Using water play to support designing and making in the early years

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The following design and technology activity was carried out in a large infant school to the north of Birmingham. The school is situated within a mainly privately owned housing estate. The children have an ethnic origin of 80% white, 10% Afro-Caribbean and 10% Asian. Due to expanding numbers this year the school increased the number of classrooms to ten and there are four Reception classes. The design and technology activity took place within one of these reception classrooms, the children all aged five by the time they started the design and make task.

During their first years in nursery and school the children have regular experiences with water play and I thought it appropriate to draw on all these experiences and develop a design and make task. Also, water exploration and play is extremely popular with all children, regardless of race or gender. Rose Parkin (1995) researched the subject of "fair play" in the early years and found similar results: "Sand and water play was as popular with boys as with girls" (p59) when children were given a free choice.

All 24 children in the class took part in the activity but for the purpose of this article I shall concentrate on following the task and its results with a group of six children of mixed sex, race and ability.

The task

Investigative, disassembly and evaluative activities (IDEAs)

- explore the ways in which toy boats behave in water
- look at and discuss pictures of boats/ships in books. Consider size, design, method of movement, use
- free play in water with containers, funnels, water wheels, objects, to explore properties of materials.

Focused practical tasks (FPTs)

- sorting activity – floating and sinking
- use of previous experience to develop prediction skills – carry out experiment and record results
- experiment with polystyrene/plastic trays, yoghurt pots, corks, plasticine, to build up a knowledge of materials which float
- develop skills for making boats e.g. cutting, sticking, use of masking tape.

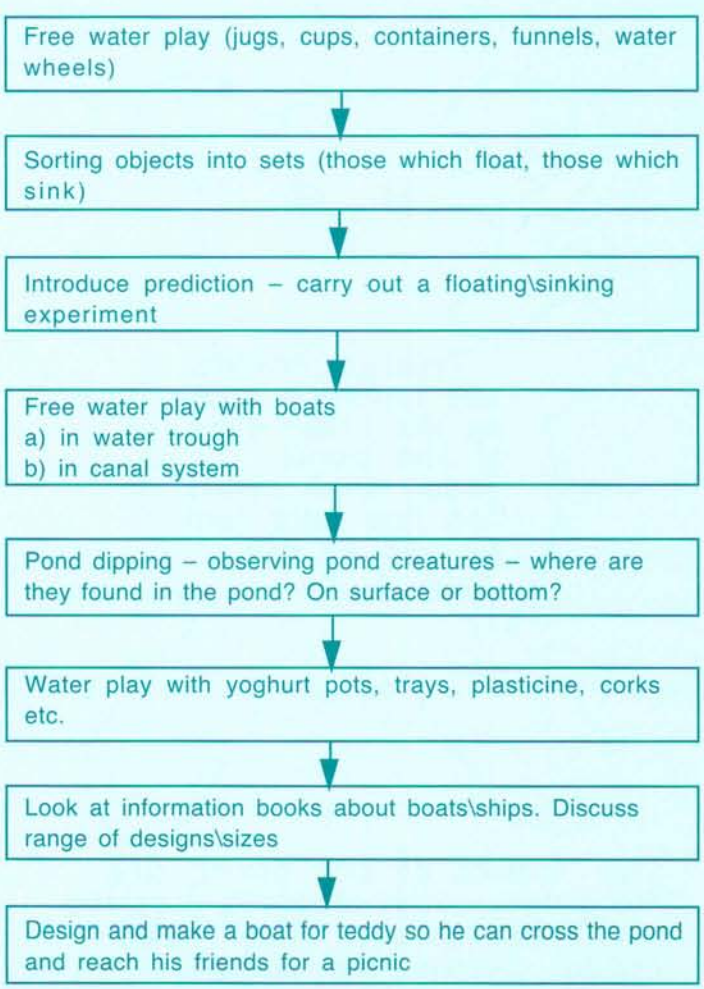
Extension activities

- explore methods of decorating/finishing product in view of waterproofing
- explore methods of movement in water.

