Using 'Slowmation' for intentional teaching in early childhood centres:
Possibilities and imaginings

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INCREASED NATIONAL AND INTERNATIONAL attention towards early childhood education has resulted in the development of an Australian Early Years Learning Framework (EYLF) called *'Belonging, Being and Becoming*' (DEEWR, 2009) for realising agreed practice, principles and outcomes. The EYLF highlights the importance of educators using *intentional teaching* to deliberately promote many important elements of early education. These include children learning about conceptual development, skills and values. In this paper we show how a new teaching approach called 'Slowmation' (abbreviated from 'Slow Animation'), a simplified way for children to co-construct a stop-motion animation, can be used to support intentional teaching in early childhood settings. We present the outcomes of two exemplars, which used video and field observations to document how scientific concepts become conscious to both children and preservice teachers as they co-constructed Slowmation creations. In drawing upon cultural-historical theory, we argue that Slowmation provides a mediating context where a system of interdependent concepts can be held constant, while the relations between a particular everyday concept and scientific concept can be interrogated through action and thought. Slowmation is an innovative way of realising intentional teaching in early childhood settings as young children co-construct digital animations about science concepts.

Introduction

In 2009 Australia saw the release of the first national early childhood curriculum framework, *Belonging, Being and Becoming* (DEEWR, 2009). More commonly known as the *Early Years Learning Framework* (EYLF), this document sets out to convey 'the highest expectations for all children's learning from birth to five years and through the transitions to school' (DEEWR, 2009, p. 8). Two important pedagogical elements are highlighted in this document: First, the now well-known concept of scaffolding and, second, the pedagogical concept of intentional teaching.

Intentional teaching is a new pedagogical concept to early childhood educators in Australia. This term comes out of 20 years of growing discontent with previous research, which positioned early childhood educators as facilitators of children's ideas rather than taking a more active role in deliberately planning children's learning and teaching (Fleer, 2010). Intentional teaching has been defined by the EYLF as an approach which 'involves educators being deliberate, purposeful and thoughtful in their decisions and actions' (DEEWR, 2009, p. 15). Research has shown that the intersubjectivity between children and adults can be conceptualised in pedagogical terms as *shared sustained thinking* (Siraj-Blatchford, Sylva, Muttock, Gilden & Bell, 2002; Siraj-Blatchford, 2007) and *shared collective imaginary situations* (Fleer, 2011). In the former, children and adults build extended discussions of concepts and ideas. In the latter, adults and children create imaginary situations in their play that are understood across a community of players. In both situations, educators take a more active role in children's learning by deliberately designing and implementing experiences of teacher–child interactions that enact specific pedagogical strategies to foster 'high-level thinking skills'.

We seek to explore two examples of intentional teaching that also build *imaginary situations in play,* involving children in the co-construction of a simplified form of stop-motion animation called 'Slowmation'.

The focus on early childhood educators taking into account children's deliberate conceptual development is not necessarily a widely held view in the field, so

we give two examples of where this occurs. We draw upon Vygotsky's (1987) theory of everyday and scientific concept formation to frame the curriculum investigations reported in this paper, and which underpin the pedagogical theorisation of intentional teaching that we illustrate in the second part of this paper.

A cultural-historical view of *intentional teaching*

In Australia the term *intentional teaching* has been coined to capture the teacher–child interactions that purposefully build concepts, skills and values in early childhood settings. It falls within an international trend for educators to take a more active role in fostering conceptual development of young children. In play-based programs, which deliberately focus on intentionally developing concepts in play, it has also been called *conceptual play* (see Fleer, 2011). This idea has also been conceptualised as developmental teaching in both the Netherlands (see van Oers, 2009) and in Russia (Davydov, 2008); it is known as a *double move* in Denmark (Chaiklin & Hedegaard, 2009), as the play-learning child in Sweden (Pramling Samuelsson & Carlsson, 2008), and is featured in Singapore as *purposeful play* (Ministry of Education, 2007). In our curriculum investigations we are interested to know how this intentionality helps to develop concepts in the everyday interactions children have with each other and with their educators when using Slowmation. In order to better understand how interactions can build concepts, we turn to the work of Vygotsky (1987) for explaining conceptual development.

