. Teamwork will increasingly be adopted as the working practice of the 1990s in order to deal with these new pressures.

This view is supported by Walton (17) who argues that advanced technology can be operated more effectively by skilled operating teams. Peters (18) argues that the self managing team should become the basic building block of the modern competitive organisation. Teamwork has come to be seen as part of a package of related organisational changes offering improved performance on flexibility in the face of changes in technology, trading conditions and customer expectations.

The writer is currently observing the development of teamwork practices at Rolls Royce. This work is at an early stage, but it is possible to make the following observations.

Since 1987 Rolls Royce, have also recognised the need for change so that they can respond to severe competition and changing markets. Alongside their traditional competitors, they are now facing new competitors for example the Japanese. Teamwork is being encouraged as the problems of conventional systems have been recognised. Many established systems were designed to support a different set of circumstances from those existing today i.e. less competition, low variety markets and long production runs. The conventional systems of line management and the production line are less able to respond rapidly to market demands. Furthermore the introduction of new products may require changes to be made in the natural group boundaries and in the mix of machines, processes and people.

Rolls Royce use the term Cell when referring to a team. A Cell can vary in size, 150 members being large and 30 being a small Cell. For each shift the Cells are broken down into smaller groups called elements. There are 7 skill groups represented in each element. The skill groups consist of machinists, finishers, welders (1) and welders (2), process operators, inspection and hot group.

By encouraging participative involvement i.e. working with people rather than controlling them, Rolls Royce have recognised that people, when they can influence the work they do, want to do their best. They feel that participative involvement can help develop each member of the team to their fullest potential. Further, motivation rises when the work environment provides employees with a sense of belonging, which exists where employees have a secure sense of membership in the team and are perceived as valuable members of the group.

Rolls Royce also advocate that team members should be allowed more input in the decision making process. Practical participation begins by involving members of the group in the decision making process in the following areas:

1. Participation in making day to day decisions. By creating and evaluating well defined options and then choosing the best, all members of the group will be involved in the decisions concerning the way work will be performed.
2. Participation in problem solving. This involves group participation in the diagnosis of problems and in the generation of possible solutions before the final decision is made. Everyone will then be more likely to be committed to implementing the best possible solutions. The early indications are that decision making increases a person's commitment to the Company, resulting in higher morale and improved work performance.

This emphasis on human potential and motivation by Rolls Royce lends support to Maslows (19) theories of human motivation. These theories argued that employees would demonstrate high levels of effort and performance if their social and intellectual growth needs are met in addition to the desire for mere financial reward.

At an educational level there is also evidence of increased learning and performance from teamwork. Yeoman's (20) research into collaborative group work revealed that the results of cooperative learning were, in many cases, significantly better than more traditional methods of learning. Particularly at lower attainment levels it proved to be a more effective method of learning. The research also indicated that

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high achievers within groups were not held back in terms of academic attainment by the lower achievers. Furthermore Yeoman found that collaborative group work had strong and consistently positive effects on relationships of different ethnic background.

Whilst the above gives a very positive impression as to the benefits of teamwork, there are also potential problems. According to Buchanan (16) historically, some of the industrial experiments in Composite Autonomous Group Working (AGW), have floundered. AGW involves giving control of an overall task to a team, who are collectively responsible for the work, and have no direct supervisory control. He suggests that there are probably two reasons for this. Firstly that the more traditional methods of work organisation are easier to apply and seem to work. Secondly, some forms of work design, particularly AGW appear to threaten traditional managerial decision-making prerogatives.

LESSONS FOR EDUCATION

It is difficult to draw firm conclusions as to what lessons industry can teach education primarily because industry has not yet fully worked out its' own ideas. The historical development of teamwork in industry illustrates how the use of teamwork has not always been fully understood or easy to implement.

Education can learn from industry's experience of teamwork by recognising the difficulties they have faced and thus spending more time trying to understand teamwork. According to Bennett and Cass (21) the research in Britain to date indicates that children often work in groups, but not as groups. As such, groups are no more than physical juxtapositions of children engaged on individual tasks. They go on to argue that in these contexts cooperation is limited, unplanned and rarely task enhancing.

More recent industrial experiments in teamwork have shown how managers together with shop floor workers, working as teams can plan production more effectively. This was certainly considered to be one of the strengths of teamwork at Rolls Royce. We should consider this point in education. Curricula and schemes of work may well be better planned when planned by a team of teachers rather than an individual.

Teamwork, it is argued, is increasingly becoming the working practice in certain areas of industry in the 1990s. Although there are reservations within secondary education about the degree of vocational skills that should be brought into schools, teamwork can provide an important and relevant preparation for the working practices of industry. The National Curriculum has called for more group work as can be seen in the documents covering Design and Technology, Science, and English. This vocational demand for group work, it could be argued, is a result of the demand from industry on education to provide suitably equipped workers for the industries that are increasingly relying on teamwork due to fierce competition, technological changes, manufacturing innovations etc.

Despite the difficulties associated with teamwork, the positive effects of teamwork i.e. increased motivation and productivity found at an industrial level, when considered alongside the findings of Yeoman's research at an educational level, as outlined above, indicates that teamwork can have positive benefits for learning.

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