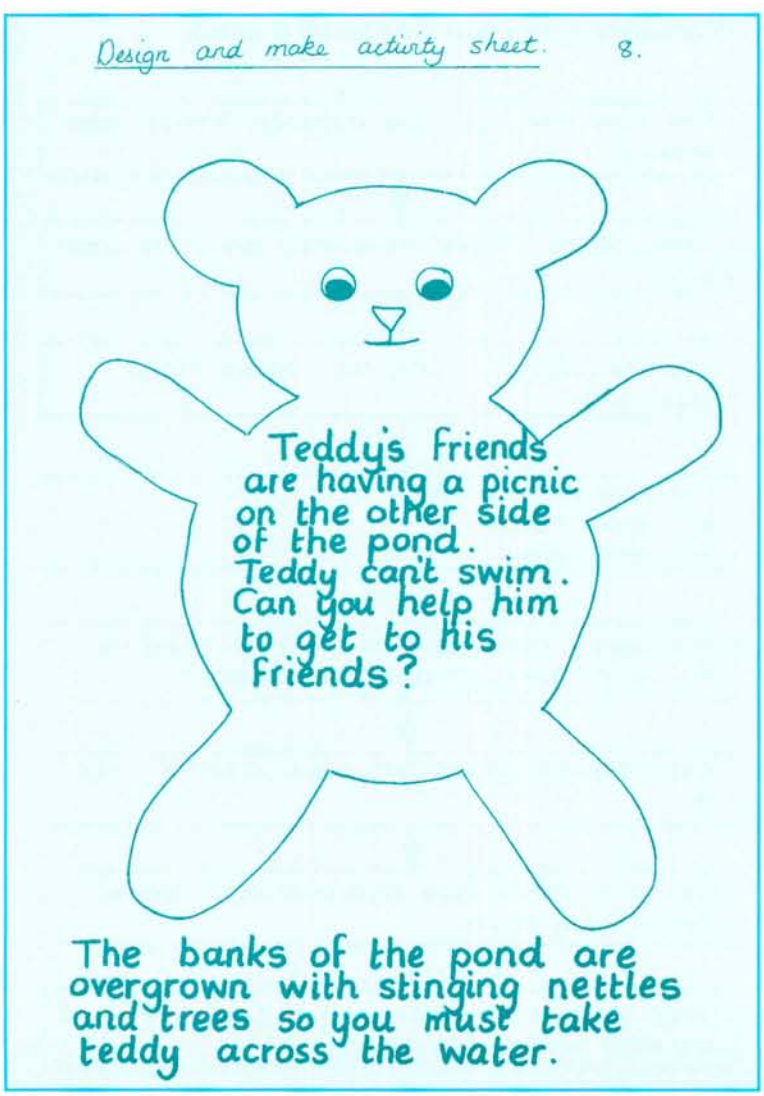
Assessment opportunities

- refer to set criteria - does it achieve criteria
- observation during activity
- discussion and comments
- ability to review and amend.

Development of the design and technology activity



Free water play



Plan for design and make assignment

Title: Boat for Teddy

Time allocation: 6 x 1hr

Context: Help teddy to reach his friends who are having a picnic on the other side of the pond

Materials focus: Sheet materials, Reclaimed materials

Potential outcomes:

- Use of appropriate reclaimed materials which will float
- Construct a boat which will suit teddy's needs
- Use of appropriate assembling techniques to secure construction

Curricular links:

Science
properties of materials
floating/sinking
methods of movements

English
listening to others
talking and discussion
extend in story telling

Maths
measuring
capacity

Resources:
Weighted plastic teddy bears
Water trough/trays
Toy boats
Information books
Polystyrene trays
Plastic trays
Yoghurt pots
Pipe cleaners
Masking tape
String
Straws
Lollipop sticks
Corks
Paper
Card
Glue
Scissors

Learning objectives:

Designing skills

a. draw on their own experiences to generate ideas

b. clarify their ideas through discussion

c. develop ideas through shaping, assembling and rearranging materials and components.

Making skills

a. select materials, tools and techniques

c. assemble, join and combine materials and components

f. evaluate their products as these are developed, identifying strengths and weaknesses.