Vygotsky (1987) stated that children, through their interactions with others and the material world, build intuitive tacit knowledge that is not always consciously understood. For example, when children are in the playground, they do not necessarily think about the range of forces acting upon their bodies as they slide, swing and climb across different surfaces; however, they are experiencing them in action. Here they are engaged in everyday experiences, building everyday understandings about moving effectively and purposefully on the play equipment. This situation explains how everyday or spontaneous concepts may be formed. Intentionally setting up the outdoor area in an early childhood setting to promote deliberate conceptual outcomes might not seem obvious at first. In this example, one aspect of intentional teaching is when the educator has scientific concepts in mind when planning the use of the play equipment. However, it is when the children become consciously aware of specific concepts, such as the forces that are acting while riding their bikes through sand, across a concrete path or over the grass, that a new type of self-awareness may occur, especially if it is highlighted by an early childhood educator. That is, the child can become aware of the path of least resistance, as well as developing understanding of the concept of force, if this is made explicit by an early childhood educator.

The concept of force (e.g. how forces act, forces causing change, pressure, etc.) is known as an academic or scientific concept because it represents knowledge that has been invented by humans for supporting social and economic activity within communities. The concept of force helps explain why it is hard for a child to ride a bike over the grass, and easier to ride it over a concrete path. Because scientific concepts are explanatory inventions, their genesis does not arise in everyday situations without explanation or conscious exploration. That is, it requires an educator to mediate or make conscious to a child the specific concept to explain what is happening in everyday bike-riding or sliding down a ramp. The historical development of a concept is important to recognise in the pedagogical activity (Davydov, 2008), because it gives insights into the essence of what matters in knowledge formation historically at the societal level, but also in relation to what matters to a child in that moment (see also Fleer, 2010 for examples in early childhood settings). That is, teacher professional knowledge of conceptual development has been shown to be directly related to the level of teacher–child interaction (Siraj-Blatchford, 2007; 2010). Educators who understand conceptual development can have sustained conversations with children about what they are experiencing or noticing. These conversations can make conscious in the context of play a specific concept in relation to forces such as friction from various surfaces, *air pressure*, or even that all forces are acting equally when an object is stationary.

In short, scientific concepts and their associated terms often do not come spontaneously to children in an everyday situation, but sometimes need to be explicitly introduced to children in a purposeful and meaningful context. *Shared sustained conversations* through intentional teaching create the necessary space and interaction to help show children in everyday situations important concepts which can transform their thinking – such as when an educator draws a child's attention to the range of forces that are acting when riding a bike or swinging on a swing. Vygotsky (1987) also argued that children need experiences with building both everyday concepts and scientific concepts as they interact with their social and material world. Children need to build everyday concepts in practice, so that they lay experientially forged pathways. At the same time, children need scientific concepts, so that they can give new meaning to their everyday experiences. Educators play an important role here because they can *intentionally* give new meaning and social purpose to an everyday activity, such as when a child climbs up a ladder and slides down a slide (everyday concept).

This can be understood with a scientific framework of a smooth surface not having much resistance and therefore less force than another kind of surface with more resistance and therefore more force acting. When children have an understanding of the term 'force', it can transform their approach to many things they do and give them a word to describe the experience. Although their material world has not changed, how they think about it has, because they have a word and experiences to explain it. Giving a scientific explanation to children's everyday understandings/observations, and exploring these further changes the relationship the children have to their everyday world. Another way to implement intentional teaching is to use a pedagogy that incorporates technology to encourage early childhood educators and young children to co-construct stop-motion animations to explain science experiences.

Exploring a technology-based pedagogy for intentional teaching

'Slowmation' (abbreviated from 'Slow Animation') is a simplified way of making stop-motion animation that preservice teachers and young children can co-construct. The animation is played slowly at two frames per second, enabling the creators to narrate the slow-moving images to explain a science concept or tell a story (Hoban, 2005, 2007, 2009). See www.slowmation.com to illustrate how to use widely available technology to create Slowmations.

