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The seduction of the wheel: a synthesis of research-based issues surrounding car-led construction activities of young children and the relationship these may have with current environmental trends which progressively seek to limit the impact of road traffic

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Abstract

Construction activities play a core role in design and technology education. Some of this activity is undertaken through the medium of construction kits, especially in the early years. Modelling of wheeled vehicles has always been a popular activity for children and indeed this is often the premier choice for pupils engaged in "free choice" situations. This paper examines aspects of free choice activity and relates this to the "car-led" mindset of wider society and the implications this may have for future transport choices. Research evidence has been collected from a range of cultural/geographic settings to provide qualitative and quantitative data on building choices made by children. Against the evidence collected from this research background, the paper asks to what extent car-led construction activity in primary schools may, by virtue of the consequent mindset developed in children, be a future mechanism for strengthening public resistance to changing travel habits in order to secure environmental benefits.

Construction activities by young children in school can provide a platform for skill development and the progressive deepening of children's subject knowledge and understanding of areas such as structures, materials and mechanisms. Construction activities can occur through media such as reclaimed materials and construction kits.

Part of the pattern of experience undergone by most young children is "free-play" in which an open choice to activities is invited. This typically early years experience may be offered as a "filler" at the end of taught, structured sessions, or perhaps as a reward for completing a task. Free play of course, is also a significant element in non-formal education and it applies to children across a span of ages. The benefits of free play are significant. Parker-Rees (1997) in his comparison between aspects of play versus teaching makes the following comment:

"Finding out what can be done with objects, situations and roles by trying them out in different combinations and contexts can enable children to abstract *general*

concepts from their experiences of particular exemplars". (p.21)

Construction kits may have a significant role within free play. They enable children to make a range of objects reliably and relatively quickly. Children can indeed "find out what can be done" with objects, situations and roles in a variety of combinations and contexts. Within this rapid kit-led construction work, modelling of wheeled vehicles is perhaps of profound significance. Construction of wheeled vehicles is often the premier activity of pupils engaged in these "free choice" situations in the 3-8 age range. Teachers may admit that gender issues exist in their classrooms, expressed for example, via the manufacture of cars (and guns) as the preferred product outcome of male constructors.

Construction work in design and technology, in a range of guises, often reflects issues from society. It can be context-driven and children may represent their aspirations, their dreams and model things they see around them.

Undoubtedly, construction activities in schools have a relationship with the wider social, economic and environmental picture of which school life is but a fragment. However, is it possible that such construction activity, particularly that which is car-led, has a significant future environmental price tag attached?

Environmental awareness

A change of government in the UK has initiated a series of debates regarding the interrelated strands of transport, land use and environmental pollution. The 18th Report of the Royal Commission on Environmental Pollution (1994) set the agenda for change with targets related to such issues as improving the quality of life by reducing the dominance of cars and lorries. Headlines from the national press underline the urgency of what is now seen as a fundamental problem. An illustrative headline such as that of Foster (1997) writing in *The Times* on September 26th, 1997 captures the spirit of the culture change which is starting to pervade our national press.

'Air pollution ' exceeds limits every five days'.....Air pollution reaches levels harmful to health once every five days in parts of Britain.....' (p.4)

The response of the incoming government has been rapid. As part of a public consultation exercise, the Department of Environment, Transport and the Regions (DETR) has launched a detailed document "Developing an Integrated Transport Policy, An Invitation to contribute" (DETR, 1997), in a bid to search for answers to transport-related problems. Central to this consultative paper is the core idea that changes in travel habits —principally reduced car usage— are essential to improving environmental quality for all.

If it is accepted that progress towards a sustainable future will entail society making hard choices and far-reaching lifestyle changes, then do some of the "typical" construction-type activities in schools assist in this process? Possibly not. On the one hand, children in schools might for example be representing their world and their aspirations to own perhaps, bigger, faster and more

complex cars. As a consequence of the car-led mindset developed in some children, one is left to ponder if such construction kit activity may be a future mechanism for strengthening public resistance to changing travel habits which may be needed in order to secure environmental benefits.

From the classrooms of today, will the next generation of young adults be so embedded in "car culture", that public transport alternatives — with lower spatial impact and greater fuel efficiency than the private car — will be more difficult to promote and implement?

