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Design at Orange Hill: A Retro–spective Analysis

Though the idea is much debated nowadays, there is a general consensus of opinion that design and technology education in schools is a 'good thing'. However, there is nowhere near as much agreement over exactly what form this education should take. While it may be agreed that the traditional craftwork lessons were lacking in some areas, exactly which areas these are is not really clear. What is it that should be taught in schools, and what is it that a pupil taking a design and technology course can hope to learn?

In this article I will attempt to show what it is possible to gain from a design course by a review of the teaching of design at Orange Hill School. After a detailed analysis of the teachings and underlying thought behind the course, we will conclude with a brief discussion on what the course omits.

In explaining the content and teachings of Design, we can divide it into three sections, and deal with each separately. The first two sections, which we will name 'Theory' and 'Practice', do not differ wildly from traditional teaching methods. The third section – 'Philosophy' – does.

Though these sections have been separated for the purposes of this article, it must be stressed that no such division exists in the actual teaching, and indeed, consideration of more than one area of study for application to problems is encouraged.

THEORY attempts to provide a broad technological awareness. The emphasis is on learning general principles rather than detailed knowledge. (The reasons behind this will be discussed later). While the areas of study are obviously biased towards design and engineering, there are a number of important exceptions to this, and we will look at these first.

Ergonomics and environmental studies have an important role to play in design practice, and this is mirrored by their importance on the course. Any product has to be used when completed, so it is vital that it is produced with the user in mind. The same product will also have an effect on the environment, and again this must be considered when designing. The student on the course gains an elementary understanding of basic human movements and limitations, as well as an insight into the fragility of the ecosystem, and the ease with which this can be unbalanced. Unfortunately there are numerous examples where this has happened, as in the case of acid rain, pollution, and high rise tower blocks to name but a few.

This is further developed into studies of disabilities and studies of design in a Third World environment which provides useful practice at identifying situations which are outside the student's normal range of experience. It also emphasises the necessity for *responsibility* in design.

New technology is another major issue that is important to any design course that claims to be current. New materials, processes, and technological problems are being discovered and adapted at an ever increasing rate, and it is the designer's purpose to keep abreast of these changes. The course endeavours to do this by highlighting these changes, especially in the field of microprocessors and computing, the learning of which is actively encouraged by the staff (and games-playing fellow students).

Graphics and drawing are also a noteworthy topic as designers and engineers alike both have to be able to communicate their ideas, and drawings, sketches and photographs are a simple and effective method of achieving this. In addition, there is a supplementary study of advertising and marketing techniques.

All the above subjects are supplemented by industrial visits and lectures from outside professional speakers. Not only do these provide actual examples of what is learnt in theory, they also provide an understanding of how a company functions.

As can be seen, this part of the course can easily link in with other subjects being taught in other departments in the school, or with other subjects that are being learnt by the student. Biology and Chemistry are connected with ergonomics and ecology, new technology ties in with Chemistry and Computing, graphics with Art, and the workings of a company is learnt in Business Studies.

By now the traditional engineer may be wondering why the 'proper' engineering subjects have not yet been mentioned: Doesn't the course include the study of gears, cams, lathe cutting speeds, and the like? Well, yes it does, but only as a *complement* to the rest of the theoretical teaching. Many, many questions have to be answered before the production stage is reached.

The course is mainly concerned with material technology, and comparatively examines the structure, strength, elasticity and so forth of woods, metals and plastics. It is not just sufficient to know the limitations of a material, and so equal importance is placed on knowing how the material is refined and produced, the most common manufacturing processes used, and the cost of production. The environmental and ecological effects are considered as well.

Also included are studies of basic mechanisms (here are the gears and cams), and measuring devices and instrumentation. There is also provision to learn ceramics and printing.

PRACTICE is very closely linked to theory, and is used to reinforce the teachings of the other. The course teaches basic craft techniques suitable for the production of models and prototypes, and workshop experience on a variety of basic machines such as drills, lathes, milling machines, saws, grinders, polishers, and so on. Tuition is also given in the casting, forging, welding, and soldering of metals, as well as the moulding of plastics.

An elementary course in measurement and accuracy is taught, and again the teaching is supplemented with many industrial visits.

PHILOSOPHY is where the course departs from what would otherwise appear to be a modern, yet fairly standard syllabus. The underlying ideas behind the course differentiate it from traditional craft teaching methods, and make it almost unique amongst academic subjects. The first difference to note is the vast range of ideas and topics that Design encompasses, and which no other subject dares to approach. For in its broadest sense, design can be seen to touch upon nearly everything we see: even the countryside is planned. The scope for study is enormous.

This would explain why the course deals in *generalities* rather than specialist knowledge. As the scope of design is so vast, it would be a great loss to specialise on one specific aspect. It is also felt that general techniques could be applied to anything, and so the course would be valuable in any number of situations. It teaches *adaptability*.

