

Reflection of S.T.E.M. Activities using nature and recycled resources

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Introduction

The following report lists learning witnessed during a grade 2 classroom's (50 students) Junk and Nature playground session over a two-hour period. The resources provided were five 44 gallon drums full of 1.5-2.5 metre branches, 5 old pallets, rope, 50 litres of Barossa Valley Biscay mud, a pop up mud kitchen, various junk musical instruments, and assorted loose parts. The teacher's role was to observe emergent learning (Student led), and help with conflict resolution, if needed. For most of the students, this activity was play in uncharted waters. When questioned on nature play some suggested that was something you could do at a zoo.

Content descriptors witnessed.

Mathematics

measurement

Compare and order several shapes and objects based on length, area, volume and capacity using appropriate uniform informal units (ACMMG037)

During cubby construction many of the students needed more branches to complete their constructions, from a nearby pile. One student needed to grab some pieces that were around 1800mm. They used a 1800mm stick as their informal measuring template. They took it to the nearby pile and grabbed a random stick and eyeballed the two next to each other. She threw that choice to the side and used her 'measuring stick' to search out two more, 'roughly' the same length.

Identify practical activities and everyday events that involve chance. Describe outcomes as 'likely' or 'unlikely' and identify some events as 'certain' or 'impossible' (ACMSP047) using the language of chance, and explaining reasoning.

During loose parts nature play many students were witnessed 'weighing up their options'. Whether it was precariously balancing a branch on top of a bunch of other branches, or jumping over a blue barrel, they were predicting the likelihood of a successful outcome. 'What are the chances of this branch, actually staying on top where it is required and what is the chance of it falling on top of my head'. When a high probability was assumed, the activity was attempted. If the branch balancing proved to fail 80% of the time they deduced a low probability of success and went on to choose something else. Through experience, they were better able to calculate the probability of success, as they measured the data collected through previous attempts.

Describe the features of three-dimensional objects (ACMMG043)

What better way to explore the properties of a cylinder, than to roll around inside one? Maybe roll around in one with a friend while another friend pushes you. Exploration of the blue barrels enabled the students to examine cylindrical features such as:

- Cylinders roll
- Cylinders are harder to roll when there is one or two people inside.
- When inside if you lay lengthways you will roll
- If you roll fast the force spits you out of the open end

In regards to the students describing these features, they couldn't help but narrate their experiences, with observations such as "Don't roll when I'm trying to get on, wait until I'm on top" and "Oh My God! It spat me out!" "one of you will have to get out! I can't roll it", "can we roll it on the asphalt. It's easier"

The stick construction induced a lot of shape talk. A group of students explained why they made a square around the bottom of their Tee-pee. "we put a border that touch every pole and it made a square, because it turned into a pyramid". Another builder informed me he made a triangle cubby because the square one fell down. "Triangles are easier to make strong" he added.

Year 2 Math standards

Students recognise the features of three-dimensional objects.

This was evident when the students discussed created structures, faces, corners, edges and shapes.

Students order shapes and objects using informal units

This was evident when students used sticks as a benchmark for choosing similar sized sticks for building construction. Students were also witnessed using steps to measure a span that needed bridging. Some used their body height, to select suitable sticks.

English

Literacy

Interacting with others

Listen for specific purposes and information, including instructions, and extend students' own and others' ideas in discussions (ACELY1666)

This happened all over the play area. One student invented a 'jumping over the barrel' game with a sequence of steps needed to play it. He communicated these to a couple of friends. They wanted to add a few more steps, but were vetoed. Once the student demonstrated the game, the other two joined in. Many building teams communicated strategies needed to successfully build. "you have to hold these two sticks while I tie them together", 'go and get a couple of branches that are longer than this one" and "What if we use this stick to hold up this end, while that one gets threaded through the fence". Many of these statements led to extended discourses focused on sharing ideas and reaching common construction goals.

Use interaction skills including initiating topics, making positive statements and voicing disagreement in an appropriate manner, speaking clearly and varying tone, volume and pace appropriately (ACELY1789)

Voicing disagreement in an appropriate manner was very evident throughout the session. From interchanges such as:

A: "Hey! Those are our sticks! We put them there".

B: "Can we just take a couple?"

A: "OK"

to impersonating a family member (a Mum serving tea) while dishing up a delicious mud pie;

A: "Would you like some Pie? I cooked it myself"

B: "Yes Please. Have you got any coffee to have with it?"