Knowledge and understanding

b. structures – how to make their structures more stable and withstand greater loads

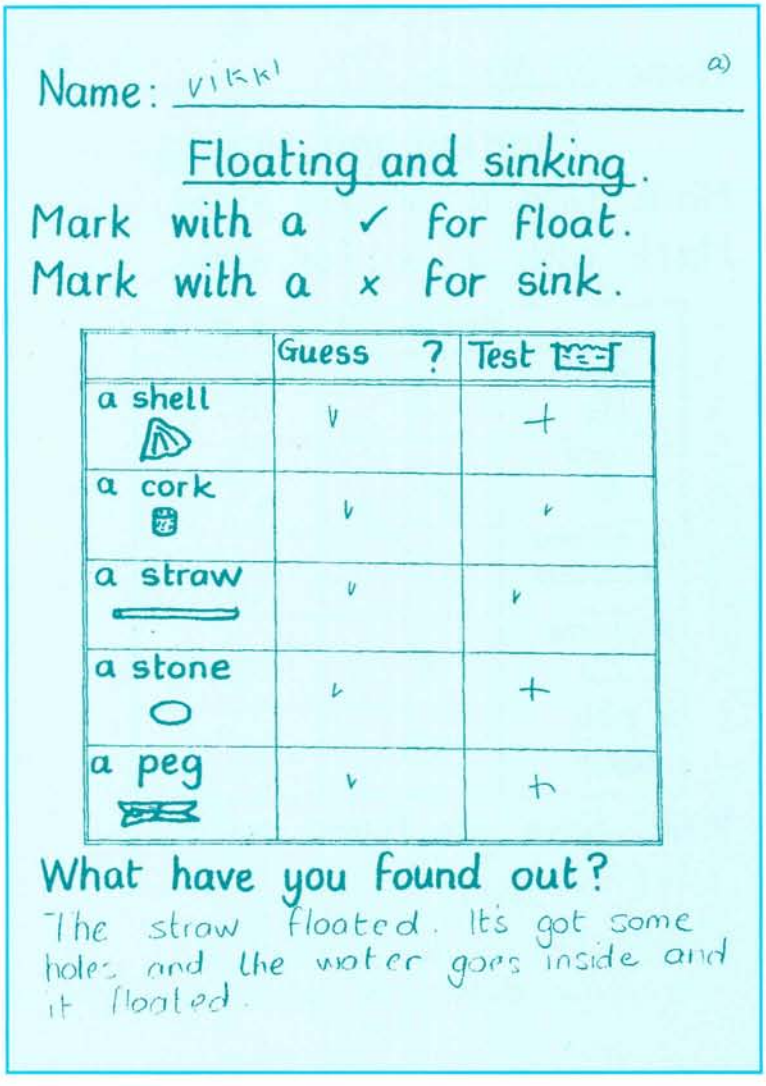
d. products and applications – to relate the way things work to their intended purpose, how materials and components have been used, people's needs, and what users say about them

e. quality – that the quality of a product depends on how well it is made and how well it meets its purpose.

Results of FPTs

The children worked in groups of six to sort a selection of objects into those which float and those which sink. A certain amount of discussion was needed before the activity to ensure the children had a clear understanding of the meaning of the words float and sink. Each set of objects was contained within a sorting ring, labelled and displayed.

The next floating and sinking task was more structured. Five objects were chosen to test – some which would float and some which would sink. The children explored one object at a time and recorded their findings on a prepared worksheet (see samples). Firstly, I asked the children "Do you think the shell will float or sink?" Some children based their prediction on previous knowledge of where shells are found. For example, Gavin said the shell would sink because "shells don't swim in water". David also said it would sink "because it isn't a fish." Their predictions were not based on weight or material properties of the shell.



Name: Vikki a)

Floating and sinking.

Mark with a ✓ for float.

Mark with a x for sink.