Evidence from schools: early years

This paper focuses on aspects of research evidence recently collected from a range of cultural/geographic settings to provide qualitative and quantitative data showing the types of choices children make in kit-based construction settings.

Firstly some disclaimers. Of course there are flaws in the approach taken to investigate activities undertaken by children when working with construction kits. Within the surveys referred to and undertaken for this paper, all the construction kits employed had the capability to produce wheeled vehicles. Hence it is not unreasonable to expect that if children are given these sorts of construction kits to work with (and of course, most construction kits have wheels!) then they might well want to explore the full capability of the kit, and will naturally want to *make things* with wheels.

In a UK-based study concerned with the construction activities of young children of ages 4 - 5 (Parkinson, 1997a), in free choice situations it was found that children seemed to build under the influence of two factors. First, external sources of motivation seemed to have a role. Children might represent a climbing frame for example, because this was an item of interest to them personally. Second, the nature of the kits themselves seems to have been of key importance in determining construction outcomes. The nature of component parts such as tubes and plates in a kit such as *Reo Click*, would suggest

particular functions to children and so promote a product outcome with a certain feature. In a parallel study undertaken in a Jamaican school outlined by Parkinson (1997b) for example, the tubular-based Reo Click became the focal point for:

“contagious small-arms manufacture (which) swept through the classroom and boys triumphantly held aloft a surprising array of automatic weapons...it seems that the nature of perceived building possibilities of the kits themselves may have determined the outcomes, for the tubular-based Reo Click, which so readily forms lattice shapes yielded two ladders and of course, a variety of gun barrels.” (p.35)

Whilst the children in the Jamaican enquiry indicated that their building choices were inspired by motorised road vehicles (13 examples out of 20 responses), the UK children produced a greater diversity of product, and only a third of the artefacts had wheels. It is possible that the UK children, with a greater familiarity with construction kits (the sample of Jamaican children had never seen an educational construction kit), were able to model a diversity of ideas from a broader experiential base.

Evidence from schools: upper primary

For older children, free play is not an important area for learning within the formal education environment. Beyond the school of course, it gains much greater significance.

In order to test the matter of pupil choice of activity with construction kits across a range of ages, an enquiry was undertaken with children in UK primary years 5 and 6. The children were in the age range 9 - 11 and a sample of 20 pupils (ten boys, ten girls) was selected at random from four classes in a school on the fringes of an industrial town in Kent. Children were invited to build any object of their own choice. They were given identical sets of Lego Technic, minus electric motors. Each set had a base-board on which large structures could be assembled. The same questions were asked of children as for the above enquiries with early years children. These simply were related to what children

were making and what gave them the idea for their construction. The children were isolated, each to his or her own table, so there was no opportunity for them to confer and cross-fertilise ideas.

There are obvious reservations about the research methodology. The children were in an unfamiliar setting, uncharacteristically doing work of open choice on an individual basis, and of course the majority of boys had Lego at home. All of these reservations (and many more!) are acknowledged.

The results were stereotypic in the extreme. They overwhelmingly reflected the early years findings of Beat (1991) in which boys made things that move and girls tended to concentrate on static models. Eight out of the ten boys made vehicles. These ranged from the simple “car” to more specific vehicles such as “the army reconnaissance craft” the “wrecker” (for rescuing racing cars) and the “formula one car”. Two boys made buildings. One was a garage forecourt (“where they repair cars”) and another was a domestic garage. Whilst working at the latter task, the child concerned predicted “All the others (boys) will make cars, so I’ll make a garage”. Reasons for the choice of construction ranged from “Well, my mum likes cars so I made a car” to “I just saw holes and wheels” and “I just kind of built it as I went along”.

With one exception, the girls made buildings on the large base plate. Most chose houses. On giving reasons for their choice of construction, one girl said “It’s the only thing I could make”. The one girl who did not make a building, constructed an assault course “Because that is what I like doing”. Two girls made buildings which were not homes. These were a garage and an airport terminal building. For both of these, perhaps motivated by an influential external context, they extended their construction range to build appropriate wheeled vehicles. These were for a car and an aeroplane. Unlike the boys, who saw ways of attaching shafts and wheels to the Lego structural elements, the girls had difficulty. Wheels were placed onto shafts and then initially laid *under* other Lego pieces without any precise connection.