In previous research with preservice teachers it was found that a Slowmation animation could be made in one to two hours using existing plastic models or models made from everyday materials such as paper, plasticine and cardboard (Hoban & Nielsen, in press). The creators take digital still photos of the models as they are moved manually. The creation process integrates features of clay animation, object animation and digital storytelling, and previous research (Hoban & Nielsen 2010; Hoban, Loughran, & Nielsen, 2011) has shown that a five-step approach is helpful to preservice teachers when first planning for its use as a resource for learning: (i) research notes; (ii) storyboard; (iii) models; (iv) digital still photographs; and (v) the narrated animation. In short, a Slowmation displays the following features:

- *Purpose*—the simplicity of making a Slowmation enables preservice teachers to make a narrated animation or to co-construct one with young children to explain a science concept. The design can include a range of enhancements to assist in the explanation, such as narration, music, photos, diagrams, 2-D and 3-D models, labels, static images, repetitions and characters.
- *Timing*—Slowmations are usually played slowly at two frames per second, not the usual animation speed of 20–24 frames per second, thus needing 10 times fewer photos than in clay or computer animation—hence the name 'Slow Animation' or 'Slowmation'.
- *Orientation*—models are made in 2-D and/or 3-D and usually manipulated in the horizontal plane (lying flat on the floor or on a table) and photographed by a digital still camera mounted on a tripod looking down or across at the models, or by a hand-held mobile phone, which makes them easier to make, move and photograph.
- *Materials*—because models are usually made flat on a table and do not have to stand up, many different materials can be used such as soft playdough, plasticine, 2-D pictures, drawings, written text, existing 3-D models, felt, cardboard cut-outs and natural materials such as leaves, rocks or fruit.
- *Technology*—preservice teachers use their own digital still cameras or mobile phone camera (with photo quality set on low resolution) and free movie-making software available on their computers (e.g. iMovie or SAM Animation on a Mac, or Windows Movie Maker on a PC).

We believe Slowmation offers the potential for bringing children's everyday concepts and educators' (and some children's) scientific concepts into a shared sustained interaction, so that the dialectical relations between these can be explicitly explored. We also believe Slowmation can offer a collective imaginary situation (Fleer, 2011) for extended activity, discussion and thinking. The relations between everyday concepts and scientific concepts are central to conceptual development (Vygotsky, 1987) and this process generates theoretical knowledge and dialectical thinking. In this paper we focus on everyday concepts and scientific concepts and argue that they each forge foundational pathways which constantly interact with each other. How Slowmation achieves this is the focus of our curriculum investigation, with two exemplars illustrated in the following section.

Curriculum investigations

Two key features make Slowmation likely to be suitable for use in early childhood settings. First, the number of manipulative materials such as plastic toys, felt cut-outs and existing models make the approach highly suitable for young children. Second, the stop-motion technique can be halted at any time, allowing children to ask questions and discuss ideas at each step of the animation process. This facilitates the immediate social interaction between children and the educator which is so important in an early childhood setting. This

process is very different from making a video, which mainly needs continuous filming and time-consuming editing and often misses the 'moment' for discussion. While studies have been done on using Slowmation in university teacher education classes (Hoban, 2010; Hoban, Loughran & Nielsen, 2011) and in schools (Hoban, 2005), none have yet been conducted in early childhood settings. To explore the approach in an early childhood setting, especially as a way to implement intentional teaching, the following curriculum question was devised:

> *How can Slowmation be used to implement intentional teaching in early childhood settings and in what ways do the preservice teachers and educators co-construct conceptual awareness with young children?*

Documenting exemplars of intentional teaching

The current curriculum investigation was conducted during 2010 (Hoban) and 2011 (Fleer) and was documented as a series of curriculum exemplars to examine how Slowmation could be used by early childhood preservice teachers in early childhood settings. Although the focus was on curriculum development and analysis, it is important to understand the pedagogical approaches needed to effectively implement Slowmation. We argue that in curriculum investigations it is also important to analyse 'contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident' (Yin, 2003, p. 13). In this investigation the phenomenon is the use of Slowmation teaching approach in the real-life context of an early childhood setting. The curriculum investigation was conducted using a cultural-historical conception of the categories for analysis (Vygotsky, 1996; 2004), and together these guided curriculum observation, analysis and interpretation.

