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A' Level design and technology– the view engineers and designers in higher education have of the subject

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Abstract

The 'Lucas' report (1980) recommended that A' Level design courses conform to a number of set criteria and that a pass should be acceptable as an entry qualification for all design-based undergraduate courses. Since the report there has been considerable growth in A' Level design and technology. Preliminary indications are that, with the start of AS/A2 examinations, growth will continue. Discussions with heads of department in schools revealed that A' Level design and technology students are gaining places on both design and engineering degree courses but there are still uncertainties.

In the year 2000, a new range of AS/A2 design and technology examinations started in schools. At this point of change it seemed important to establish the key elements of acceptability for the subject. The research focused on design and engineering degree programmes selected at random from university undergraduate courses. The aims were to establish the acceptability of A' Level design and technology for entry to undergraduate courses and tutors' views of the subject.

The results produced surprising information, with engineering tutors expressing different views about A' Level design and technology to design tutors. The educational value of project work is one of the differences. Also there are differences of opinion about subject knowledge. Many designers have concerns with certain aspects of design and technology in schools while engineers generally embrace the subject.

This research will be of interest to teachers of A' Level design and technology, careers teachers, and admission tutors in universities.

Keywords: A' Level, design and technology, admission tutors, career teachers, engineering, product design, designers, higher education, A2/AS

Introduction

During the 1970s, craft, design and technology in schools changed from a traditional craft base to more enlightened courses based on designing, making and using technology. At this time, the main destination of A' Level students of the subject was teacher education. As the new design and technology courses developed, the profession called for acceptance of the A' Level for entry to a wider range of degree courses. The publication of *Design Education at Secondary Level*, often referred to as the Lucas report, was a milestone in these developments. It made the following significant recommendations:

The admission requirements of most university engineering departments are good A' Levels in mathematics and physics plus one other

subject ... We believe that a pass in a design A' Level satisfying the criteria listed in 5.4 should be equally acceptable and carry as much weight as any other A' Level for general entry requirements. We also believe that such design A' Levels should become a preferred entry qualification for all design-based undergraduate courses.

Paragraph 5.4 set out criteria which an A' Level design and technology syllabus should conform to.

In 1981, Harrison boldly questioned the whole basis of qualifications for engineering degree courses with the following statement:

One might wonder whether it was not a waste of national resources to run courses in engineering in higher education for those who are good at 'A' Level mathematics and physics,

but are not capable of tackling, head on, an engineering problem requiring a creative, innovative approach calling for application of scientific understanding and not merely possession of that understanding.

His argument was that the engineering profession needed to consider whether the A' Levels being asking for provided a sound basis for producing innovative engineers required by industry.

Throughout the 1990s, design and technology has undergone a metamorphosis and is now a major force in the school curriculum. There has been a significant increase in the number of candidates for A' Level design and technology. The following table shows recent numbers.

| <i>Year</i> | <i>Number entered</i> | <i>Number of successful candidates</i> | <i>Comment</i> |
|-------------|-----------------------|--|------------------------|
| 1998 | Not known | 13,316 | Actual number |
| 1999 | Not known | 12,500 | Rounded to nearest 100 |
| 2000 | 13,700 | 12,500 | Rounded to nearest 100 |

Table 1: Recent entry onto A' Level design and technology courses. (Table compiled from DATANEWS.)

It has not been possible to establish a figure for the A' Level entries during the early 1980s, however, the Lucas report records that '...candidates numbered hundreds'. Additionally, the quality of work has improved, the OFSTED Secondary Design and Technology subject report for 1999-2000 recording that 'post-16 work in the subject is often outstanding' and '29% gained grade A or B'.

Discussions with design and technology heads of department (HoDs) in schools revealed that A' Level group sizes were growing and the September 2000 introduction of the two tier post-16 AS/A2¹ examination system had resulted in a further increase. Further discussions with four HoDs revealed that A' Level design and technology students were having success in gaining places on degree courses providing the combina-

tion of subjects matched university requirements. However, they said that there was still confusion and some successful A' Level design and technology candidates had been disappointed in not gaining access to courses of their choice. Further discussions identified that the A' Level design and technology students broadly fell into three categories regarding their university entrance aspirations:

- 1 students aiming to join engineering degree courses therefore studying maths and physics
- 2 students aiming to join industrial, product or three dimensional design degree courses with a variety of subject combinations
- 3 students doing A' Level design and technology because they liked the subject but were uncertain about their future careers.