One is drawn to the observations of Claire (1992) on early years children. She records that:

“the girls’ models were less well made and less sophisticated than the boys’....” and that “Girls left alone without teaching or oversight turned construction play into house play...the thought struck me that girls were sometimes transferring their 2D skills at pattern-making and decoration to 3D work...” (p.29)

Ross and Browne (1993) make the point that “free choice” activities are themselves gender related, and convey the notion that girls have very little freedom of choice due to a weight of socially-driven prior experience which pre-conditions them to construct passively. This notion may of course work both ways. Perhaps boys *also* have a weight of prior experience, and this may pre-condition them to action-related constructions. One could even turn the argument around and suggest that boys are disadvantaged in that, due to socially-driven prior experience, they are *denied* the opportunity to construct passively!

One clear feature of the upper primary level study in the Kent school is that the results are stark and seem to suggest an intensification of the gender-related issues that have been a research feature in early years education.

Progression, continuity and purpose

Within the curriculum, issues such as progression and continuity lie at the heart of what is taught and learnt. Progression in kit-based constructional terms is related to factors such as a gradual increase in the complexity (number of parts/ range of parts) that the child encounters. Another element is product specification. Children in the early years may initiate work with no teacher-directed specification — it is “free choice”.

As children progress through the primary years, specification takes a more important role. Teachers may set tasks, initially indicating an overall outcome to children. “*Make your own version of the Big Red Bus*” may be the first step. Adding to the specification within an overall task so that there is greater qualification of the outcome leads on to the

instruction “*Make your own version of the Big Red Bus so it can carry these four teddies*”. In the controlled setting of the classroom then, teachers are in a prime position to influence construction activity. They have the opportunity to elevate and extend thinking beyond both the stereotypic constraints of the car and the house which so often stem from free-play.

Discussion can play a key role in progression and continuity. Barnett (1994) raises the issue of the responsibility of the designer. He notes that one facet of technological activity is that it can be seen as a response to human need and then gets to the heart of the matter in questioning “fitness for purpose” driven values by probing deeper into the concept of “fitness of the purpose”.

This questioning of purposes may enable teachers to add a further dimension to the modelling process through a reflective view on the way that technology impacts and interacts with society. Hansen (1994) highlights this view in relation to the concept of “Technological Bildung”, of which one facet is the design activity starting with:

“an anticipation of a the desired function of a machine....in relation with the social and ethical context of this technology” (p. 372).

In the controlled environment of schools, the opportunities exist both for shaping and directing construction activity and for adding elements of discussion on areas such as purposes, effects and social consequences. Perhaps then, *progression through specification* acts as a valuable counter to some of the initial influences of free-play as the child progresses through the primary school years. Beyond schools, within that great ocean of influential informal experience, stereotypic influences may take over. Is it *beyond* the influence of the school that car-culture is most actively embedded via boys interacting not just with construction kits— but with the rest of real life?

Some thoughts for the future

Interestingly, despite a move towards “clean” technologies that produce environmentally less-

damaging vehicles, technology itself has not produced a solution to road traffic problems. The Royal Commission on Environmental Pollution 20th Report (1997) reminds us that we are using modern ("clean") vehicles more and numbers are increasing. Moreover, current trends in car sales indicate that whatever positive environmental gains are made in overall engine fuel efficiency, these are largely cancelled out by the additional energy requirements of the trend towards larger, heavier vehicles, incorporating such features as air conditioning and four wheel drive.

Budgett-Meakin (1992) raises the issue of sustainability from the platform of appropriate technology. Her comments on the impact of a consumer-led society in which of course, car production plays a central role, have particular relevance.

"In our society we have surrounded ourselves with material goods, and we have been seduced by a way of life which esteems and indeed demands consumption.....One of the results of our consumer society is a vast industry which is devoted to the creation of new "wants" and therefore to the development of technologies to satisfy those wants" (p21)

At a classroom level, the research implications arising from this paper may have relevance to the context and levels of specification of classroom tasks. It may be beyond the classroom however, that the greatest car-led construction related pressures are felt.

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