English standards

When discussing their ideas and experiences, students use everyday language features and topic-specific vocabulary.

This was evident when students would discuss stick creations, such as the tee-pees. They would switch from a vocabulary based on construction "Tie the knot onto the top two branches!" to role-playing vocabulary "no wolves are allowed in here!". While role-playing in the mud-kitchen they would use inflections based on observations of home life and media "the dinner is nearly cooked, it will be ready in five minutes", yet flip back to instructional dialogue "Hey, don't throw Mud!".

Science

Chemical sciences

Different materials can be combined for a particular purpose (ACSSU031)

The elaborations of this descriptor state "*sorting and grouping materials on the basis of observable properties such as colour, texture and flexibility*". The students were gathering branches for cubby building. Important properties needed were similarities in size and diameter, as these attributes were required to construct a certain shelter. The students were observed sorting through piles of sticks looking for the 'right' ones.

Earth's resources are used in a variety of ways (ACSSU032)

One thing that was obvious to many students was the fact most of the resources used came from nature. The branches were used to construct shelters, throw, (like spears), and make climbing frames out of. The rocks were crushed up into powder and used to make body paint (it made a cool zombie skin effect).

Physical sciences

A push or a pull affects how an object moves or changes shape (ACSSU033)

One student was observed hooking a pallet up with some rope. He loaded it up with some objects and attempted to pull it across the grass. He struggled as it moved slowly along the grass. Once it hit the asphalt it quickly sped along, much to his delight. Another student noted how the open end of the blue drum went from circle to oval when her friend bounced on it.

Use and influence of science

People use science in their daily lives, including when caring for their environment and living things (ACSHE035)

An elaboration of this descriptor states *'exploring how different cultures have made inks, pigments and paints by mixing materials'*. The students were soon aware of the paint properties of the black Biscay mud. Objects were painted and so were people. The white calcrete, crushed in the recycled railway sleeper pestle and mortars, added a contrast and different texture to the slimy mud. The students made the connection between the fun they were having and certain Indigenous cultures traditional practices.

Pose and respond to questions, and make predictions about familiar objects and events (ACSI037)

An elaboration on this descriptor states *'thinking about 'What will happen if...?' type questions about everyday objects and events'*. You could observe this thinking process all over the site, from students weighing up the option of, what will happen if I climb on top of this cubby, to, what will happen if I add all of this water to this powder I just made. The environment presented many challenges to their thinking. Resources were getting used in ways they hadn't experienced before, so outcomes had to be predicted. Many 'what if's' were put to the test, with surprising results. The students did not expect their structures were able to hold their own weight let alone the weight of a stout teacher.

Year 2 science standards.

- By the end of Year 2, students describe changes to objects, materials and living things
- They identify that certain materials and resources have different uses.....

One of the many properties of mud is its constant alteration of form. As the students engaged with the mud, it moved from crumbly sticky plods, to runny, watery, slimy soup. At one stage they could use it to make a rissole, or throw at a target. The next it was like dark paint, difficult to wash off. By adding dry, crushed rock, it went back to a more solid form. You could see some student transfixed by its morphing properties. Some were learning for the first time, of its ever changing form as they made cakes, went back for more mud, yet now they couldn't get it to stop from pouring out of the cake tin (friends added a few more litres of water while they were 'cooking'). By describing what they saw, and felt, they were describing changes to materials, which is year 2 science standard.

Many of the students understood the origin of the Mobile Junk and Nature Playground resources. The science standard states *'students identify resources have a different use'*. This was evident when they were rolling around in a blue barrel. The blue barrel was now a fun toy, yet they were aware it was once an industrial container used to carry liquids. The musical drums once held cooking oil, and the cubby walls were once pallets used to store boxes at a hardware store.

Arts

Create compositions and perform music to communicate ideas to an audience (ACAMUM082)

The junk drums encouraged students to explore rhythms and polyrhythms. The drums were set up in groups, while some were so large, groups could play just one. This social arrangement leads to students creating rhythms. Some were a collection of students playing the same rhythm together, while others worked out complementing polyrhythms, where each student plays a part, and together they create a whole. Not only does this activity fulfil an arts role, it also builds a sense of wellbeing, as drums have traditionally been used to encourage a trance like meditational state.

