A Child Centred Technology Curriculum — a Primary School Case Study

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This case study is based on my observations over half a term, for one morning a week, in two classrooms in Sir William Burrough Primary School in Tower Hamlets, London E14. The teachers with whom I negotiated my visits were Dave Eva — with a vertically grouped class of 8-11s, and Sarah Lane, who taught vertically grouped 4-8s.

Sir William Burrough has roughly 260 pupils on roll including a small nursery of 25. The intake from the local council estates of Tower Hamlets is 77% Bangladeshi (the majority of whom are bilingual in Bengali and English) 15% indigenous English and 8% 'other' (Chinese, Afro Caribbean, Turkish, Indian). There are 15 full time staff (11 class based, 4 non class based), and 6 primary helpers. Some of the full time staff are funded through Section 11. (Section 11 provides Government money to support children from the New Commonwealth who require English language support). Although Sir William Burrough is perhaps not a typical English primary school much about its philosophy and way of working is relevant and thought provoking to teachers wishing to reflect on their own practice. The commitment of Sir William Burrough's staff to a child centred, negotiated curriculum offers a particular opportunity to explore issues of learning and teaching in design technology. The staff believe in a negotiated curriculum, starting with children's own interests which they develop and extend. They do not take a *laissez faire* attitude to the curriculum, or allow children to do as they please: they monitor that children are experiencing a range of content and processes.

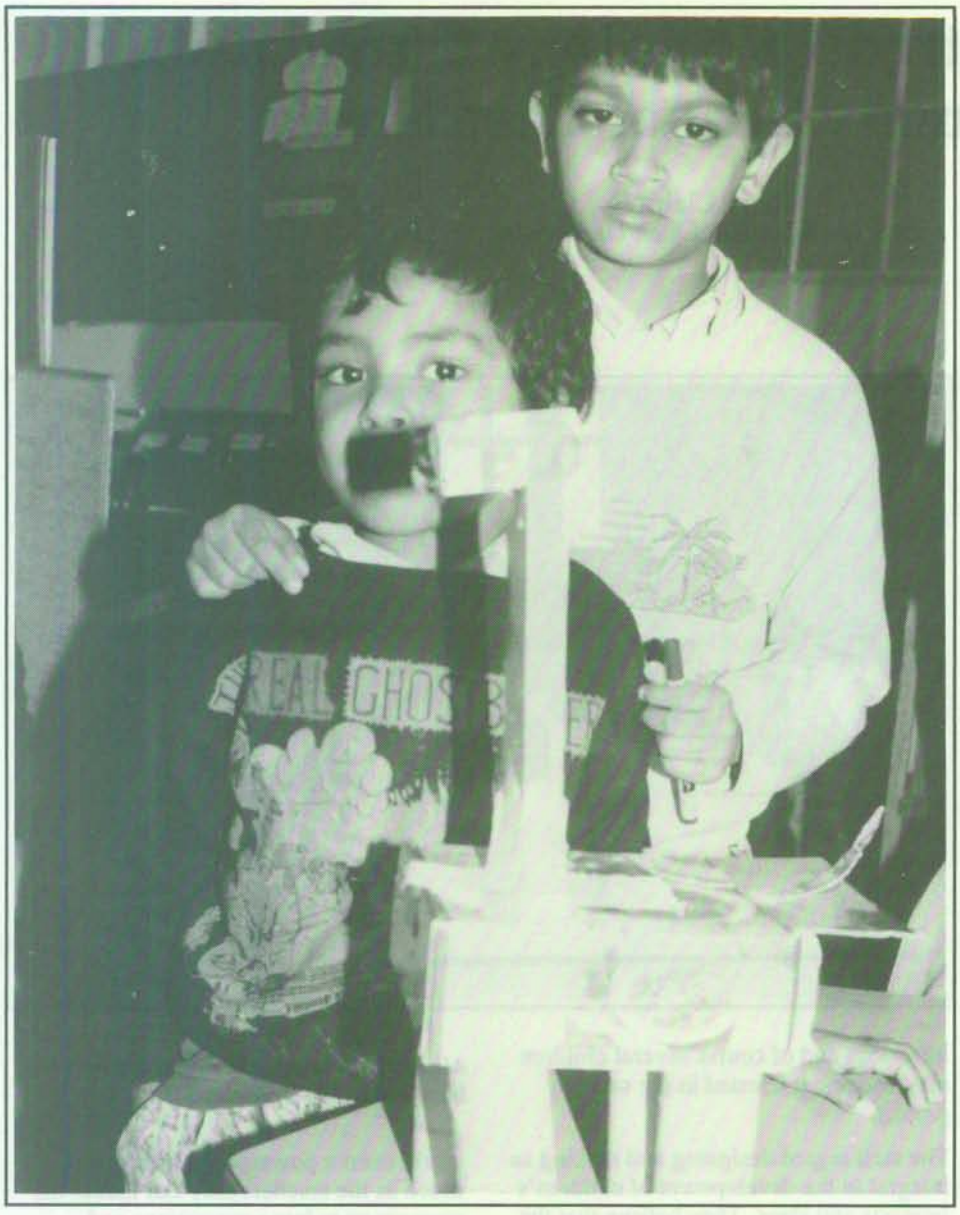
If a child wants to work on something they have done before, the teachers will try and find new angles or extend it in new directions. Sometimes of course, children's interests come from what the school itself has introduced, for example through displays, stories etc., but a great deal of the children's work comes from them saying 'I want to do/learn something about...' This approach is infectious and of course several children may become interested in the same project.