At a time of change it seemed appropriate to revisit the issue of acceptability of A' Level design and technology for entrance to higher education courses.

Aims of the research

The research had three aims:

- 1 establish the present level of acceptability of A' Level design and technology for entry to degree courses
- 2 explore present attitudes to A' Level design and technology in higher education
- 3 establish reasons for confusion and disappointment for some of the applicants to degree courses.

Research method

As the heads of departments had identified two groups of students with specific objectives for entering higher education, the research focused on entrance to engineering and design courses. These included named awards such as aeronautical engineering as well as more general engineering courses such as mechanical engineering. For design courses the focus was industrial, product and three dimensional design.

The following research methods were adopted:

¹ *The Advanced Subsidiary (AS) is the three-unit General Certificate of Education (GCE). It provides progression between GCSE at level 2 and the full A' Level. It is both the first half of an A' Level and a qualification in its own right. All A' Level specifications include an AS Level. A' Level is the six-unit GCE. It consists of the AS and a further three units called the A2, usually studied in the second year. From September 2000 A' Level study in schools follows this format.*

- an Internet search of UK university and college web sites looking for the inclusion of A' Level design and technology in the prospectus information
- structured telephone interviews with admission tutors, year tutors or course leaders of engineering and design courses.

Fifty four higher education web sites were searched using a University and Colleges Admission Service (UCAS) handbook as a starting point. For each institution, the search included engineering, art and design departments or schools. Several sites included 'search on title' facilities, these were searched for engineering, product, industrial and three dimensional design. If design and technology was listed as a title within this facility it was included in the search. The objective of the search was to see if design and technology was included or mentioned in the entry qualifications required for the courses. Text was scrutinised for any mention of design and technology.

The structured interviews were conducted with admission/year tutors of a random sample of 14 engineering and 12 design courses.

The questions were grouped into the following sections:

- confirmation of the acceptability of A' Level design and technology² courses for entry to the course followed by establishing the relationship with other A' Level requirements for entry. If design and technology A' Level was not acceptable the plan was to branch to discussion about reasons for non-acceptance.
- strengths/weaknesses of A' Level design and technology as a preparation for entry to the course
- tutors awareness of the current A' Level design and technology syllabuses
- comments and/or suggestions.

Analysis and discussion of the results

The Internet search

The search produced very few references to design and technology on engineering or design web pages. Of the 30 engineering sites searched, the majority were very specific about the requirement of A' Level mathematics and physics plus

one other A' Level. Only two sites included specific reference to A' Level design and technology as a suitable third subject. In addition to design and technology, these sites included reference to a foreign language or chemistry. Several indicated that general studies was not an acceptable A' Level. Two sites were less specific about physics, indicating any physical science would be appropriate. Typical examples are:

- A/AS BBC – BCC, maths required, physics preferred
- Typical A' Level offer: BCC-CCC: mathematics, physics and one other subject
- '...BCC for the BEng degree. This must include mathematics and science, preferably physics, but excludes general studies.

The following are the specific statements about A' Level design and technology:

Good passes in three GCE A' Level subjects including mathematics and physics, or their equivalents (typical offer: ABB/BBB grades). The third A' Level can be in any subject except general studies. Chemistry or further maths are commonly offered but subjects such as economics, a modern language or design and technology also have much to recommend them.

Those taking A' Levels (or A with AS Levels) should generally have good passes (BBB or 24 points) including mathematics and either physics or a design/technology subject.

While these searches represent only a sample of courses, they do indicate engineering is specific about the requirements of mathematics and physics but there is minimal evidence that A' Level design and technology is acceptable as a third A' Level.