Setting 1: Southern University

The first curriculum was associated with a university in the southern region of Australia, and in Singapore. The early childhood centre itself was located in a middle-class region of Singapore where the concept of *purposeful play* is featured in the curriculum. The focus of the investigation was the interaction between a preservice teacher and a four-year-old child as they co-constructed their Slowmation. The preservice teacher was a regular preschool teacher who was upgrading her qualifications. The child was observed at play at home and in the community. Three hours of field observations and photographic documentation were gathered to build the curriculum profile of the child's everyday experiences and concepts. The observations and the corresponding Slowmation creation formed the two major assessments for the preservice teacher. Observations suggested that visiting the park was a favourite activity of the focus child.

Setting 2: South-Eastern University

The second curriculum investigation took place in an early childhood centre at a university south of Sydney. It is a large centre with five rooms, and the investigation took place in a room with 24 children aged three–five years and a mean of four years. The children were separated into eight groups of two–three and each group was taught a science experience by two preservice teachers for a half-an-hour at 2.00 pm every Wednesday for five weeks. Each lesson had explicit outcomes as a feature of intentional teaching, and afterwards there were two more experiences so the children could co-construct a Slowmation with the preservice teachers as an assessment of the science they had learned in the previous five weeks. The last two lessons were video-taped.

Curriculum analysis

Both curriculum projects used a three-pronged and interrelated approach to analysis known as the dialectical approach to understanding children's development (see Hedegaard and Fleer, 2008). Level One of the analysis involved a commonsense approach; all the observations and photographs/video were viewed and organised into clips/folders which represented activity associated with play, intentional teaching, and Slowmation creation. The second level of analysis involved examining the clips/folders for practices around everyday concepts and scientific concepts, and specific forms of intentional teaching. The third level of analysis involved a thematic approach, which sought to examine interpretations across observations/folders/sets for multiple evidence of specific concepts/activity and preservice teacher intentionality.

Outcomes of curriculum investigations

Exemplar 1: Intentional teaching at Southern University

In 2011, preservice teachers at both the Australian campus and the campus in Singapore participated in a compulsory subject entitled *Early Childhood Science and Technology*, where they were requested to undertake field work in an early childhood centre associated with the development of a curriculum program using Slowmation. Intentional teaching in Australia and purposeful play in Singapore framed the curriculum investigations the preservice teachers undertook. The preservice students were asked to look closely at making conscious to their focus child the chosen scientific concept in meaningful and relevant ways through the use of Slowmation. An example from one preservice teacher, Christine, is presented

Table 1: Observations of Sophia in the park

Sophia was at Pasir Ris Park with her grandparents, two uncles and me. She led Uncle JJ and me to a spinning equipment that she discovered earlier. She sat on it and requested Uncle JJ to spin her.
Sophia: *Spin!*
Me: *How should Uncle JJ do it?*
JJ: *You should know how to spin it yourself ...*
Sophia: *Hold on tight.*
JJ: *Yes hold on tight* (started to spin her)
(Sophia grabbed on tightly to the pole.)
JJ: *Later you'll be very giddy, you know.*
Sophie: *Don't worry!* (which also means: you can spin fast; I can handle it).
(Uncle JJ turned the knob fast and Sophia squealed with excitement).
JJ: *Giddy already ... Slow ... The other way.*
Sophia: *Faster faster faster!*
Me: *Is your head spinning too?*
Sophia: *No, but the wheel is ...*
Sophia: *Faster and faster* (squealed with excitement again).
JJ: *Slower ...*
Sophia stood up and next was Uncle JJ's turn. He stood on the spinning equipment. Sophia held on to it with one hand and ran. She gave it a push and observed how it continued to spin without her holding on to it. He squatted down and the equipment slowed down. He exclaimed, 'stop!' She helped by using her arm and body strength to bring him to a complete stop.

Figures 1 and 2: Observations of playing in the park

here, as an exemplar of how everyday concepts and scientific concepts are brought together in a curriculum investigation using Slowmation for the preservice teacher's focus child.

