The Design and Development of Cognitive Acceleration through Technology Education (CATE): Implications for Teacher Education

John L. Backwell
University of London, London, UK

A. Hamaker
Independent Education Consultant, London, UK

Introduction

The Cognitive Acceleration through Technology Education Programme (CATE) has been designed to help 11 to 14 year old students develop their thinking and reasoning skills so that they are in a much stronger position to solve more difficult problems that they may well encounter later in the school curriculum. The activities are purely cognitive in structure (i.e. there are no 'hands on' practical or making activities) and such lessons are integrated into the established schemes of work. The authors worked closely with KS3 Design and Technology teachers in order to determine the subject oriented platform from which the cognitive tasks could be developed. Although these tasks were *not* designed to teach concepts or skills directly related to design and technology schemes of work, they did align with a range of focus topics in order for students to feel coherence within the delivery framework of the subject however this might be formulated by the individual schools, and in turn, design & technology departments.

The authors believe much of the success achieved in the pilot schools may be attributed to the methodologies adopted by the participating teachers and in turn the nature and quality of the training they have received. Prior to embarking upon 'CATE teaching', a structured and comprehensive in-service training programme is delivered involving all of the design and technology department within a school. In addition some Local Education Authorities in England and Wales have launched aspects of CATE teaching through a centralised training programme and one of the authors has integrated a study of CATE (including training for classroom implementation) into a BA Ed Design and Technology initial teacher training degree. An evaluation of these training strategies will be reported on within this paper and an indication of the further developments of CATE in light of this will be discussed.

In developing this programme, the authors wished to address questions concerning the effects of the intervention on the students' performance, including the following:

- Would cognitive intervention methodology improve the technology capability of the student?

- Would such an intervention programme improve the general information processing capability of the student?

- Would such an intervention programme allow for transfer into other areas of the school curriculum?

These have been reported on at several junctures of the development period. This gave rise to the need to investigate the effects of intervention methodology upon perceptions of teacher professional development.

CATE Training Strategies

Initial Teacher Training – the key element within initial teacher training both on undergraduate programmes (3 and 4 year) and postgraduate programmes (1 year and 2 year modular) was awareness raising. This was introduced this year as part of the 'learning and teaching' framework across each programme with the opportunity provided for support for students wishing to trial materials whilst on 'school experience' placements. It is too early to provide 'take up' or evaluative data at this stage. However, initial responses have been very positive.

In-Service teacher training – This is phased wherever possible:

Introductory training – primarily for key teaching personnel from schools within local education authority regions and/or of whole departments in schools. Expectations at this level are for participants to gain an understanding of the philosophy and underlying theoretical framework together with an insight into delivery and management considerations.

In-class support – this may include demonstration lessons and certainly includes supporting teacher led de-

livery. Discussion is ideally with the whole department encouraging individuals to learn from each others practice. Such support is frequently on-going within the first year of implementation usually ranging from 2 to 5 training 'visits'.

'Revival' training – aimed at schools where major staff changes or departmental reorganisation have taken place since the original CATE implementation. The nature of such training is a negotiated variation on the above.

Joyce & Showers (1980) reported that the most effective teacher professional development activities are those that combine theory, modeling, practice, feedback and coaching for application, particularly peer coaching. This was the line adopted for CATE training, though in practice many schools / education authorities have favoured the 'one hit' introductory training experience to be followed by cascade training in-house.

Research rationale and methodology
Design and Technology is a relative 'newcomer' with regard to assimilating a cognitive intervention methodology into its learning domain. It is also a subject predisposed to many perceptions from without and within its subject bounds. The authors wish to determine what effect CATE might have upon such perceptions and the subsequent effect this may have upon the professional development of D&T teachers.

A post-training analysis of evaluative data has been collected over the past two years – this has been the first indicator of possible changes in perception of design and technology teaching roles and subsequent practice. A trial in three schools in 2002 included a more extensive analysis based upon open discussion with participants (all three schools) and individual interviews (two of the three schools). The open discussions occurred during in-school departmental meetings at least three months after initial training. Interviews took place eighteen months after training and introduction of the CATE programme in those schools. Further interviews are planned over the next year to provide a more comprehensive view.

Initial findings
The post-training evaluative data raised many issues whilst in the main conveying much positive feedback concerning both content and delivery styles. Although the questionnaires were focussed upon a broad evaluation of the cognitive intervention methodology, response to a number of statements gave insight into revised perceptions of role, sphere of influence and effectiveness. This was further confirmed and elaborated on by the interview data where in addition, interviewees were

given the opportunity to be more reflective about their practice and their original expectations. The authors believe this may point toward a new focus for design and technology teacher education and warrants further investigative study.

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