The role of group/team work in design and technology: some possibilities and problems

DATER 90

THE ROLE OF GROUP/TEAM WORK IN DESIGN AND TECHNOLOGY : SOME POSSIBILITIES AND PROBLEMS

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Introduction

By using groupwork appropriately it is possible to help people both learn and achieve far more than working individually. The evidence for this statement comes from both research and the practical experience of many industrialists, for example Peacock (1) as Research Director of Phillips, speaking at DATER 89. This evidence has influenced the National Curriculum with a number of references to forms of groupwork in the D&T, Science and English documents (2).

Terms and definitions

Fieldwork (not yet published) is indicating that some teachers are daunted by the multitude of terms groupwork proponents use; `groupwork`, `teamwork`, `collaborative groupwork`, `cooperative groupwork`, `autonomous groups`. Similarly there are many descriptions from industry eg `problem solving teams`, `special purpose teams`, `self managing teams` (Hoerr, 3). Some researchers have used these phrases without defining them, some documents appear to interchange terms without clarification.

In this article `group` is a generic term which relates to any situation where two or more people work together. This could be passively, by sharing a resource but working independently, or actively where there is collaboration. The distinction between collaboration and cooperation has not been adequately defined by those that use these terms. They appear to have been used in a interchangeable way to imply a situation where learners have actively experienced a learning resource together. For example a bible study group or two pupils solving a pnuematics problem together.

`Team` can be used when there is distinct delegation for part of the time; each member would complete a different aspect, but together they tackle a greater task than would be possible if working individually. In contrast a group may work together, each member completing the same task in his or her own way. Groupwork may involve cooperation but there is replication, teamwork involves cooperation with little replication. In groupwork communication will be largely explanation and discussion. In teamwork communication will also involve reporting back. A further possible indicator of teamwork is the introduction of competition at an inter-team level. Groups, whilst they may have internal competition (perhaps informally and not due to teacher planning), do not compete externally without becoming a team. When using teamwork the teacher cannot ensure identical learning of bodies of knowledge, however there are other benefits explained below. There will be cases where members of a team act as a group or visa versa. This will vary as the task unfolds.

HMI (4) suggest that the following `qualities` are important in developing group/team work.

- value cooperation
- responsibility towards other members
- readiness to listen to others points of view
- willingness to support the view which seems to carry best hope of a solution
- willingness to lead or follow as appropriate
- perseverance

Barlex (5) puts this simply as cooperation, communication, leadership, empathy/sympathy and reliability. Members need more than simply intellect. Bradshaw (6) observed teams with high mental ability scores completing a task in comparison with random teams. Often the high ability teams finished last because members spent too much time persuading others to adopt their own view. Similarly they

tended to identify flaws in others arguments whilst failing to build a solution. Whilst we must beware generalising from a specific case this point is of interest.

Many writers suggest roles be adopted within a team eg manager, secretary, and that the qualities required will differ accordingly. This writer`s experience is that the use of specific roles is often counterproductive and that the team may develop some of the limitations of `scientific management` (Buchanan 18) for example, lack of flexibility in responding to a developing task. Fieldwork (Denton 7) indicates that children often prefer a cooperative model of working, though leadership may emerge from various members at different times as the individual`s experience becomes central to the task as it evolves.

POSSIBILITIES

Social benefits

The social benefits of group work have generally been accepted which is why it is so often used by special needs teachers. Yeoman (8), looking at `collaborative groupwork` feels that self concept and self esteem can be enhanced, reporting an improved identification between learner and school and mutual concern between group members. Similar findings are reported in other studies (Cowie and Rudduck 10, Miller and Davidson-Podgorny 9).

Groupwork can have benefit in racial/minority integration. Miller and Davidson-Podgorney (9) looked at integration in American schools where racially mixed groupwork helped develop empathy. Cowie and Rudduck (10) also note these effects in gender and social class.

Vocational benefits

Cowie and Rudduck (10) indicate that there is confusion amongst industrialists as to what they want in their recruits. There is, however, an emerging consensus (Peacock 2) that the ability to work effectively in a team is important.

Groupwork has been well established vocationally in this country, particularly through TVEI and enterprise type exercises (Denton 7) which often use teams rather than groups. An aspect of such work is the introduction of competition. Competition makes many teachers fear for the self esteem of lower achieving children. There are others who actively challenge the competitive nature of society and feel that many ills develop from it. This concern is clearly both morally and professionally defensible. However, if we could protect children from the effects of competition, how would the young adult manage on leaving school and joining the society of today? By introducing the element of competition within a controlled environment we may help children come to terms with the problems and possibilities it raises.

Learning benefits

Perhaps the least understood advantage of groupwork lies in achievement. Many are familiar with the concept of synergy, the way in which a group can generate more and better ideas than the same individuals working alone. There are simulations such as `Lost on the moon` or `liferaft` which invariably show a better score for groups than the sum of individual scores (Ginifer 11). Driskell et al (12) refer to this as an `assembly bonus effect` in that pooling thinking minimises errors. This may be true but is not adequate to explain synergy as people who have used effective brainstorming techniques will know. The ideas of others can be used to `leapfrog` to further ideas much as DeBono proposes (13).

We need to recognise that working in groups can aid academic attainment. Yeoman (8), concluded that when children learn in groups the effects can be significantly better than learning individually and at the very least no worse. She pointed out that for low level cognitive tasks there is a positive effect on learning and that for high level work there again appears to be a positive gain though this effect needs clarification.

