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The Role of Teamwork in Technology Education: Observations From an Action Research Program

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Technological education has a central role to play in the education of children and development of modern society. We can instantly recognize the basic vocational dimension, but possibly of more importance is the role of technology in general education; that is the development of technological awareness in all children, the realization that "it" is within our control and not beyond it.

[Persig's \(1974\)](#) message in ZEN AND THE ART OF MOTORCYCLE MAINTENANCE is as fresh as ever and certainly should be essential reading for every teacher in the field of Technology.

There have been many definitions of technological education, however they tend to focus on content, such as electronics, mechanics, etc. [The National Curriculum developments in England \(HMSO, 1989\)](#) have refocused the definition of Technology into a process led model where content is secondary to the basic technological design process. Despite this welcome re-appraisal of technological education, there is an obvious omission in the assessable attainment targets -- i.e. the ability of children to work as efficient members of a team. The above statement may appear strange, but if we look to industry for a model of technology, we see teams of people involved in the design and production of artifacts, systems and environments. Note that the central foci are the task and the team - not a specific body of knowledge. I do not suggest that a knowledge

base is unimportant, only that it should be recognized that teamwork and the management of a task are equally important.

Teamwork falls within the overall concept of groupwork. I would differentiate by suggesting that groupwork occurs when a number of children share a learning experience such as a textbook. They are engaged in the same task but work independently, although discussion may take place. All members of the group go through the same learning process and produce similar results. In a team, children would manage a task in which individuals would not necessarily have the same learning experience. Discussion would be essential rather than simply possible. The task would be broken into sub-tasks and delegated. Everybody contributes to a bigger whole.

Teamwork clearly cannot be used in teaching strategies where it is important that a certain body of knowledge is understood by all children. Teamwork exercises can, however, greatly enhance learning situations where the emphases are on exploration, open-ended learning and the application of knowledge to new contexts. Here team work approaches can increase levels of interest and application, increase perceived relevance, and develop the skills children will need when they enter the world of work. Such teamwork exercises, whatever their context, do need careful and long term planning for progression.

Industry has frequently called out for teamwork skills to be developed in children. [Peacock \(1989\)](#), speaking at the Loughborough DATER 89 conference as research director of Phillips, was very clear as to his requirement for teamwork skills amongst the technologists he employs. There is evidence that consensus development in teams is more likely to lead to better results than if individuals work alone ([Ginifer, 1978](#)). Why then, is it relegated so far in educational

thinking? The answers to this question lie in the field of assessment and the self-perpetuating system of teachers who tend to have little or no industrial experience.

Educational assessment in England revolves around the General Certificate of Secondary Education (GCSE), administered on or after age 16. This is basically a Nationally organized and externally moderated system of examinations. These examinations cannot assess an individual's ability to work as a member of a team, they are really only suitable for assessing knowledge and a limited range of skills. [Lewin \(1989\)](#) in a lighthearted, but serious critique of examinations as assessment instruments, pointed out that:

1. all problems last 30 minutes
2. all problems have a definite answer
3. you must work on your own
4. all problems have just the right information, no more, no less
5. no copying

The English educational system has tended to develop around the teaching of the easily assessable. Many skills and attitudes which children will need in life are not easily assessed and are therefore left out of assessment schemes. It was very noticeable that the Working Party developing the Science guidelines for the National Curriculum included "teamwork skills" within their report as Attainment Target 18. This commendable effort was reversed in the final statutory document. Reasons have not been given but it is reasonable to assume that it would be assessment difficulties.

Whilst the GSCE system cannot assess teamwork performance with the required reliability and validity, it is my thesis that it is simply too important to be ignored. Profiling and records of achievement offer insights into such abilities -- we should use

them. They do not offer the rigour of public examinations but they do allow teachers to evaluate both children and the learning experiences.

As our profession moves forward we must recognize the importance of teamwork and stop avoiding the issue. There are systems which can be used to assess such abilities and even if this were not so there is still a case to be made for including teamwork exercises within a teaching/learning program. What we must turn our attention to is the question of how we should build such a program and how progression can be ensured.

Teamwork exercises can take many forms and it is immediately apparent that they should not be the sole prerogative of technology teachers. Technology, however, can be the central focus for work which involves teachers from a variety of areas, cooperating as a team themselves and working with a larger number of children. My own research into such activities particularly when the timetable is suspended and the task pursued uninterrupted, indicates that children identify with the work, recognize its relevance and put far more effort into it than in conventional curriculum and timetable structures ([Denton, 1988](#)). Factors to be considered in developing a policy in teamwork skills are: ensuring the policy is whole school; team size; team composition; time scale, and progression.

Teachers can incorporate teamwork building exercises within individual curriculum areas, however as it is a cross-curricula, skill development should be planned by cross-curricula teams. The question of progression also needs to be addressed. It is very clear that 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" ([Ghaye, 1986](#)).

Start with simple, short term exercises

within normal teaching. Teams should be initially small (2-3) and self selected, this will increase the chances of children being able to cooperate and work together. As experience is gained, staff should attempt simple cross-curricula exercises, perhaps using adjacent rooms and again within the normal timetable. A science and English class could combine to tackle a task.

Team size can be slowly increased to perhaps a maximum of seven, so that children learn how to delegate and communicate in more difficult situations.

Whilst efficient teamwork can generate a "hothouse" effect for ideas and work, there is also the danger of the phenomenon termed "social loafing" emerging. This phenomenon has been described by many workers as a situation in which members of a group or team may relax their efforts ([Harkins, 1987](#)). The causes of this are complex but it is my experience that, providing the team is not made too large and the task is designed to offer relevance, it rarely arises. Team composition can be experimented with. In industry or commerce, individuals do not have choices as to who they work with; they need to learn how to get along with others. Children will naturally choose preferred friends. They need to be slowly helped to be able to work with children with whom they do not normally mix. This is stressful but children often make comments such as "I found it very difficult, but I could see why we were doing it." A key point is that we must tell children why we are organizing their learning as we do. Often this is not done.

Basic attention span theory has always been interrupted by teachers as meaning all lessons should be short. This simply does not apply when children operate in teams around a task. Provided the task has a perceived relevance, such as a simulated industrial or commercial setting, you will find that it provides an ever changing environ-

ment, which in turn satisfies attention span. Children can build a far higher degree of association with a task if they are not constantly disturbed by lesson changes. We can get far more out of them if we suspend the timetable and they will learn far more.

In researching this area, it has become very clear that teachers everywhere recognize the value of teamwork in learning experiences. Deeper analysis, however, shows that they rarely have a clear understanding of the nature of teamwork, how it can be developed, or how it may be assessed. The next stage of this research is to look deeper at the whole question of what makes an efficient and effective team, how we can assess this, how we can assess individuals' performance within the team, and how we can develop their ability to be effective team members.

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