Above: Nazma making her castle and the houses for the village.

The staff regard designing and making as integral to the development of children's interests and ideas. They believe that the Attainment Targets of the Design Technology Orders exemplify a desirable attitude to *all* learning (ie through children identifying an interest or need, deciding what to do, planning their work, implementing and evaluating it).

Classroom Management and Organisation

The whole school is organised into 6 vertically grouped classes for team teaching. Four of these are 'double units' with roughly 50 children, and two are single units with 25 children. Dave and Sarah both worked in double units and I will concentrate my descriptions on those arrangements. The school serves a tightly knit community of extended families, and there are often siblings, relatives or close friends in the same class. In vertically grouped classrooms children of different ages regularly work together. The older children, who are both more skilled and familiar with the prevailing ethos of work, exert a powerful influence; as much as the teachers they can induct the younger ones into expectations and practices, as will become clear later in this article. Each double unit has two regular teachers and a third adult who is usually a primary helper or a floating teacher. (The single units have one teacher and one helper.) This generous adult: child ratio partly results from the Union ratios specified for vertically grouped classes, the presence of Section 11-funded teachers and school policy where all adults, including the head, spend the majority of their time with children, rather than in other institutional activity. Each day, one of the three adults is the 'circulator', available for children to approach freely for help. The other two programme their time to work with a specific group, or observe and monitor individual children. They target these children in daily review meetings concentrating on children who appear to need support with their project or behaviour, to be 'stuck' and needing teaching intervention. There is also



Left: Abjul (aged 5) and Shelim (aged 7) with Abjul's giraffe.

systematic observation through the whole class list so that everyone is monitored regularly.

The teachers keep detailed daily records of the day's work and progress for all the children, which they compare and share at the end of every day. This takes about an hour, after school. For this they use proformas which briefly show actual work, and possible developments. Each child also has a profile sheet which is kept up to date (roughly fortnightly), including highlighting ATs in the core subjects and technology. These sheets alert the teachers to areas of the curriculum which a child might be neglecting, or to a child who is flitting from activity to activity.

What the pupils do from day to day is negotiated with them, through sensitively listening and following through on their interests but also suggesting what they might need to do next. The teachers allow a longish time span for an interest to develop, knowing that pupils can return to another area of the curriculum later. They prefer depth of study and involvement, to a 'butterfly' approach. Children often work in pairs or small groups, which go across ages.

How does design technology occur in the curriculum?