	Guess ?	Test
a shell	✓	+
a cork	✓	✓
a straw	✓	✓
a stone	✓	+
a peg	✓	+

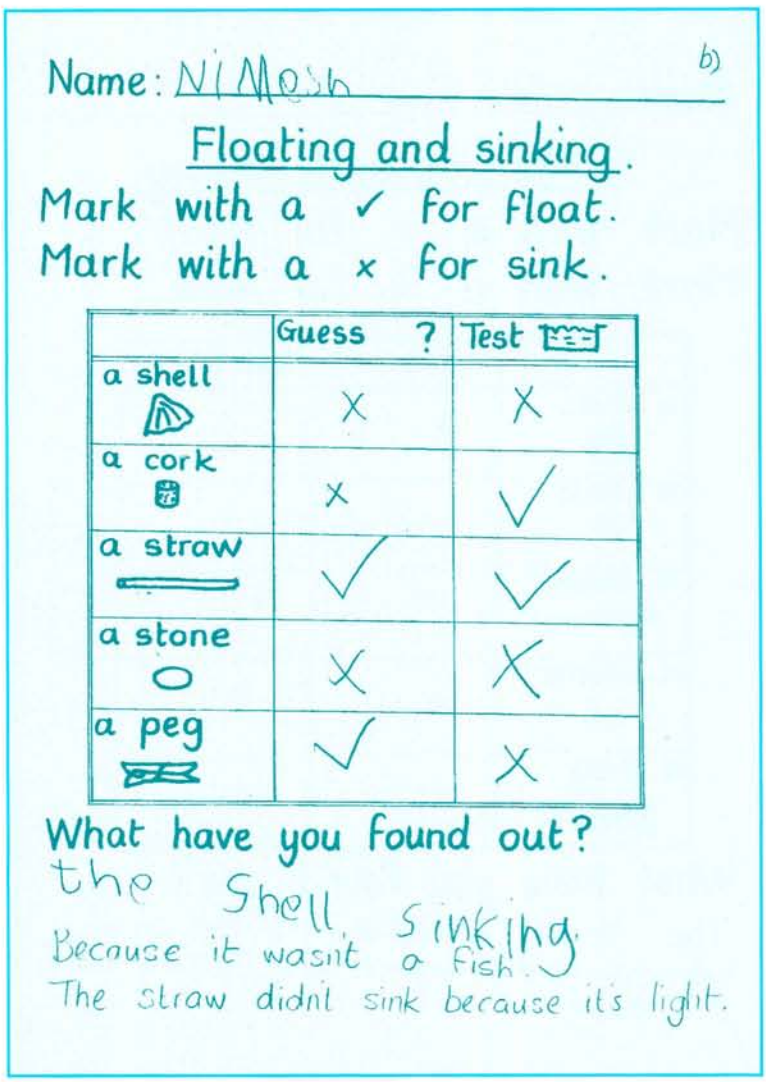
What have you found out?

The straw floated. It's got some holes and the water goes inside and it floated.

Sample worksheet

However, some children had more awareness of the makeup of a straw and used this knowledge to interpret their results. Nimesh said "the straw didn't sink because it's light". Vikki had another explanation as to why the straw floated. "It's got some holes and the water goes inside and it floated"

After the completion of this activity I assessed the amount of knowledge and understanding the children had about the properties of materials. Their experiences to date had only been limited and I needed to extend their experiences before attempting the design and make task. Tina Jarvis (1993) recognises this problem when teaching young children.



Name: Nimesh b)

Floating and sinking.

Mark with a ✓ for float.
Mark with a x for sink.

	Guess ?	Test
a shell	x	x
a cork	x	✓
a straw	✓	✓
a stone	x	x
a peg	✓	x

What have you found out?
the Shell Sinking
Because it wasn't a fish.
The straw didn't sink because it's light.

Sample worksheet

"Very young children have limited experience of the properties of materials they use so are often unable to anticipate how they can be used effectively." (Jarvis, 1993, p.10)

I provided the children with a selection of reclaimed materials such as polystyrene trays, plastic trays, selection of yoghurt pots, corks and plasticine. They enjoyed playing in the water, filling containers and floating trays. They found that the trays floated well even when over turned. Nimesh explained that it was because the polystyrene tray was light: "I know why they're made of plastic, plastic doesn't sink." They could, however, make the trays sink when filled with water. "It sank because it's full of water," said Nimesh.

"What happens to the plasticine?" I asked. The children all agreed it sank. "Can you make it float?" I asked. Chelsey led the group by putting her lump of plasticine in a yoghurt pot. The other children followed her example – but some vessels toppled over with the weight. Daniel then proceeded to mould his plasticine into a flat shape and placed it in the water. "What are you doing, Daniel?" I asked. "Making a boat shape," he replied. Gavin and Nathan tried attaching their plasticine to a cork. "Why are you doing that?" I asked. "Because the cork floats," said the boys, drawing from their previous experiences of floating and sinking. But unfortunately the plasticine still sank!

I felt the children were now better prepared to solve the design and make assignment.