Bennettt and Cass (14) found that when children of different ability worked in groups the lower ability worked better and achieved more if with higher ability children providing they were supported by having another lower ability peer in the group. A low ability child alone with higher ability children tended to withdraw. High ability children appeared to achieve just as well when with high or low achievers, they were not `held back`.

The D&T final orders do not mention groupwork within AT2 (generating a design). Is this a lack of vision or another example of assessment convenience over-ruling educational practice? Note how the original Science AT 18 `working in groups` (24) was removed in those final orders.

Problems

Parlett and Hamilton (15) showed how the `scientific paradigm` of evaluation tends to make us value the easily measurable. Less easily measurable qualities tend to be ignored by external examination boards because they are difficult to measure with any reliability. Many examination boards (16) do accept group work but they do so on the basis that work is clearly identifiable to individuals. They do not address group/team skills or the synergetic effect.

When some teachers use groupwork it may be by children `working in groups rather than as groups` (Bennett and Cass 14). This is an important distinction, we often use groups for administrative and logistic convenience, not recognising the educational benefits.

Groupwork experience needs to be planned for progression. Teachers tend to be successful products of our education system which at secondary and higher levels tends to avoid groupwork for the reasons outlined above. So we tend to perpetuate this situation. Saba, as Chairman of Toshiba (17) considers much of the relative economic performance of this country and Japan to be due to the fact that Japan is a group orientated culture in comparison to the UK.

Buchanan (18) notes how `scientific management` in industry breaks tasks down into small sub-units. This has been shown to have serious drawbacks such as worker dissatisfaction and poor production. Industrial experiments with production teams such as at Volvo showed promise but many failed, Buchanan feels, due largely to management fears of teamwork.

Human beings need more than basic extrinsic rewards. Buchanan looks back to Maslow (1943) - that people have social and intellectual needs which must be met in their work.

Understanding the factors

Some users of groupwork report very positive results (Cowie and Rudduck 10) but current fieldwork at Loughborough indicates that there are teachers who have failed to get the results they hoped for. Often noise levels have been `too high` and children have not focused enough on their work. This often leads to the teacher abandoning groupwork. Groupwork is a complex area which needs understanding before it can be made to work effectively.

Not all members of a group may contribute fully. Ingham et al (19) described the `Ringelman effect` based on the simple task of rope pulling. Ringleman found that individuals tended to pull with less effort when they were part of a team and that as team size grew the effect was more significant. This work does not mention what rewards there were for the task but it is clear that there was little social or intellectual reward and therefore the validity for an educational context looks poor. Harkins (20) describes the concept of `social loafing` where individuals may lower their effort if they feel that their individual performance will not be identified within the group performance. Harkins also showed that when evaluation potential was held constant pairs outperformed singles in many tasks. He called this `social facilitation`. This appears to be close to synergy.

Salomon and Globerson (21) highlighted other negative effects possible within groups. For example the `freerider effect` when a member simply goes through the motions, leaving the real effort to others. They reported that this was observed with lower ability members when completion of the task was

dependent on higher ability members. All members of a group must have a positive role to play and be needed.

A talented member of a group may slow down if he/she feels that they are being left to do all the work. This is the `sucker effect` (21). Similarly pupils may see certain tasks in a sexist light and not perform fully if they feel they do not fit the role.

There is evidence (21) that if a group does not like or value a task they put less effort in.

PRACTICAL LESSONS FOR TEACHERS

The task

This must be seen as challenging. It should not be dependent on the abilities of one member but needs the contribution of all members. There should be no roles which children see in a sexist manner and teachers must be sensitive to this in the way they introduce the task.

A group base

The group should have a base where direct communications are possible for the whole group. Individual members may well move off to complete specific, delegated tasks, but the base must always be available.

Roles

Many enterprise type simulations use traditional structures such as a managing director, sales director etc. The writer`s own experience suggests that staff should sometimes allow groups to decide how to allocate roles. They usually do this on a cooperative basis, though a natural leader may emerge. Certainly experience (Denton 7) shows that a cooperatively managed group can react more readily to developments. A strong leader can help, but the rigid demarcation into several roles can be negative in that individuals may disengage at times.

Group size and composition

Starting with young children in small groups we should progress and give experience of larger groups. We may start with self selected groups and slowly introducing elements of teacher selection as they gain experience. The teacher should then consider putting children who would not normally work together in one team. Gender and race are other factors to consider (Cowie and Rudduck 10). Remember that a single boy or girl with two or more of the opposite sex may feel uncomfortable and lower ability children should similarly be given the support of a peer if in a group with higher ability children.

Assessment

Children need to see that they are being assessed as a group but also as individuals. Records of achievement or profiles can be used. It should be possible to identify the work of individuals within the task. Such identification can never fully account for the contribution of the individual in a synergetic sense but it will maintain motivation and help prevent `social loafing`.

Group composition

In forming a group staff need to be sensitive to the fact that it takes time to become effective. Tuckman (22) describes 4 stages: orientation, when members identify the task and their new colleagues; emotionality, where members struggle to establish the team and their role within it; relevant opinion exchange, where the group has established itself and emergence of solution, where the group move

into a directly operational phase. These phases cannot be rushed and staff need to be particularly sensitive and supportive in the first two.

Conclusion

Groupwork, when effective, can have dramatic effects in terms of learning. Those that have witnessed such work recognise it instantly and appreciate the benefits.

Establishing such situations is not, however, straightforward. Teachers need to appreciate the limitations as well as potential benefits. Above all groupwork must be planned in a progressive sense. As Ghaye (23) put it ' The social and intellectual skills that children need in order to work together in a cooperative, egalitarian and supportive manner, need to be taught in a sustained and systematic way`.

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