In this section we discuss the observations of everyday interactions and concepts, followed by a discussion of how these were turned into a Slowmation curriculum investigation. We specifically focus on purposeful play and intentional teaching. Pedagogical and curriculum planning are shown to illustrate the nuances between teacher knowledge of science, the focus child's engagement with Slowmation, and the way concepts were consciously considered to provide a platform for thinking and acting in new ways within the focus child's everyday world.

Everyday concepts in everyday life

In Table 1 below we provide an extract from the preservice teacher's observations of the focus child, Sophia. It is evident that, through her everyday interactions of playing in the park, Sophia has developed everyday understandings of how she can use and move playground equipment.

The preservice teacher has specifically observed and noted the kinds of interactions Sophia had with the with equipment, noting in her observations how Sophia was using her body within the system of forces that were acting. The preservice teacher also noted Sophia's observations of how the equipment was behaving, and how she was using her body. These intentional observations of Sophia's everyday concepts allowed her to meaningfully analyse Sophia's everyday concepts with the view to considering how she might develop a shared and sustained scientific conversation in the preschool related to forces.

Table 2 shows the preservice teacher's analysis of both the everyday and scientific concepts associated with force.

Table 2: Scientific concepts related to Sophia's everyday concepts evident when playing in the park

Everyday concepts:	Scientific concepts for intentional teaching (Science—Physics):
• Sophia knows that Uncle JJ can make her spin faster; she uses the term 'faster'. • Sophia is aware that when it spins too fast, there is a danger of falling off. • Sophia knows that she can stop Uncle JJ from moving by using her arms and body strength.	• Force is required to get a still object to start moving. The greater the force, the greater the speed. However, the friction between the object and the surface slows down the speed. Force exerted in the opposite direction of the moving object will cause it to slow down or stop.

Table 3: Slowmation as a tool for intentional teaching

Intentional teaching in action	Photographs of the process are documented
Plan from observations: I decided to set up a playground scene to teach scientific concepts related to physics.	
Storyboard: Sophia and I wanted two characters to be playing in the park. We chose two of her toys, named 'Piggy' and 'Doggy'. I prompted her to think about what they might be doing in the park, and she thought they would be playing with the equipment: see-saw, the spinning equipment we found in Pasir Ris Park (we decided to call it a merry-go-round), slide, football and scooter.	Figure 3: In the park 
Model: Together, we moulded these playground objects using plasticine, a roller and a plastic knife. Instinctively, Sophia picked up the models and engaged in pretend-play (see photograph). She was also exhibiting some egocentric speech as she narrated what/how the pig was doing or feeling on the spinning equipment. This was a moment that exemplified what Fleer (2010, p. 141) argued, 'the imaginary-creative dimensions of activity are totally dependent upon the richness and diversity of the child's previous experience'. In other words, Sophia's wealth of experiences at the playgrounds formed the basis of her imagination and creativity displayed in this situation.	Figure 4: Making the model 
Co-creating the script: This was the critical juncture when I intentionally planned to illustrate some of the scientific concepts through the interactions of the characters as I took the photographs. For instance, Piggy gave Doggy a hard push and he went spinning very fast, and Doggy gave a light kick to the ball which did not travel far enough to reach Piggy. These are multiple examples of the same scientific concept on forces creating motion and affecting speed and distance. The other two examples (i.e. see-saw and slide) address another concept of forces, gravity as a pulling force.	Figure 5: Image from Slowmation creation 
Narrated animation: Script S for Sophia ('Doggy') C for Christine ('Piggy') S: *Presenting in the park, science in the park.* S: *Yay, see-saw, I can go up and down. Why can't I go up?* C: *Hello Doggy, that's because gravity pulls you down. But I'm heavier than you. See, now I go down and you go up. Just give a little kick and we will go up and down, up and down.* S: *Thank you, but now I want to play on the slide. I am climbing up. Wheee. See, I came down so fast. Ah-ha, that's because gravity pulls me down.* C: *You are right, Doggy.* S: *Watch me, OUCH ...* C: *Oh dear, be careful, Doggy.* S: *Okay. Shall we play on the merry-go-round, Piggy?* C: *Sure, why not? Do you wanna go fast or slow?* S: *Fast, very very fast!* C: *Okay, then I will have to give you a very big push! Watch out!* S: *Oh! I am spinning so fast! I can't stop! HELP!* C: *Okay, let me give you a little push in the opposite direction then.* S: *Oh man, I am so giddy.* C: *Ha-ha, I'm sure. Hey look, there's a football; shall we play? I'll kick it to you. Kick it back to me.* S: *Ha (kicking action).* C: *Doggy, you kicked it too lightly. Try again.* S: *Okay.* C: *Oh-oh, you have to kick even harder than this.* S: *Ha (kicking action).* C: *Yay, that's good. Now back to you! Now I am going further away. See if you can make the ball travel far and fast.* S: *No problem, I will kick it really hard. There you go. Piggy, you went the wrong way.* C: *He-he, oopsy, let me try again.* S & C: *Aren't we having so much fun?* S: *Gravity pulls you down.* C: *Gravity pulls you down.* S: *A hard push will make something spin fast.* C: *A light push will make something spin slow.* S: *A light kick will make the ball move a little.* C: *A strong kick will make the ball travel far.* S & C: *The End. Hope you enjoyed the show.*	Sophia was fascinated to see a 'movie' when we had been taking still pictures instead of a video clip. I narrated the accompany script once through on my own so that she could understand how the two work together to make sense. Thereafter, she got involved by taking on the role of narrating Doggy's parts. As it was a slow animation, I had time in between to check Sophia's understandings by asking her questions such as 'Why do things fall to the ground?' or 'What makes a ball travel fast and far?' I argue that Sophia's involvement in Slowmation set the stage for a shared sustained interaction between her everyday concepts in the park and the educator's (myself) scientific concepts. Figure 6: Image from Slowmation creation 