The school philosophy is that children do not compartmentalise their interests and knowledge, and that personal relevance and motivation are central to their learning. This is the context for the technology curriculum. The most effective way to explain this is by examples of what Dave and Sarah say:

> *Sarah:* Basically ideas come from the children, but with the new, little children, we direct them a bit. Say a child says she wants to do something about The Three Bears and she's not sure. We write a list together about what she'd like to learn. Some of the younger children can't decide or follow through so we plan for them, and suggest they could design and make something, like the house and the furniture.
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> *Dave:* We're very concerned to try and ensure continuity and make sure design technology is embedded in a context which the children are interested in. Its best when they design for a real purpose that they have identified personally. Sometimes we ask them to think about what they might make, or we extend it (for instance 'I want you to make the head move on the robot, or the eyes light up'). We might give a specific challenge to concentrate on an area like circuits. It depends on what they've done previously. They know what their friends and siblings have done and quite often come up with a good idea of what they'll do. 'Show and Share' time is also good. We do this in the middle of the process, not just at the end and get suggestions from each other on how to proceed and improve. That sparks off ideas in others.

Here now are some examples from the two classrooms of ongoing projects and how they arose:

Sarah's class

1. The teachers had been talking with the children about Chinese New Year and had created a display of Chinese artefacts, writing and so on. In the 'share and tell' time they had asked what the children would like to follow up. Some had chosen to do Chinese writing and paintings. Others wanted to set up a Chinese restaurant. A member of staff took responsibility for turning the home corner into a Chinese restaurant, working with a small group. *James & Joseph* (6yrs) felt the restaurant owners would need to move all their things from China to their new restaurant and were making a removal

lorry and furniture out of junk card. Although this opportunity for designing and making might not have occurred to an adult, from their perspective the boys had identified this as a 'real need'.

2. Some children had been on a visit to a nearby park. *Hannah and Dawn* (5 & 6) wanted to make a picture of the park to show everyone. The picture turned into a large 2D plan of the environment, with paths, flowerbeds, play areas and apparatus represented by different materials, painted paper and drawings, which were stuck into the plan.
3. Ninja Turtles were flavour of the month! There was a class display and stories written by pupils about the turtles' daring deeds. *Joel* (6) wanted to make a car for the turtles. He drew a design and used wood, masking tape and cotton reels to implement his ideas. It is interesting that Joel seemed to have a picture in his mind which both his plan and the model developed. Given the number of images and props for Ninja Turtles which were around at the time, this is not surprising.
4. Sarah had been reading stories to the class about large animals and there were several books and lots of posters and photographs on display. Some children had started to make animals from junk, and were building up a 'zoo'. *Abjul* (just 5 and new to school) wanted to make a giraffe from junk like Shelim's (7). Shelim helped Abjul and interpreted for him ('he's my mate').
5. *Samad & Shelim* (aged 7) developed and wrote an elaborate story together about burglars. Samad told me they had been burgled recently; the family had not felt that the police had been helpful or prompt ('they didn't come when we phoned miss'). Subsequently, their extended family had banded together to protect themselves. After writing the story, the boys wanted to make a model of the shop and house where the (foiled) burglary took place. Again they listed all the items, partly from their story, but also including new ideas fired by their excitement. The final list contained not just burglar alarms, escape doors and an automatic gun controlled by a computer, a robot which sensed burglars and gave a warning, but also domestic and shop items like a photocopier and counter, and a special dishwasher for the kitchen. They made the whole model from lego. Many of the items were quite simply blocks of lego, but some were more complex, like a delivery mechanism for the shop which had a working pulley. Later they drew a plan based on the model, rather than working from a plan to making the model. The story and the model were poignantly rooted in real experience.

Dave's class

1. *Salam* (8) (who was recently from Bangladesh) saw other children making houses out of clay and wanted to do so too. Dave felt that he should be extended and spent some time discussing the buildings in the area. Eventually, Salam decided to make a warehouse but wanted to do more. Dave brought him a book of houses. Salam's inspiration came from pictures from Iran, Tunisia and Morocco, but his house was his own. He designed and sketched it on paper, incorporating a domed roof, a second floor verandah and a ladder to reach it, and barred windows. The final model was made from clay, card and sticks, and had a very Middle Eastern feel.
2. *Nazma* (9): 'I made a castle out of lego and then I made it in clay and I just left it. Then Dave brought me a book about castles and said why don't I make towers and walls. Dave said he'd take me to the Tower of London. I've done a fairy tale about my castle and I'm going to make it into a book later.'

Nazma's eventual model, which took the whole term to complete, coming back to it over the weeks, had the large clay castle on a mound, a moat and drawbridge and a surrounding village of houses made of paper and card. These were based on careful scrutiny of a book about medieval Britain. Nazma was able to talk to me about the feudal relationships between the lord of the castle and serfs.