Once the students composed a piece of music that impressed them they were eager to share it with others, and short impromptu shows abounded.

Arts Standards

Students improvise, compose, arrange and perform music.

(See the above paragraph to support this standard.)

Design and Technologies Knowledge and Understanding

Identify how people design and produce familiar products, services and environments and consider sustainability to meet personal and local community needs (ACTDEK001)

The whole Mobile playground encourages sustainability. The students were informed beforehand, that nothing before their eyes came from a shop. It was all sourced from a sustainably grown forest, or from societies waste. The fact that a whole playground could be created for free got a lot of students thinking. Many wanted to know how this was done, as they wanted to be able to source similar resources.

Explore the characteristics and properties of materials and components that are used to produce designed solutions (ACTDEK004)

This content descriptor was observed through much of the cubby building. One student asked if a branch was strong enough to support her weight. I asked how would she find out. She said "swing from it?". Once she swung from it, she understood one of its properties.

Design and Technologies Processes and Production Skills

Explore needs or opportunities for designing, and the technologies needed to realise designed solutions (ACTDEP005)

Use materials, components, tools, equipment and techniques to safely make designed solutions (ACTDEP007)

Use personal preferences to evaluate the success of design ideas, processes and solutions including their care for environment (ACTDEP008)

Technology standards year 2

Students create and evaluate their ideas and designed solutions based on personal preferences. Following sequenced steps, students demonstrate safe use of tools and equipment when producing designed solutions.

Movement and Physical Activity

Moving our body

Perform fundamental movement skills in a variety of movement sequences and situations (ACPMP025)

Create and participate in games with and without equipment (ACPMP027)

Learning through movement

Use strategies to work in group situations when participating in physical activities (ACPMP030)

Propose a range of alternatives and test their effectiveness when solving movement challenges (ACPMP031)

Health and P.E. Standards year 2

They identify areas where they can be active and how the body reacts to different physical activities. Students demonstrate positive ways to interact with others. They select and apply strategies to keep themselves healthy and safe and are able to ask for help with tasks or problems. They perform movement sequences that incorporate the elements of movement.

Cross-curriculum priorities

Aboriginal and Torres Strait Islander Histories and Cultures and sustainability.

The three cross-curriculum priorities are salient subjects embedded throughout all disciplines. Nature play and junk play are useful activities to help develop a deep understanding of aspects related to two of these priorities. The school has a considerable indigenous cohort (above national percentages), and the session was part of the 2016 reconciliation week. One of the cross-curriculum objectives is designed to develop respect and recognition of the world's oldest continuous living cultures. During this play the students have a lot of time to reflect on the Indigenous culture through hands on engagement with the resources and technologies available pre-colonisation. One Indigenous student commented on the 'Humpy' he was building. "My Dad builds humpy's" he said. Other non-Indigenous students discussed what it would have been like, building shelters when there were no shops around.

In regards to sustainability, everything in the mobile playground either comes from sustainably grown forest, or recycled from community waste. This aspect does not go by unnoticed by the students. An innate hunger for knowledge had most students questioning the origins of the resources. Many able to identify the origins themselves. By 'playing' with recycled, and re-imagined resources, the overt consumer based view of modern society can be addressed. If they experience enjoyment by playing with 'junk' then the reliance of the latest toy as an object of satisfaction, can be watered down a little.

Summary

This two-hour session revealed a great amount of learning led by students play. Many content descriptors were met, and many standards reached. While forward planning is a powerful tool for curriculum design, this session showed emergent curriculum can also produce results measurable against the Australian Curriculum. Looking at this activity using the lens of the Reggio Emilia's 'environment as the third teacher' concept, creating a learning environment, full of open-ended resources, can develop students learning in multi-disciplines. Students natural inquisitive nature can lead to areas of learning not envisaged by the teacher. Hence, watching students engaged in mathematical tasks of estimating amounts, and lengths of branches needed for a set construction, also developed social skills such as leadership, equity, empathy and communication. The mud kitchen showed students ability to informally measure capacity and volume, yet also showcased their understanding of their home culture, through their role-playing. Sharing home culture practices during role-play is an inclusive activity which develops understanding and acceptance of diversity. The school where this activity took place is looking at installing a permanent nature and recycled play area in the near future. If this learning occurred over a two-hour period, it will be interesting to see what happens when it is always available.