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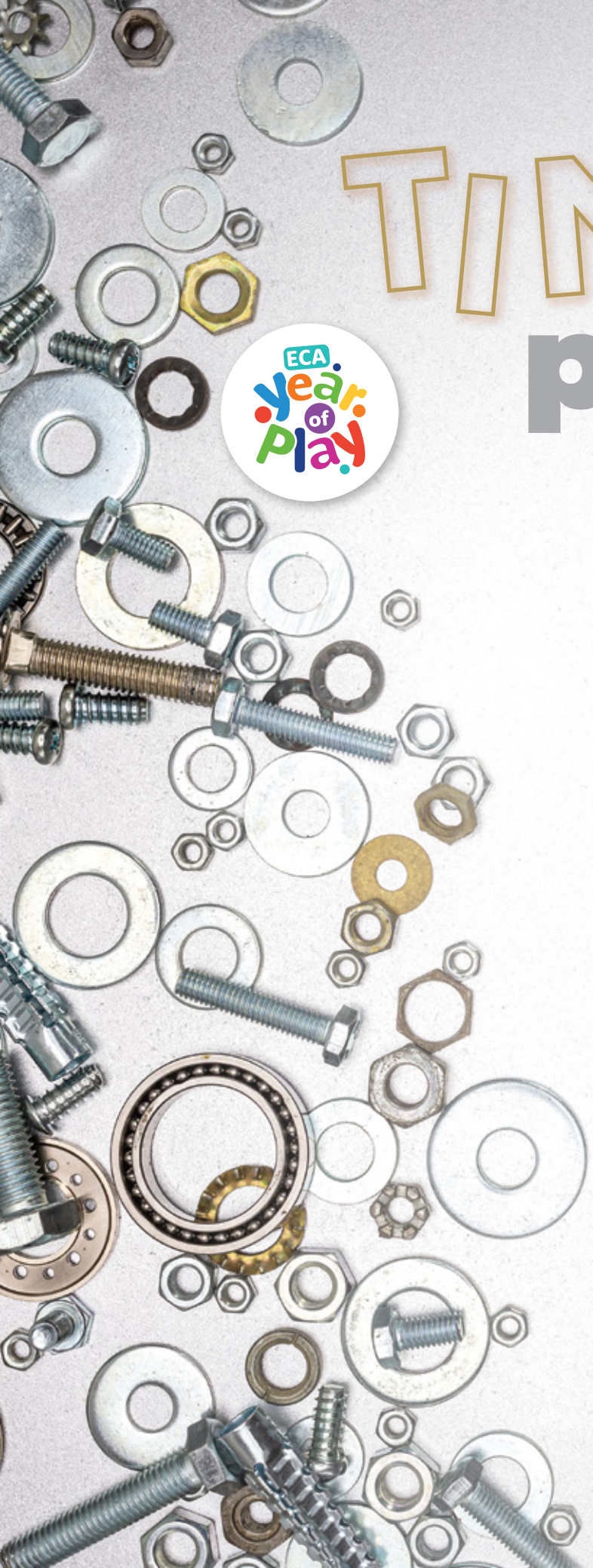


TINKER play

with unplugged tech

Tinkering with non-working digital technologies, writes **Honor Mackley**, a Brisbane-based primary teacher and ECEC researcher at Australian Catholic University, increases children's wellbeing, boosts active learning and interest in technologies, and lays the groundwork for play-based learning with functional technology.

What is tinkering?

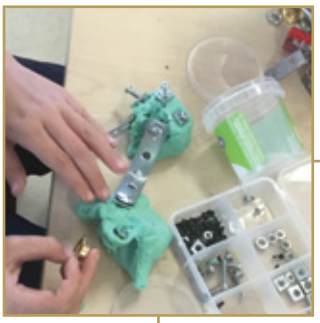
What comes to mind when you hear the term 'tinkering'? People often associate tinkering with fixing, taking things apart and constructing in open-ended contexts. Closely aligned with play, tinkering is characterised by unstructured experimentation, investigation and discovery through processes of making and creating.

Young children are natural tinkerers. They love to explore, use their hands to take materials apart, figure out how parts work together and reassemble materials in new, imaginative ways. Tinkering develops many different kinds of learning, ultimately fostering curiosity about the mechanics of everyday objects and materials.