Identifying needs

In the examples above, there was a commonality of purpose in designing and making, namely to meet the child's own need to express and work out ideas, interests or feelings. This is what one would expect in this child centred approach to technology. The more conventional meaning, referring to identifying the needs of others is woven into these (and other projects which I observed). James and Joseph's removal van for the restaurant owners is an example, and there are others, as I will explain later. Extending the possibilities for technology and helping children identify needs which can be met through designing and making is a subtle negotiation, rooted in the kind of relationships established between child and teacher, and recognition of children's interests. The teacher does not abdicate from intervention and making suggestions. However, it is the child's project, and the professional skill and art lies in planting ideas which the child can take on and make her own, or helping extend her existing plans.

Making plans

One of the issues which emerged from my observations was the most helpful and appropriate timing for children to draw up plans. Planning work had two dimensions — firstly an overall plan of how the project would proceed and secondly, drawing plans for a specific artefact. Dave and Sarah had definite views about both these processes.

> *Dave:* it is for us and for them. It helps organise the child's thinking and approach, and ours about what the child will do and get from the project. It helps to clarify what they are going

Right: Sarah and Leanne with a plan of their Lego model house.

> to make and what they will need. We may have to get things for them. As for the plan, with the older children we might say draw as accurately as you can, or to scale. Then we can compare the original plan with what they've made and talk about modifications and why they made them. We wouldn't say you didn't achieve what you set out to do, but look at why they needed to do things differently from the plan.

For some children drawing a plan precedes the making stage; for others, particularly the younger ones, it is a way of recording and preserving the work. Representation in 2D or 3D work can be very difficult and frustrating. A plan drawn *from* the model can be far more useful in learning the techniques, conventions and skills of drawing plans. At this point, teachers can give technical help based on the actual model.

Again, some examples

Sarah & Leanne (both 6 yrs) read a story about Spot and the tortoise and made their own book. Their teacher suggested that they make Spot and the tortoise out of clay. They decided Spot needed a kennel and food bowls (an example of how girls typically conceive of needs and plans within a domestic context). The plan (drawing) they made before starting probably contributed little to the actual model which was 'in their heads'. However, doing a plan reinforced a classroom practice which the teachers wished to establish.

Richard & Joel (both 6 yrs) were building roads in the sand tray, trying to represent the area where they lived. However, they were getting confused about the positions of buildings and junctions. Sarah suggested that they sort out their muddles by collaboratively drawing a large plan on sugar paper. First they listed what would need to go on the plan, then they sorted the items, eg the block of flats is on this road, by the traffic lights. Later they pinned the plan above the sand tray and created their environment with sand, bricks, toy cars, lego people and so on.

Asif, Rubel and Marouf (all 8 yrs) were making a puppet theatre out of a large box (puppet theatres were a popular theme in this and in the younger class). The box kept bending sideways despite their efforts to prop it with a piece of wood. Rubel fetched a large piece of paper and quickly sketched his solution (speaking Bengali which I couldn't follow). The three boys argued and all contributed to the sketch. Finally they returned to the model, moved the wood prop into a new position, fetched more wood and started hammering the whole construction together.

Intervention and support in learning and practising skills

I have already indicated how Sarah and Dave intervene through suggestions for designing and making, and extend children's ideas. In practice, much appropriate, supportive intervention at the next stage boils down to giving guidance and practice with skills, particularly use of tools or making joints.

Dave has clear views about the right time and place to introduce new skills:

> I'd emphasise that you only teach particular skills as the children need an answer to a particular problem. Someone had taught the kids about Jinks joints and they were using them any old way when it wasn't even the best solution. They were just plastering little triangles of card all over the joint!

Observation is very important. We don't just leave them to it — we're watching when to intervene. It's really difficult not to lead too much, sometimes I just say I'll help you to get them over frustration points.'

Sarah: (6) When we was making Spot the dog it was hard to stick the clay ears on, so Helen (our teacher) showed us about making little lines and a little bit of water.

Joel (6) was having difficulty joining the bonnet of his 'turtle car' to the chassis using masking tape; he was not satisfied. I asked Shelim and Abjul to show him how they had joined parts of the giraffe with pieces of folded card. Joel adopted this idea which he found more successful and tidier.