The preservice teacher intentionally planned for Sophia's conceptual development by bringing together her everyday concepts with scientific concepts through actively re-creating the park as a model (Davydov, 2008). Two soft toys chosen by Sophia were used as the characters in her Slowmation, and plasticine was used to reproduce the play equipment in the park.

In Table 3 we see the planning associated with the Slowmation creation for Sophia where storyboarding, modelling, co-creating the script, and the final narrated animation are shown alongside a sample of Slowmation photographs taken for the final animation.

Intentional teaching as shown in Table 3 gave more purpose to their model-making of playing in the park (Slowmation creation), and provided additional opportunities for the focus child to explore new scientific understandings about force. Through re-creating the playing in the park the focus child had to think about the playground equipment in a new way (force). The preservice teacher and the child created a script to explain the science. Viewing the photographs as animation made explicit elements of the narrative, which featured both everyday and scientific concepts.

Children aged four and five years need structural devices such as Slowmation to bring previous activity and learning forward to other events and activities on subsequent days. Slowmation allowed concepts to become more visible to both the preservice teacher and the focus child, and both developed new scientific understandings about the concept of force.

Exemplar 2: Intentional teaching at South-Eastern University

Intentional teaching was one component of an elective subject for early childhood preservice teachers at the South-Eastern University in second semester 2010. The purpose of the elective subject, *Science and Technology for the Early Years*, was 'to provide students with an understanding of curriculum, teaching approaches, science activities and theory related to implementing science with children birth–five years'. There were 17 students enrolled in the elective subject.

Intentional teaching was incorporated into the 13-week elective subject using a three-phase framework of planning, implementing and assessment. In *Phase (i) Planning* in weeks one–four, the preservice teachers were placed in pairs and allocated science topics relevant to the three–five-year-old children, as well as visiting the early childhood setting. The allocated topics included dinosaurs, jungle plants, cooking, plants, under the sea, weather, the body, and life cycles. During these four weeks the preservice teachers learned how to make a Slowmation in a two-hour workshop and prepared experiences and resources consistent with intentional teaching. The teachers were encouraged to use a variety of teaching approaches, including modelling, discussing, asking questions, problem solving, speculating and role-modelling as part of intentional teaching. In *Phase (ii) Implementation* in weeks five–ten, the students went to the early childhood setting each week to teach a half-hour experience to their allocated group of children concerning their specific