Tinkering with unplugged technologies

Recent research, conducted by the author as part of an ongoing PhD study, looked at the specific types of learning arising from tinkering, aligned to the *Queensland kindergarten learning guideline* (QCAA, 2018) and the *Early Years Learning Framework* (EYLF) (DEEWR, 2009), when kindergarten-aged children tinkered with 'unplugged technologies'. Unplugged technologies are non-working digital technologies that are literally 'unplugged', that is, non-operational and disconnected. In this research, unplugged technologies included old computer keyboards, computer mice and game controllers sourced from e-waste recovery outlets.

Three kindergarten educators at Habitat Early Learning in Brisbane guided children through a series of iterative tinkering workshops, identifying learning outcomes through observations and reflections. First, the children were introduced to real tinkering tools like screwdrivers, metal screws, nuts, bolts and metal brackets, along with playdough. They were invited to explore the tools and materials using the playdough as a base to experiment with different ways of manipulating and combining the resources. The educators modelled safe and effective ways of using the tools, encouraging fine motor coordination and manual dexterity. Each child (and educator) was provided with age-appropriate eye protection (safety goggles) to wear during tinkering at all times.



Once children showed confidence and independence in manipulating tinkering tools, the educators introduced a range of unplugged technologies with provocations to use the tools to explore and investigate the technologies and deconstruct them into smaller parts. The educators observed that the children showed keen interest in and active engagement with the artefacts. All unplugged technologies were cleaned and 'pre-tinkered' with by an adult to remove batteries, power supplies and sharp components, such as microprocessors, before the children interacted with them. In addition, some screws were removed and others loosened for easier access by little fingers and hands.

The educators followed the children's interests in unplugged technologies by introducing them to some basic concepts relating to digital technologies. For example, computer keyboards, mice and gaming controllers were explored as input devices that send information to the 'computer brain' (CPU) for processing before displaying that information on output devices, including monitors, speakers and printers. The educators supported development of these concepts through discussions, modelling, open-ended questions and support materials such as diagrams, books and YouTube clips.

Children's developing concepts about technologies were evidenced in their play during the final tinkering workshop. During this workshop, deconstructed unplugged technologies, tools and playdough, were provided to the children with an open-ended invitation to create, make and innovate according to their individual interests. Children experimented with combining the materials in exciting and imaginative ways, and many of the children's creations were inspired by everyday familiar digital technologies such as iPads, keyboards and gaming controllers.

Tinkering tools (available from hardware retail outlets)

- Child safety goggles, lightweight with clear lenses
- Mini 'stubby' flat-head and Phillips head screwdrivers, lightweight with thick, textured handles for sturdy grip and ease of motor control
- Variety of machine and self-drilling screws with flat (non-sharp) bottoms
- Variety of metal brackets

Learning identified by educators

Through their observations, the educators concluded that children's tinkering experiences could be mapped onto all five learning areas/outcomes described in the QKLG and EYLF. Some learning outcomes were observed more frequently than others. For example, QKLG's 'Wellbeing' (EYLF LO3: 'Children have a strong sense of wellbeing') was noted by educators as consistently evidenced through observations of children's increased manual strength and fine motor coordination, alongside their safe manipulation of tinkering materials.

QKLG's 'Active learning' (EYLF LO4: 'Children are confident and involved learners') was also frequently observed by educators through children's consistent demonstration of curiosity and enthusiasm for learning, along with problem-solving and investigating skills. In addition, children were described by educators as showing imagination and creativity through their innovations, actively exploring inventive ideas and processes.

The educators also identified children as 'showing interest in technologies', one of the 'Significant learnings' under QKLG's 'Active learning' area. This was evidenced through children exploring the purposes and functions of the range of technologies, and then applying that knowledge to inventing their own creative versions of technology. Overall, the tinkering experiences were described by the service as setting a precedent for play-based learning with technology.

After participating in this research project, Habitat Early Learning subsequently developed a Manual Arts Program. Resources such as hammers, powerless drills, screwdrivers, nails, loose parts and wood, donated by families and local community services, have been incorporated into the service's curriculum to continue the provision of tinkering opportunities. Through this program children continue to develop fine motor skills and confidence when using a range of tools, and are able to create purposeful structures that represent their understandings of the world around them.

References

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