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Balancing play and science learning: Developing children's scientific learning in the classroom through imaginary play

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Abstract

We know a lot about the teaching of science in the early years, where we use models of teaching, such as *Discovery learning, Process approach, and Guided inquiry.* These models begin with the science concept. But what if we want to begin with children's play? In this presentation we will look at a model of teaching science that begin with imaginary play. Through a case example of children playing being characters in the story of Robin Hood of Sherwood forest, we will explore how imagination in play supports imagination in science. We will also look at other case examples through videos of practices, children's drawings, plans, and designs. The model presented is called a *Conceptual PlayWorld for the intentional teaching of science.* It was developed from ten years of research in early years settings through a series of educational experiments. The 5 characteristics that make up a *Conceptual PlayWorld* are: selecting a dramatic story, designing an imaginary space, planning entry and exit, planning the science problem, and considering the role of the teacher. The pros and cons of beginning with the science concept or beginning with children's play will be explored, and a discussion on how to balance play and learning of science in the early years will feature.

Promoting science learning through imaginary play or developing children's play through science learning

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There are many ways of teaching science in the early years - children spontaneously learning science when playing (left side) to children formally learning science concepts in the classroom (right side). We can plan science learning by beginning with an imaginary play situation, where science concepts are introduced into children's play. We can also plan for learning by beginning with the science concept.

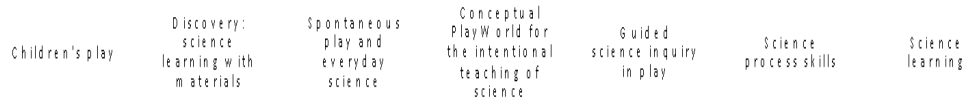


Figure 1: A continuum between play and science learning (Copyright Conceptual PlayLab).

We can capture the continuum between play and science learning in these models of science teaching -

1. *Discovery learning:* Provision of materials for self-learning, such as a science table or display in a preschool.
2. *Process approach:* Development of scientific skills, such as observing, classifying inferring, etc. For example, giving children hand lenses and inviting them to observe something specific, such as a seed.
3. *Guided inquiry:* Setting up a problem, and children research the solution in small groups, such as, how to make dirty water clean?
4. *Conceptual PlayWorlds for the intentional teaching of science:* Creating an imaginary play situation where problems arise that need STEM concepts to keep the play going, such as, in the story of Robin Hood who needs help with getting into the castle, but does not know about the mechanics of drawbridges.

Whilst the first 3 teaching models are well known, the fourth may not be. Therefore, we showcase this approach through the example of the story of Robin Hood from Sherwood Forest.

Developing children's imaginary play (Robin Hood) and imagination in science (How to get the treasure out of the castle) is supported through the 5 characteristics of a Conceptual Playworld for learning science (Simple machines). The imaginary play situation can last a morning, or it can take place over a whole term.

Table 1: Planning a Conceptual PlayWorld for the intentional teaching of STEM (Fleer, 2020)

	Characteristic	**Details**
1	Selecting a dramatic story	The story of Robin Hood was selected because it if full of drama and excitement – social problems arise because children want to help the villagers who are poor. There are many different kinds of adventures (chapter books) or storylines that children or teachers can introduce so that the imaginary play situation can be dramatic and go for days, weeks or even months.
2	2. Designing an imaginary play space	The outdoor area with its play equipment becomes Sherwood Forest. The climbing equipment becomes the castle, where a drawbridge with a double pulley can be secured.
3	3. Planning the entry into the Conceptual Playworld	The fort becomes the time machine that takes the children back into the time of Robin Hood. Entry into the time machine has a count down and children are taken back in time. Children return to the classroom through the time machine.
4	4. Planning the problem that needs science concepts	*Problem 1:* How to get into the castle to rescue the treasure to give back to the villagers who are starving. *Research:* Find out how drawbridges work. Making prototypes of castles and drawbridges. Studying YouTubes of the science of drawbridges.

		Problem 2: Designing an escape plan to quickly remove and then to hide in Sherwood Forest. *Research:* Google Earth to look at castles, their school, their neighbourhood. Parent shows the children how to draw from a bird's eye view, front view, cross sections – to help them design their plans. Look at books of castles with cross sections. *Problem 3:* Friar Tuck goes into the time machine and visits the children, carrying a letter from the Dragon who is stuck in the dungeon and needs help. *Research:* After visiting the Castle Engineer back in time, the children plan a simple machine to retrieve the treasure. Children look at YouTubes of cranes, and the science surrounding cogs and wheels. *Problem 4.* How to design a simple machine to retrieve the treasure. *Research:* The children use a pulley system, role play being links in a chain, cogs and wheels, and make with support a prototype of their simple machine.
5	5. Planning the role of the teacher	The teachers are characters in the play, taking on a role, and role-playing together with the children. Sometimes they ask for help, sometimes they give help, and sometimes they do things equally together. The different roles allow the educators to model or support the asking of questions, the investigation process, predicting, planning and trying out ideas, gathering evidence, discussing the evidence, presenting and communicating their ideas etc.

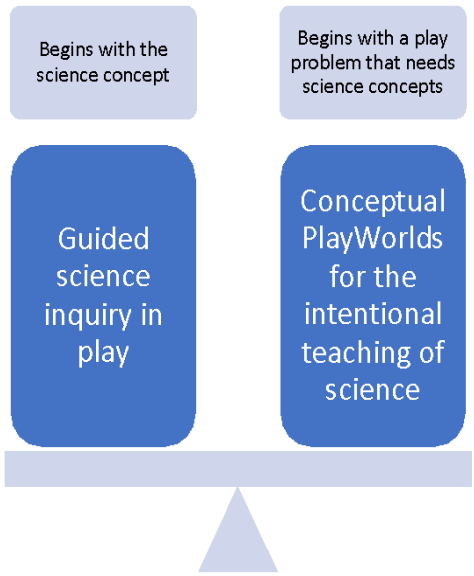
As teachers we need to make decisions about what approach will work best for the particular children and the setting, along with considering our own beliefs about how children learn and develop. How do we preserve the child's wish to play and systematically deepens their explorations for the learning of science concepts? There are pros and cons for all approaches to the teaching of science learning.

Table 2: What are the pros and cons of beginning with the play or the concept?

Beginning with play		**Beginning with the science concept**	
Pros	*Cons*	*Pros*	*Cons*
Children are highly motivated in play. When they want to help the character solve the problem,	Children may not be interested to bring science concepts into their play.	The science concept and the process skills drive the learning activities. There is more confidence that	Children may not be motivated to focus on the science or the process skills.

they are really in tune with the science concept.		the science is being covered.	

Figure 2 invites you to consider the balance of play and science learning in your program.



What is key for effective learning is planning a program that brings to children not just scientific lenses for understanding their world, but a passion and motivation for scientific activity and thinking. Play motivates children's science learning and a conceptual PlayWorld to take this forward in a systemic way.