Table 4. Summary of intentional teaching experiences

Experience	Question	Intentional focus	Activity
1	What did dinosaurs eat?	Dinosaurs that are plant-eaters are called herbivores and have blunt teeth for grinding leaves. Dinosaurs that are meat-eaters are called carnivores and have sharp teeth for ripping meat.	Read a book about dinosaurs focusing on their teeth. Look at a range of models of dinosaurs, examining their teeth.
2	Where did dinosaurs live?	Dinosaurs lived in different areas; some lived on land, some in the sea and some could fly.	Construct a habitat using plastic dinosaurs.
3	How did dinosaurs die?	Some dinosaurs died from being near volcanoes that erupted.	Make a model volcano.
4	How did dinosaurs die?	Some dinosaurs died from changes in temperature of the atmosphere.	Use a model of the Earth and a model of asteroids that hit the Earth.
5	How do people find dinosaur bones?	Dinosaur bones and teeth make fossils which can be found on Earth. Revisit topic of dinosaur teeth.	Use a 'dinosaur dig up kit'.
6	Take digital still photos.	Teach the children how to take digital still photos as the plastic dinosaurs are manually moved.	Set up a tripod and teach the children how to take digital still photos as the dinosaurs are manually moved, to create a stop-motion animation.
7	Make narration.	Have the children record a narration as an assessment approach of their conceptual development.	Play the sequence of photos in the animation as the children explain it as a narration to document their conceptual development.

topic. In *Phase (iii) Assessment* in weeks 11 and 12, the preservice teachers co-constructed a Slowmation with the children to ascertain if the children could recall any of the knowledge they had been taught in the previous five experiences. In week 11 the children assisted in taking the digital still photos and moving the plastic models for the stop-motion technique. The preservice teachers then used their computers to make the Slowmation. In week 12 the children provided the final step, to record a narration to explain what they had learned in the previous experiences. The content of the experiences that were intended to be taught, as planned in phase i and implemented in phase ii, is summarised in Table 4. The three main outcomes addressed in the experiences in relation to the EYLF were 'Children are connected with and contribute to their world', 'Children are confident and involved learners' and 'Children are effective communicators'.

The EYLF (2009) suggests that intentional teaching needs to have 'examples of evidence that educators may observe in children as they learn' (p. 19) which can include encouraging children to talk, make choices and decisions, play with other children, interact with resources and use tools, as well as investigating and solving problems. Slowmation provides an opportunity for young children to use technology to co-create a digital animation as an outcome of their learning.

The co-creation was done in two parts. In the sixth experience, a workstation was set up with the dinosaur models in a garden, with a digital still camera mounted on a tripod looking down and across at the models. It was explained to the children that the main purpose of taking the photos was to demonstrate the two types of dinosaurs, especially in relation to their teeth. Two of the early childhood children helped the preservice teachers to move the models, while a teacher helped one of the children to take a digital still photo of each manual movement. In all, about 30 digital still photos were taken of the stop-motion movements. The children then swapped roles. The purpose of the final experience was to see if the children could record a narration as a verbal explanation of what they learned from the previous experiences. After several trials, this was the narration one of the children provided to explain different types of dinosaurs:

> *This is a movie about dinosaurs*
>
> *And this is a herbivore eating a leaf with its blunt teeth*
>
> *And here is another herbivore eating another leaf with its teeth*
>
> *And here's a T-Rex creeping and knocking over a dinosaur and eating its neck*
>
> *And it's going over and knocking over another dinosaur and eating its tummy.*
>
> *The End.*

The following figure shows some of the still photos accompanied by the child's narration.

Figure 7. Still photos from Slowmation with child's narration

		
'And this is a herbivore eating a leaf with its blunt teeth.'	'And here's a T-Rex creeping and knocking over a dinosaur and eating its neck with its sharp teeth.'	'And it's going over and knocking over another dinosaur and eating its tummy.'

The child's narration shown in Figure 7 suggests that he recalled what he had learned several weeks earlier, which indicates that the intentional teaching about the different types of dinosaur teeth was achieved. When the 52-second Slowmation was shown back to the children, they wanted to know when it would be shown at the local movie theatre.