At the same woodwork bench, Richard was struggling to saw parts for his aeroplane. It took only a moment for me to show him how to position his wood against the saw board, and how to use the weight of the saw to help rather than hinder his efforts.

Kamal (9) was struggling to fix legs to the seat of a small wooden chair. I showed him how to use Jinks hinges and he went on to make a bed and a table, each time improving his accuracy and proficiency.

Katie (9) was making a pool table from wood. This was an extremely ambitious project as she was determined that this should be a working model. Her first effort was impossibly large, so she agreed to make a scaled down model, but still had many problems of implementation. To give her practice in hammering skills, Dave suggested that she do an experiment about how well nails go into different materials. She assembled a variety of materials, eg, polystyrene, balsa wood, soft board, scraps of thick card, and worked with a friend.

For all these children, skill teaching and practice in a 'need to know' context, where they were motivated to learn and use the skill, was effective.

Sometimes a 'wait and see' attitude can allow the pupils to discover solutions for themselves with consequences for their learning. For example Asif, making the puppet theatre (described above) chose nails that were too short for the purpose. Realising the wood was not holding he merely hammered in more and more nails. His sheepish and contrite expression when he realised his error indicated that he really didn't need a teacher to intervene.

Attitudes and coping strategies

It was noticeable to me that in the encouraging and supportive ethos of these classrooms, children were prepared to embark on quite complex problems, in terms of design and execution. Attitude and confidence seemed central, as well as a high tolerance for failure.

> *Sarah:* Children have different personalities and strategies. Some are more independent and think for themselves. Others are more dependent and you have to coax them into trying for themselves.

In Dave and Sarah's experience, an unfinished or failed project was often put aside and then revived much later. 'They've got enormously long memories and they often want to have another go at something they did even a year or two before.'

Nazma's clay castle with its feudal village was a second attempt — the first castle had collapsed after weeks of work. Katie's first attempt at a pool table had to be abandoned. She did not give up, but agreed that it was more sensible to make a smaller scale model. A flexible approach was important in tackling the pockets for the billiard balls. She wanted to carve these out of blocks of wood but could not find a way to fix them to the main table, or to carve deeply enough. Dave let her pursue this idea till she was personally convinced that it would not work. Then he suggested she go back and look at a real pool table. She returned the next day having decided to make the pockets out of string bags.

Resources

Compared with some primary schools, the classrooms were not well resourced. There was almost no balsa wood, few saws and no clamps. Like many inner city schools stocks are depleted through thefts and lack of money. The teachers were philosophical:

> *Dave:* The children learn to plan and make do with what there is. It also gives a purpose to their planning, because they know someone will probably have to go and buy what's needed and that they can't afford to be wasteful.

> *Neil:* (9): I made a big picture of owls because we were doing work about animals. Dave said make a book, but there wasn't any card for the covers, and the paper wasn't strong. so I asked could I use corrugated card because its strong. The problem was to fix the pages inside. In the end we used material to stick them.

Progression

In this small scale case study it is difficult to discuss progression systematically because there was no attempt at rigour in research method. It would be most inappropriate to do more than make broad qualitative observations and I will limit myself to tentative remarks, looking at the following areas:

- identifying needs
- making plans
- implementing plans
- self evaluation and modification of plans
- attitudes

Identifying design needs

I have already mentioned that needs were usually identified in a personal or domestic context. There is a tension here between the Technology Order which also requires children to consider designing in the contexts of community, business and industry. This is something I will return to later in this article.

Younger and older children were sometimes engaged on activities where they had defined their task in similar ways, for example, to make a puppet theatre so they could put on a play, or make a house with furniture or a vehicle for a fictional character. In all these cases, the project was very close to the children's own experience and entailed no research to identify needs. This does not mean that progressive ability to identify and meet needs would not have been possible, but simply that in these cases we have no evidence of progression. If teachers are concerned with progressive ability to identify and meet needs, they will have to ensure that children's projects incorporate criteria which can be looked at in a developmental way. I will return to this in my concluding remarks.