Information about entry qualifications on the 24 sites searched for design courses was in most cases vague, with reference to the university's general entry qualifications followed by statements typical examples being:

A' Levels – 14 points from at least two A' Levels at least one of which should be art and design. Talented candidates with fewer points may still receive an offer.

See standard university entry requirements. All candidates must present a folio or other comparable evidence of design/artistic achievement at interview.

A/AS Level: 16 points in art, design or business subjects ... At interview, you will be expected to present a portfolio of work...

² GNVQ qualifications were not discussed in the interviews but most universities do accept these qualifications.

Advanced GNVQ – Pass in art and design.
BTEC National Diploma – pass in art and design.
Other – art and design foundation course/equivalent learning through relevant studies and/or life experience.

Two exceptions for product design courses had the following statements:

A' Level points normally required: 18 if applying direct ... Preferred A' Levels: art and design, design and technology, physics and computer studies.

A' Level points normally required: 18, if applying direct. Preferred A' Levels: design tech; art; mathematics; physics.

A significant result came from searches returning information about new courses with design and technology as part of their title. Additionally, some engineering schools/departments offer courses with product design in their title. During the period 1980 to present, at least seven institutions with design and technology teacher education strengths have converted or offered new BA/BSc design and technology courses. The search produced four universities not previously associated with design and technology offering courses requiring A' Level design and technology as an entry qualification. The following extracts from the promotional material indicates the institutions' confidence in the subject.

Undergraduate Courses : Design and Technology. This course is the first of its type in British universities. It offers a direct higher education progression route for those taking GCE A' Level design and technology or a GNVQ equivalent. It recognises a requirement for people in all fields of design who are excellent in their ability to develop products and services from concept stage to realisation in the market place.

BSc (Hons) design and technology. This course is designed for people who enjoyed design and technology at school, have a broad perspective on engineering, and are interested in creating and manufacturing new products.

Additionally, these universities list design and technology as an acceptable A' Level for a number of courses including engineering. The new courses are based in engineering schools/departments.

The interviews of university admissions/course tutors

The randomly selected sample of 14 engineering and 12 design admissions/course tutors did not include the institutions offering new design and

technology related courses or those courses converted from a teacher education tradition.

Confirmation of the acceptability of A' Level design and technology

Both engineers and designers confirmed that they did accept the A' Level design and technology qualification. However, in all cases the engineers quickly pointed out that A' Level mathematics and physics were absolutely essential. Three pointed out that a foreign language was becoming more important as engineering now had a strong international perspective.

Designers were more guarded in their answers, with two thirds saying that art and design either at A' Level or BTEC foundation level was their preferred choice. The remaining third commented that they had more general requirements and usually made judgements on the quality of the portfolio presented at interview. They expressed some concerns about the portfolios prepared as part of A' Level design and technology courses. Two tutors commented that they used A' Level design and technology applicants to make up their numbers.

Strengths and weaknesses of A' Level design and technology

These questions resulted in 10 engineers responding enthusiastically that most A' Level design and technology candidates performed well at interview as they were able to discuss their A' Level project work. Four said that this made selection easier. Seven tutors commented positively about the quality and complexity of some of the projects seen, but three stated that they had seen some craft projects of limited value. The consensus was that a strength design and technology students demonstrated was the ability to manage a design project which included making and 'see it through to completion'. Three reported they had recently seen prototypes which had commercial value. Eleven engineers were also impressed by core study folders with nine commenting on thoroughness of the research and seven on the high quality of presentation. Nine said that studies with an industrial content were particularly useful to students entering engineering. Nine engineers had concerns about inconsistencies in the body of knowledge A' Level design and technology students have. Comments such as 'some show us CAD work whereas other students' work is more artistic. Most have a limited knowledge of engineering drawing.' Eight tutors commented on the

quality of the electronic projects they had seen but five of these had doubts the students fully understood the workings of circuits. Five tutors felt that engineering projects from schools were improving and three commented about the complex computer aided machining (CAM) work seen. Four tutors commented that they felt it would be beneficial if science teachers and design and technology teachers worked more closely together.

