Teacher Education Design Principle + code:	7. Teacher education should familiarise teachers with a range of formal and informal inquiry- and creativity-based learning, teaching and assessment approaches and strategies and their use in relation to authentic problems within the areas of science and mathematics. **TE: CreatInqPed**
Specific Teacher Outcome(s):	7.2 Teacher should be able to use a range of strategies both formal and informal for supporting children's extended engagement with an area of study and progression in learning in science and mathematics. 7.3 Teachers should be able to recognize and exploit the value of play and exploration in science and mathematics for fostering and extending inquiry and creativity, by for example prompting questions, eliciting ideas, providing opportunities for consideration of alternative strategies during children's familiarisation with phenomena and events.
Factors linked with:	**P: Play;** **P: Scaff;** **L: Formal/Informal;** **M: Inf.** **M: Expl**
Type of material (image – interview (int) – classroom extract (class):	Classroom extract (class)
Originating from:	
Country report :	D4.3 UK (Scotland)
Case:	Case 18
Episode:	Melting and Freezing
Teacher:	Martha
Age Group:	3-4
Selected episode present in D4.4 Appendix	No

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Opportunities for learning over time building on children's interests and responses

In days prior to this episode children had spent time outside observing snow and ice in the nursery garden and had noticed animal footprints. Indoors they had put snow and ice in the water tray and watched it melt. These activities provoked discussion about how animals might survive outside in these wintry conditions and whether it would be possible to turn the water back into ice. On this day Martha had designed two activities to capitalise on these experiences, *Bird Cake*, making bird cake to leave outside for the birds in the garden and *Ice Balloons*, observing yoghurt pots and balloons filled with water and left in the freezer overnight. Both these activities provided children with opportunities to explore the reversible processes of melting and freezing as a result of heating and cooling in different contexts. The activities were adult planned, but built on children's prior experiences and ideas. Examples of children's developing ideas recorded by staff on a class record sheet were used to inform the planning of these activities.

Exploring ice balloons.
Opportunities for observation, questioning and suggesting ideas for investigation

At the start of the day adults and children went to collect the balloons full of water and yoghurt pots that had been left in the freezer overnight.

Martha: I was remembering – do you remember we put some things to freeze? What do you think's going to happen to the water we put in the freezer?
Alara: Cold freeze
Martha: Let's have a look. Let's get a tray.
Alara: It's going to melt because it's warm.

They placed the ice balloons in a tray near the water tray for the children to explore freely. Salt in a pot, pipettes and balance scales were set out nearby. Adults visited the table from time to ask about how children were getting on. Two children, Robert and Alara in took ownership of the ice at the start of the day. They spent time across the day observing the ice, showing other children and taking the tray round the classroom for people to see what the ice looked like and the changes taking place.

Robert and Alara observing the ice balloons

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Robert: Mine is a ball of ice! Wow! Ice is so sticky what happens? *[screaming]*
Alara: And it's sticky and cold – there's snow inside *[on the rough surface]* crystals inside.
[...]
Alara: Ice this is what I was looking for [holding it up]. Do you think it's glass?
Robert: It feels like glass.
Alara: You can see inside it – if you shake it what will happen? It's moving a wee bit. I feel the ice there.
Robert: I've got a bigger one than yours that's why.
Alara: Let's try and get the ice out of it – let's see what happens if you do that *[puts salt].*
Robert: *[He puts it in the dent at the top of the ice balloon]* Keep it in there – see what happens.
Alara: I'll try on mine now.
Robert: Remember when the ice cracked? I heard it crack and then.
Alara: Mine's gone now *[salt].*
Robert: *[Calling to a friend]* Come and look at this. Look at that it's ice.

The children observed that the ice began to melt for example:

Robert: Watch it – see what it does – melting.
Alara: Getting like water. I can see through. You look after them and see what happens – and I'll see if anyone wants to do it. *[She took a tray with her ice balloon round the classroom to show.]*

Interactions between adults and children took place from time to time, expressing interest and excitement in the shared experience of the balloons as they were taken round the classroom. In the afternoon in response to questions about whether the water could be turned back into ice and where it would need to go to freeze, Vera (one of the nursery officers) brought out a thermometer that had a scale from red (hot) to blue (cold) and with the children set out mapping the cold and hot places indoors and out to help decide where to leave the melting ice to freeze again.

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