

Developing a bug house within a garden environment provides a meaningful example of how early childhood education can promote sustainability through practical, nature-based experiences. Early childhood education for sustainability (ECEfS) is based on the understanding that young children are capable participants in creating sustainable futures and should be supported to develop environmental awareness, responsibility, and respectful relationships with the natural world (Davis, 2015). Sustainability education is not limited to teaching children about environmental problems. Rather, it involves developing values, attitudes, relationships, and actions that encourage children to become active contributors to sustainable communities (UNESCO, 2020). Creating a bug house supports these principles by enabling children to investigate biodiversity, engage with living organisms, and develop an appreciation of ecological interdependence. However, a critical evaluation must also consider that such experiences are only meaningful when they are embedded within a wider culture of sustainability rather than being isolated environmental activities.

A key principle of early childhood sustainability education is developing children's connection with nature through direct experiences. Sobel (1996) argues that children need opportunities to develop positive emotional connections with the natural environment before being introduced to complex environmental concerns. He suggests that focusing too heavily on environmental problems at an early age can create "ecophobia", where children develop fear or helplessness rather than empowerment. A bug house project reflects this principle because it enables children to experience nature through curiosity, exploration, and care. Instead of learning about biodiversity as an abstract concept, children can observe insects within a habitat they have created themselves. This allows children to develop empathy towards small creatures and recognise that insects have an important role within ecosystems. Such experiences support the view that sustainability education should begin with meaningful relationships with the natural world.

The development of a bug house also reflects constructivist theories of learning, where children actively build knowledge through interaction with their environment. Piaget (1952) proposed that children construct understanding through exploration and experiences rather than simply receiving information from adults. A bug house provides opportunities for children to investigate, observe, question, and make

predictions. For example, children may explore why certain materials attract insects, why some insects prefer dark spaces, or how different creatures contribute to the health of a garden. Through this process, children develop early scientific skills while constructing their own understanding of ecological systems.

Vygotsky's (1978) sociocultural theory further supports the educational value of the bug house experience by highlighting the importance of interaction and adult guidance. The educator's role is to scaffold children's thinking through sensitive questioning and discussion. Rather than simply telling children facts about insects, practitioners can encourage deeper thinking by asking questions such as "What do you think insects need to survive?" or "Why do you think this material is useful for the bug house?" This approach supports children's problem-solving skills and encourages collaborative learning. Therefore, the bug house becomes not only an environmental project but also a context for developing communication, reasoning, and social skills.

The activity also reflects the principles of play-based learning that are central to early childhood education. Play provides children with opportunities to explore ideas, take risks, and develop understanding through active participation. Davis (2015) argues that sustainability education in early childhood should involve participatory experiences where children are able to make decisions and influence their environment. When children choose materials, design the bug house, and decide where it should be placed, they develop a sense of ownership and agency. This supports the view of children as competent individuals whose ideas and perspectives should be valued.

The bug house project links closely with international and national sustainability policies. The United Nations Sustainable Development Goals highlight the importance of quality education that supports sustainable development, environmental responsibility, and biodiversity protection (UNESCO, 2020). In particular, the activity connects with Sustainable Development Goal 15: Life on Land, which focuses on protecting ecosystems and biodiversity. By creating a habitat for insects, children gain practical understanding of how human actions can support other living organisms. The use of recycled and natural materials, such as pieces of

wood, bamboo, leaves, and stones, also encourages children to consider concepts of reuse and reducing waste.

Within Wales, sustainability is increasingly embedded within early years policy. The Curriculum for Wales identifies sustainability as an important aspect of learning and encourages children to develop an understanding of their relationship with the natural world (Welsh Government, 2022). Early childhood environments are encouraged to provide opportunities for children to explore outdoors, develop curiosity, and understand their responsibilities towards the environment. A bug house project supports these expectations because it creates an authentic learning opportunity where children can experience environmental concepts within their own local context.

Furthermore, the activity supports children's participation and agency, which are central principles of contemporary early childhood practice. Children should not be viewed only as future citizens who will contribute to sustainability later in life; they are already capable of participating in sustainable actions (Moss and Petrie, 2002). Through caring for insects and maintaining the bug house, children become active participants in environmental responsibility. This reflects a democratic approach to early childhood education, where children's voices and decisions are valued.

A further strength of developing a bug house is the potential contribution to children's understanding of biodiversity. Research suggests that many children experience reduced contact with natural environments due to increased urbanisation and changes in lifestyles (Louv, 2005). Louv (2005) argues that reduced engagement with nature can negatively affect children's environmental awareness and wellbeing. Although the concept of "nature deficit disorder" remains debated, research broadly supports the benefits of children having regular opportunities to engage with outdoor environments. A bug house provides a simple and accessible way of increasing children's interaction with nature within gardens and early years settings.

Despite these benefits, a critical evaluation must acknowledge potential limitations. A bug house alone does not guarantee meaningful sustainability education. There is a risk that sustainability becomes reduced to occasional environmental activities, sometimes referred to as "green activities", without children developing a deeper understanding of wider sustainability issues. For example, children may understand

that insects need habitats but may not explore broader issues such as climate change, pollution, or habitat destruction. Therefore, educators need to extend children's learning through continued observation, discussion, documentation, and reflection.

The role of the practitioner is therefore essential. If the focus becomes simply constructing the bug house, children may view the activity as a craft project rather than an opportunity for ecological learning. Effective sustainability education requires educators to reflect on children's experiences and adapt learning opportunities accordingly. Schön's (1983) theory of reflective practice highlights the importance of practitioners continually evaluating their actions and making informed decisions based on experiences. Recording children's questions, revisiting the bug house over time, and encouraging children to reflect on changes in insect activity can deepen learning.

In addition, practitioners must consider inclusion. Some children may initially feel uncomfortable around insects due to previous experiences or cultural attitudes. A sensitive approach is needed to encourage participation without forcing interaction. Children should be able to engage with the project through different methods, such as observing insects, drawing pictures, taking photographs, or discussing their findings. Inclusive sustainability education recognises that children have different ways of connecting with nature.

The bug house project can also support children's holistic development. Language skills can be developed through conversations about insects and habitats, while mathematical understanding can be encouraged through counting and comparing insects. Physical development is supported through collecting materials and constructing the habitat. Social and emotional development is strengthened through collaboration and developing care for living things. This demonstrates that sustainability education should not be viewed as separate from early childhood learning but integrated across all areas of development.

In conclusion, developing a bug house in the garden provides a valuable opportunity to support the philosophy and principles of early childhood education for sustainability. The experience promotes children's connection with nature, environmental responsibility, curiosity, and agency. Supported by theories of

constructivist learning, nature-based education, and children's participation, the activity reflects contemporary approaches that view children as capable contributors to sustainable futures. However, critical reflection highlights that a bug house should not be considered a complete sustainability strategy but rather one element of a broader approach. When supported by knowledgeable practitioners who encourage exploration, reflection, and ongoing engagement, a simple garden project can become a powerful learning experience that develops children's understanding of their relationship with the natural world.

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