Discussion and conclusion

With the introduction of the term 'intentional teaching' in the Australian *Early Years Learning Framework*, there will no doubt be many interpretations of how it can be implemented. This paper shows two ways intentional teaching can be conceptualised and enacted in practice through 'Slowmation'.

The curriculum investigation sought to focus on the nature of intentional teaching by using Slowmation to teach young children about explicit scientific concepts as well as skills in using technology. The exemplar from Southern University shows how a child's everyday concepts and experiences of playing in the park were intentionally expanded to build the scientific concept of force through the creation of a Slowmation animation. The exemplar from the South-Eastern University showed how intentional teaching was used to teach young children about the adaptations of dinosaurs' teeth for eating. Although it is generally accepted that young children like to play with dinosaurs, it is unlikely that they would have learned about particular teeth structures without intentional teaching that focused the children's thinking on these features. In both exemplars, the skills in using technology such as taking photos with digital still cameras was also an outcome of the intentional teaching. Through children co-constructing an animation about their experiences (dinosaur teaching program or everyday playing in the

park), they were able to discuss aspects of force (e.g. gravity pulls you down) and make links between the structure and form of dinosaur teeth and what they ate. The co-creation of the Slowmation was a visible artefact of the learning experienced by the children. Furthermore, when the narrated animations were shown to the children, it created additional questions and discussion and acted as a resource to support further conceptual development of other children.

A key feature of using Slowmation for intentional teaching is the discussion created through the social interaction of using technology and the physical co-construction of the stop-motion animation. In particular, engaging young children in making a Slowmation with early childhood teachers provides a context for supporting concept formation (Vygotsky, 1987). That is, the children gave new meaning to the dinosaur 'objects'—as herbivores—and, through the enactment of the narrative, they were able to think and act scientifically, thus entering into a shared imaginary situation where scientific discourse featured. As such, children were using their concrete experiences of interacting with the preservice teachers using the model dinosaurs, which were then translated into an explanation in the Slowmation. This playful narrative approach was familiar because it is how children act in play—giving new meaning to their objects, and co-constructing imaginary situations with other children. This was also noted in the science and technology teaching unit on being in the park. There the children were also giving new meaning to park objects, as the characters in the narration engaged in a scientific world of forces.

It can be argued that you cannot have intentional teaching if concepts and skills are not made explicit to children. Slowmation provides a sense of purpose for exploring scientific concepts. As such, making a Slowmation provides a means for teachers to support young children by helping them to articulate what they have learned, using concrete materials (Vygotsky, 1966; 1987). In making a concrete product such as the narrated animation, action and thoughts are therefore transformed into a visual product. What we notice in both exemplars is a possible new scientific self-awareness on the part of the children, providing an engaging way for them to 'make their ideas and theories visible to others' (DEEWR, 2009, p. 35). In our curriculum investigations, Slowmation acted as a vehicle for framing intentional teaching, and this is one way to support the principles, practices and outcomes set down in the EYLF.

Finally, we do not see intentional teaching as a dichotomy to conventional 'emergent' or serendipitous interactions that have commonly been used in early childhood centres for many years (e.g. NSW DoCS, 2008). There can be a dialectic relationship between intentional and emergent forms of instruction whereby serendipitous interactions are used in context with the social interactions created by 'educators being deliberate, purposeful and thoughtful in their decisions and actions' (DEEWR, 2009, p. 15). For example, intentional teaching can be used to help children become aware of key concepts, which can then be extended with instruction based on the characteristics and interests of the children. The key to achieving the right balance is to develop each child's high-level thinking skills. Furthermore, as with all pedagogical approaches, there are strengths and limitations for particular contexts. For example, because Slowmation involves the use of technology, such as digital still cameras and computer software, it can be staff intensive. However, there is clearly a role for intentional teaching, especially when introducing technology in early childhood settings. Our curriculum investigations suggest that educators who use intentional teaching to deliberately introduce new ideas and concepts to children with Slowmation generate new areas of interest for children. Importantly, Slowmation offers a window of opportunity for both children and staff to become aware of scientific concepts to help them explain their world, using a wide range of manipulative materials and technology that already exist in early childhood settings.

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