The design and make assignment

The design and make activity was carried out with small groups of four children. The task was set within the story context of a teddy so that the children might find it easy to identify teddy's needs. The criteria for the task were discussed and the children were given an opportunity to suggest the way forward based on previous experiences and imagination.

> "Once the task has been decided ... an open-ended element where the method or detail of the end product is not too prescribed will provide other opportunities for identifying needs" (Jarvis, Routledge, 1993, p7)

The children were encouraged to talk about their ideas and share their thoughts with others in the group. Some children had very clear ideas about what they should do to help teddy cross the pond. "We can use one of those" said Chelsey, pointing to the yoghurt pot, "and make a boat." Nathan picked up a straw and tried blowing teddy across the surface of the water, even though I had previously demonstrated that teddy can't swim because he sank to the bottom. Daniel led the way with an appropriate base for his boat. He chose a plastic tray and the other children followed his example. "Why did you choose that tray?" I asked him. "It's plastic" said Daniel, "and it might float."

They set about constructing their boats – keeping teddy close to hand to remind them of the task. They worked independently on

the whole but occasionally looked around to see what their peers were producing and shared their ideas, for example: "I'm going to make a seat like yours." The use of materials and components became a shared experience also as the group asked each other for help with the cutting of masking tape, straws and string.

Chelsey and Vikki became very preoccupied with teddy's comfort for his journey across the pond. Chelsey made teddy a seat with a backrest, a cover to keep him warm, and a bed. Vikki followed her example and made teddy an armrest and footrest – all made out of paper, card and pipe cleaners. Safety was also a concern for Vikki because she chose to place lollipop sticks across her boat "to keep teddy in". Nimesh put a lollipop stick across his plastic tray and made teddy a seat on top of the stick. He explained that teddy would be able to see where he was going from this viewpoint. He had a problem attaching the stick. He tried glue but it wouldn't hold so he wrapped masking tape round and this worked better.

Daniel was confident and worked on his own with very clear ideas about what he was making. "I'm making a rowing boat," he said, and proceeded to push two lollipop sticks through the sides of his polystyrene tray. He then stuck a cork onto the base of the boat and said "That's a motor." Meanwhile Nimesh was trying out his boat on the water and it floated. "How can you make it move" I asked him "because teddy needs to get to the other side." Nimesh thought a while and then answered. "Blow it with a straw."

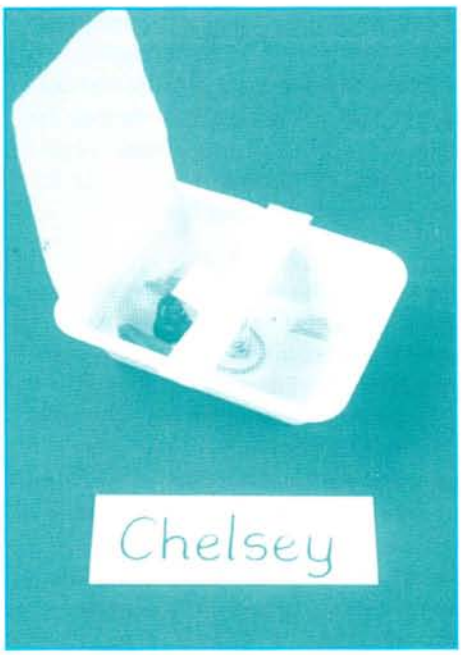
The other children thought this was a good idea and they all used a straw, even Daniel. So I asked him "Is your boat a rowing boat or a sailing boat, Daniel?" "A sailing boat," he replied, and proceeded to rip out the 'oars' and push a lollipop stick vertically into the tray. By this time Daniel's boat was experiencing difficulties because he had cut the tray in half and then tried to assemble it together again with masking tape. The boat started to break up so Daniel attached a sheet of paper under the base of the boat. The paper soon disintegrated in the water so I asked, "Do you think paper was good to use?" "No," said Daniel "it's falling apart". "What can you use instead?" "Card," he suggested, "it won't fall apart." But unfortunately Daniel's boat broke into two pieces when the water soaked through the card. "If you made your boat again, what would you do?" I asked. "I wouldn't cut it down the middle" replied Daniel.