Design admissions tutors had a very different view of A' Level design and technology. Two tutors used the word 'exciting' with reference to work they had seen but the majority (eight) made comments such as '...many of the projects seem to be 'craft based' and '...the visual quality of the work is not considered'. Three tutors questioned the need for so much technology to be included in project work. When questioned about the project portfolio, the view expressed by the majority nine is summed up by the comment 'most folios lack creativity'. Three were scathing about the use of a '...design process which does not really exist'. However, seven made positive comments about the quality of graphic work seen and four commented favourably about the CAD work with one tutor commenting that '...this would improve the work no end'. When asked about the subject knowledge nine of the tutors dismissed this as being of less importance than the ability to have 'vision' and 'to think creatively'. Three tutors considered an understanding of science and technology was becoming important. They used phrases such as 'its important to make projects work' and 'students need to understand how products are manufactured in industry'.

Tutors' awareness of A' Level design syllabuses

All tutors were aware of the introduction of AS/A2 examinations with five engineers and three designers making comments that this could '...introduce an element of uncertainty into the selection process.' However, only two tutors out of the 26 had seen any information about the new syllabuses. The engineers were far more knowledgeable than the designers about the current syllabus content with seven of them making statements about the differences between the examination boards. Five were able to make comments that the Cambridge or OCR syllabuses were the most suitable for entry on their courses. Designers did not have this level of understanding of syllabuses. Comments such as '...we like to see a good portfolio of work with a variety of art and

design skills' indicated that they were less concerned about syllabus content.

Further comments

Eighteen of the interviewees commented about the uncertainty of new AS/A2 examinations, with 10 saying they expected it would be necessary to make changes to their teaching. Eight engineers were pleased that design and technology was developing further with five indicating they liked interviewing applicants with A' Level design and technology as the project portfolio provided a focus for the interview. More than half design tutors wanted to see design and technology change considerably and become more in line with their course philosophy. However, two tutors considered design and technology as 'an up and coming subject with lots of potential'. All interviews ended on a positive note.

Conclusions

Considerable progress has been made since the Lucas report. It seems that A' Level design and technology is now an acceptable qualification for entry to engineering courses as a third A' Level. All tutors interviewed commented favourably and in many cases enthusiastically about specific skills and qualities applicants demonstrate. Design course tutors seem to accept the qualification with reservations, several being critical of its value for entry to their course. The on-line prospectus search revealed that only a small number of engineering courses make specific reference to acceptance of the subject, however those that do indicate enthusiasm for the subject. Entry qualifications for design courses are mostly vague and tend to focus on art and design qualifications. The small number that do mention A' Level design and technology do so enthusiastically. It would be helpful to both teachers and university applicants if the status of A' Level design and technology was stated more clearly in course information.

The search produced information about new courses with a definite design and technology focus. These are mainly developments within engineering schools/departments running alongside more traditional engineering courses. Clearly engineering is developing an education strand concerned with designing and manufacturing and A' Level design and technology is seen as a preferred entry qualification.

Engineers are concerned about a consistent body of knowledge in design and technology whereas designers do not see this as important. Engineers welcomed developments such as CAD/CAM and industrial perspectives but expressed doubts about applicants' understanding of the technologies embedded in projects. There are concerns about some design and technology courses having considerable elements of craftwork less suited for entry to a degree course. Surprisingly, engineers consider managing projects as being a valuable element of A' Level design and technology. Designers seem to have the opposite view, they are concerned more with creativity and cite the way design and technology is taught as not helping students explore this fully.

There seems to be a weakness in dissemination of A' Level examination information as the majority of tutors were aware of the AS/A2 changes but did not have detailed information about syllabus changes. Most accepted that university tutors acquire this information by experience of interviewing and working with students. To help tutors it would be useful if examination boards circulated a résumé of syllabus content to university departments.

The research shows that university engineering has embraced A' Level design and technology more than design. It is engineering that is extending their course portfolios with design-focused

courses. For the A' Level design and technology student there seems to be growing opportunity in a range of courses at degree level but applicants still need to be vigilant to ensure they meet entry requirements.

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