Like the rest of the course, the ideas in this section are not necessarily taught as seperate subjects, but are often incorporated in anything the student (or shall we say the designer) does. They could be labelled 'good ideas to keep in mind'.

In common with lateral thinking, design is concerned with the generation of ideas, the challenging of assumptions, and general hell-raising with preconceived concepts. As mentioned elsewhere, the designer should not just judge from the usual engineering viewpoints of cost, strength and ease of manufacture, but also consider simplicity, elegance and aesthetics, as well as ease of use, safety and environmental effect. But s/he need not stop there; psychological effect and possible market could also be considered, and so it goes on. This tends to the reasoning that a design is never complete – it can always be bettered. This could not be truer.

For unlike many subjects, there is no ultimate right or wrong. As everyone knows, this is often how things are in the real world, and so it is with design; there are degrees of rightness and wrongness. For the first time in a sheltered academic world, a student may be forced to make a *compromise* solution; selecting the right shade of grey. It is indeed a rarity to find a choice of black or white.

The need for selection is a very valuable lesson to learn. Logical and lateral thinking, mathematics and science are seen only as *tools* to help you along the various stages of thinking. No one of them alone will be the solution to all your problems. (So it may be realised that logic by itself will not design a lightbulb).

To make things harder you must have *accountability* for every decision you make. You just cannot do things for their own sake; there must be good reasons for what you are doing. So it can be seen that anything can be used to reach a decision, and that any knowledge may prove relevant.

There is a crumb of comfort for the floundering student however, as once it is seen that there is no ultimate answer, a solution may be as good as any other. After all objections have been raised and satisfactorily countered, it rests with the personal judgement, ethics and responsibility of the designer. S/he makes the decisions, and in the eventuality of a decision being wrong, must take the blame. If one thing is learnt though, it is that *nothing is sacred*.

So clearly a design student has to do an extremely large amount of original thought when compared with traditional teaching. S/he must generate new ideas, challenge assumptions and generally think about thinking. Once satisfied that enough alternatives have been generated, there then rests the task of gathering, assessing, judging, accepting and rejecting. In terms of an academic subject this is new; in terms of everyday thinking it is nothing special.

This realism in approach is also evident when case studies are selected, as an industrial history book is not needed – examples can be taken from common household objects. Examples of exceptional design are fairly rare, but bad examples can be found in abundance.

Project work is the method used to cement all these ideas together. The student is given a design brief and is then left alone. For major projects the student is not even given a brief and has to select his/her own project by identifying a need.

All the research and development of the project is the student's responsibility. S/he is encouraged to use as many information sources as necessary, and is not restricted to the traditional method of rushing down to the local library. Specialist reports from official institutions, like universities, often cover the more popular areas of research, and the Design Department can help with the arranging of interviews and ensure the availability of facilities. Private companies also prove helpful to genuine researchers, and often grant interviews and demonstrations. This is one way of ensuring that the student really knows what s/he is doing, as neither professors or engineers have time to waste.

It sometimes becomes necessary to learn a new subject if that is the path that the research takes. Computing provides a good example of this; if your research or project dictates that you need to know how to program a computer, there is no short-cut – you learn! Often teachers from other departments can help with this.

Again this is an example of how the 'general approach' pays off. Rather than teach the student specific knowledge, it is much more beneficial to teach how to get any information that is wanted.

The information is already out there; the student just has to go out and get it.

While the project is developing, its progress is carefully monitored by the staff, who question and probe, suggest other areas of research, other factors to consider, and alternative design solutions. In this way the project slowly but surely progresses from research to embryo ideas, which are then developed and tested until the ideas have grown into feasible design solutions.

As the project moves into the model/prototype stage, it can happen that resources become a problem. It may be necessary to borrow a computer, wheelchair, motorcycle engine or hot air flue! You soon learn to improvise – beg, borrow or buy. This is just one example of where close contact with private companies and research institutions proves useful.

When complete, a project will normally consist of a typewritten report detailing all research and development, calculations, and external sources of information, as well as a guide to the project and all its components. As a complement to this, clear design graphic sheets are also required, along with any photographs, machine drawings and prototypes which are deemed necessary. Completed projects are not only assessed by the teaching staff, but also by outside visitors, examiners as part of an exam, or by anyone who is passing by! (including fellow students)! The entry of competitions is also encouraged, as this brings forth even closer scrutiny.

The lessons learnt from a course like this are extremely valuable, and are not limited to the boundaries of the academic subject. A delicate balance is struck between specific knowledge and general technique, and there is as much reliance on creativity as on academic brilliance.

There are few omissions from the course, as you might expect from such an obviously biased article. More emphasis could be placed on machine-based skills and industrial manufacturing processes. It would be good to see a basic course in electronics, as well as instruction in economics and the function of industry. A short series of lessons on Alternative/Appropriate/Intermediate technology might also prove beneficial. However, there may be difficulty in fitting these extra subjects into an already full curriculum. There may also be problems in finding staff qualified to teach these subjects, especially the electronics. After all, teachers are unfortunately human.