Daniel was keen to try again and when he made a new boat he kept the tray intact. His second attempt was more straightforward, learning from his mistakes, using other children's ideas and adding his own ideas. Like Vikki, he too thought of the safety aspect for teddy and attached rubber bands on the sides of the boat, "in case teddy falls out" Daniel was also taking an interest in David's boat. He realised that David was finding the task difficult and was eager to offer him advice. "Put a cork there," suggested Daniel, "teddy can sit on it and when he wants to, he can get down."

Nathan attached a long straw to the back of his boat. I asked him about it. "It's to get the smoke out," he explained, and then decided to put a brown pipe cleaner into the top of the straw, (to simulate smoke) We had talked about steam boats and looked at pictures in books. Nathan had a problem attaching the straw securely because of its height. He wound lots of masking tape

Chelsey's boat featured a seat with a backrest, a cover to keep teddy warm and a bed

Daniel's second attempt included rubber bands for teddy's safety



round the base of the straw, and although the appearance was untidy it did achieve the purpose. Nathan decided 'oars' might also help teddy's boat to move so he added them to his boat.

Evaluation

As the children progressed through the design and technology tasks they developed a deeper understanding of floating and sinking and how materials react in water. The focused practical tasks provided experimental experiences which the children then referred to when carrying out the design and make activity.

The design and make activity was a success in the fact that the idea stimulated the children's imagination. They were clear regarding what they needed to do to help teddy reach his friends. The focused practical tasks helped develop the knowledge and skills necessary to solve the problem. Further FPTs could have been included in the planning and these may have helped to achieve a more visually attractive and realistic product but on this occasion, given the age of the children and my limited time allowance, I felt it appropriate to take the activity to this stage. Future FPTs could include:

- learning how to attach different materials together e.g. wood and plastic – assembling appropriately
- experimenting with different ways of allowing movement of boats – applying scientific knowledge to include electric motors
- experiments to find out which materials are waterproof, which are suitable to decorate and finish their model.

Throughout the activity there was evidence of children displaying many personal qualities and attitudes, including:

- **Perseverance** in the making and modifying of the products to overcome difficulties
- **Co-operation** in the sharing of ideas and resources; helping others
- **Self-confidence** developed through the success of the design and make activity; developing knowledge and skills

The opportunities for follow-up work surrounding the social context of the task are extensive. A few possibilities are:

- role play using made boats
- write a story about teddy's voyage
- draw a map of the pond and surrounding area – show teddy's route
- what food can teddy take to the picnic? Appropriate packaging
- how many friends can teddy take with him in the boat before it sinks?

It was evident when the children came to carry out the design and make assignment that girls and boys approached the task in different ways. The girls set about making a boat for social play. They were concerned about teddy's daily needs while he was in the boat and needed to be reminded about the task in hand. Would the boat float? Would the boat move? The boys were more concerned with the making process, although when they saw what the girls were doing they tended to 'borrow' their ideas. So even when girls and boys are offered the same choice of activities and materials to use this does not ensure that the learning experiences are going to be the same.

Water is never an easy option to explore in the classroom, especially when space is limited and when, as in my case, the classroom has no wet area or sink. I managed by using a variety of means. Whenever possible I used the outside for free water play. When inside I covered tables with plastic sheeting and filled plastic tanks or storage boxes with water. I also found it necessary to limit the number of children working together at one time to a maximum of four. This allowed me to observe closely what the children were doing and saying, to offer advice and clarify thinking when necessary within the controlled situation of a small group.

It was important that I was on hand during the activity to provide guidance, but I wanted the children to learn from the experience and develop independence. Elizabeth Thompson (1990) carried out a six week study relating to the promotion of individuality and originality in problem solving. She found that.

> "Non-intervention did not promote originality and individuality. It allowed the children freedom to work in their own way at their own pace. Yet they were caught in their own lack of experience and skills" (Thompson, 1990, p112)

This poses the question of how involved the teacher should become. Without instruction it would appear that children do not move forward in an activity but equally they should be given the opportunity to make their own decisions. Tina Jarvis (1993) believes that children

> "need the opportunity to decide what action to take, choose materials and select equipment to use. This will inevitably mean that they make mistakes and have to contend with them, albeit under the guidance of the teacher." (Jarvis, 1993, p3)

At this stage in a child's development it would appear that experiments and designs involve an amount of trial and error. The role of the teacher is to provide appropriate resources, and allow the child to make mistakes. Then the teacher can provide relevant learning experiences and support to ensure progression in the future.

References

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