Making plans

As I have described above, both teachers encouraged making actual plans and working 'planfully'. There is evidence of progression in children's work from the youngest to the oldest. Reception children found the actual drawing of plans very difficult, did not work from them, and often seemed to be thinking of the next move as they worked rather than planning ahead. They were inducted into the planning process by other children and by teachers. Teachers encouraged children to list (with help) what would go into a model, and try and draw a plan, knowing that their representation might fall short of the implementation. For the younger children, learning the skills involved in drawing a plan was often in the context of recording what had already been made.

Seven year olds had become accustomed to drawing a plan before they started making something, and to trying to work from it. As might be expected, the sophistication and accuracy of these plans

Neil and Marcus with their owl book.

improved with practice and age. Six year olds drawing a plan of a house before making it used a mixture of pictorial representation and the conventions for plans. Younger children were not seen attempting to sketch solutions to a design problem, but older children voluntarily did this. They also attempted to work out details such as joints or moving parts on paper, and assembled the appropriate materials in advance. This was encouraged by the need to buy or collect resources, and give a teacher a 'specification'.

Implementation of design

One would expect to see increasingly sophisticated and complex solutions to design problems as children got older (as well as increasingly complex problems). This was noticeable both in pupils' ideas, and in their own satisfaction with solutions. Five year old boys (James and Joseph) making a lorry were satisfied to join parts by wrapping masking tape round the whole structure. However, Kamal at 9 carefully made hinges to fix legs on tiny chairs and a bed. Hannah and Dawn (5 and 6) stuck crudely cut paper and material to a large sheet to represent buildings and apparatus in a park. Nazma (9) created a miniature castle and village in 3 dimensions from clay, card and paint. The wheels of 6 year old Joel's turtle car could not revolve, and he was not concerned to have them do so. However, 11 year old Mansur and his 8 year old friend Meruf together made a robot with jointed knees and a moving head.

It was important for the teachers to look back over the progress of their pupils over three years and to value what they were doing at the time, knowing from experience that they would move themselves on as and when they were ready.

Self evaluation — AT 4 and beyond

Self evaluation includes but goes beyond AT 4 in the Technology Order, which requires children to evaluate the processes, products and effects of their work. Here I am referring also to reflection upon one's own learning, and willingness to consider not just the product, but one's own developing attitudes and skills. This is linked with issues of progression, since pupils' willingness to set themselves higher standards and be increasingly self critical is an important aspect of development. Older children were noticeably more self critical, able to tolerate a design failing to work or breaking, and prepared to start again, or improve on their early attempt.

Samad (7) (asked what he might change about his lego house) said: 'Its Ok, I'd change the windows, they're wobbly.'

> *Jean* (7): (who had made a house for The Three Bears out of wood and card, including furniture): The hard bit was the triangle bit (the roof). Bradley (a child) showed me but I couldn't do the pointed bit. I'm going to break this one up and make it again and put it right to fit and be straight. I'm going to make it bigger and better and not wonky.
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> *Nazma* (9): My first clay house was too large and it wasn't strong so I made it again. Now I'm making the little houses out of card. It's better. I want to make doors that open.

An observer's eye view

This case study highlights strengths and weaknesses in an approach to design technology based almost exclusively on projects developed through pupils' own interests.

In the time that I was in the school, there was not a great variety of problem setting and approaches. There was an emphasis on artefacts, and little attention to systems or environments. Contexts were largely domestic or fantasy rather than extending into the community or world of work. Decision making about economic issues, the weighing up of alternative proposals and conflicting priorities did not come up. This would need to be looked at and interventions and suggestions made to extend the work, in the ways that Dave and Sarah both mentioned as part of their professional role.

As a corollary, in the child centred contexts I observed, important evaluative aspects of the design process, namely being aware of, identifying and researching *other* people's needs tended to be missed out. Criteria by which children could evaluate the success of their designs in terms of other people's needs were limited and evaluation was expressed in terms of personal satisfaction, concentrating chiefly on the technical execution of their designs.

Nevertheless, the brief descriptions to which this case study is limited, show that many if not most aspects of the Technology Order were being fulfilled. Furthermore, initial reluctance to be involved in construction, designing and making which can be typical of girls, was soon overcome in the younger class, and simply not in evidence among older girls. There is little doubt that children were highly motivated, prepared to accept criticism and be self critical and persevered in attempting to overcome difficulties. Particularly in the older class, where designing and making had become an accepted part of all projects, the standard of ideas, skills and technical problem solving was high.

