Research Poster

Evaluating the Impact of an Innovative Pollinator Curriculum on Fifth-Grade Student Knowledge: A Pilot Study

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Introduction and Review of Literature

Pollinators are vital for ecosystem health and biodiversity. Without them, over half of flowering plants would experience a fertility decline exceeding 80%, and one-third would fail to produce seeds altogether (Rodger et al., 2021). The National Park Service (2024) has shared research about pollinator populations being threatened by habitat loss, pesticides, and climate change. Through media and education, people have been provided a lot of information about the effect that pollinators have on the Earth and humans; however, humans play a large role in pollinator population conservation through agriculture practices (Popp et al., 2012). Pesticides and insecticides play a crucial role in agriculture by effectively managing pest populations, increasing crop yields, and ensuring food security (Popp et al., 2012). Neonicotinoid insecticides are widely used for their high toxicity against pests, but their indiscriminate effects pose risks to pollinators, prompting some countries to ban them while others implement regulations to mitigate their impact (Jeschke et al., 2011; Alsafran et al., 2022; Wood & Goulson, 2017).

Teaching children about pollinators early is crucial for overcoming fears and fostering appreciation, yet pollinators are often overlooked in elementary standards, creating gaps in understanding (Yoori & Dowon, 2018; Danish et al., 2011; Hayes et al., 2020). Despite the National Research Council's (1988) call for systematic agricultural instruction, the Next Generation Science Standards (NGSS) lack pollinator education (NGSS Lead States, 2013). A structured progression from elementary to high school, introducing topics like habitat loss, climate change, and pesticides, can help students become informed citizens capable of addressing pollinator decline. Integrating pollinators into elementary curricula could strengthen life-science learning, promote systems thinking, and inspire careers in agriculture conservation.

Purpose and Objectives

The purpose of this research was to develop an innovative five-day unit on pollinator conservation and sustainability, emphasizing human impact on pollinators for fifth-grade students, and to evaluate its effectiveness in enhancing student knowledge of these impacts. The research objectives were the following:

I. Compare the change in fifth-grade students' knowledge of human impacts on pollinators before and after implementing the newly developed curriculum
II. Examine participants' perceived understanding and confidence in their knowledge of pollinator conservation and human impacts before and after

Methods

The researchers employed quantitative methods investigating the effect of a five-day lesson on pollinators on student development of knowledge. The prescribed curriculum was developed with a focus on the human impacts on pollinators supporting *[State]* Agricultural Education Elementary Standards of Excellence (fifth grade). The research was designed for data to be collected through a pre- post- assessment where fifth-grade students were tested prior to the pollinator curriculum being taught and again directly following the conclusion of the curriculum. The assessment was developed by researchers following the objectives of the five-day unit and reviewed by a panel of experts for face and content validity (Messick, 1994). The assessment was 20 questions– 19 of which were directly content related and the last evaluated participants' perceived understanding and confidence in their knowledge. Reliability was assessed using Cronbach's alpha (α=0.84), indicating good internal consistency.

This research utilized convenience sampling by selecting an elementary agriculture teacher who was readily accessible to the researchers (Creswell & Creswell, 2023). The teacher's involvement was based on availability and willingness to implement the five-day pollinator curriculum within their classroom, rather than through a random or systematic selection process. As a result, while this sampling method facilitated timely data collection, the findings are not generalizable to other educational settings or student populations. Data was collected from 29 fifth-grade students. Data was analyzed in SPSS for the comparison of the pre- and post- test scores to explore changes from the administered intervention of the curriculum utilizing a paired samples t-test (Kent State University, 2024).

Findings

A paired-samples *t*-test was conducted to compare the knowledge of the 29 fifth-grade participants regarding human impacts on pollinators before and after implementing the newly developed curriculum. The results indicated a statistically significant increase in knowledge from pre-test ($M = 6.76, SD = 3.23$) to the post-test ($M = 13.24, SD = 4.03$), $t(28) = -8.218, p < .001$.

A paired-samples *t*-test was also conducted to examine change in participants' perceived understanding and confidence in their knowledge of pollinator conservation and human impacts. Participants were asked to rank their understanding of human impacts on pollinators from (1- Very little understanding, 2- Some understanding, 3- I understand, 4- I could teach others about it). The results demonstrated a statistically significant increase in self-reported confidence from the pre-test ($M = 1.76, SD = .83$) to the post-test ($M = 2.52, SD = .738$), $t(28) = -4.477, p < .001$.

Discussion and Recommendations

The results of this study indicate that the five-day pollinator unit curriculum significantly improved fifth-grade students knowledge of the human impacts on pollinators and their confidence in understanding pollinator conservation. Aligning with previous research on early environmental education (Hayes et al., 2020; Yoori & Dowon, 2018), the increase in the post-test scores suggests that structured instruction on pollinator conservation heightens elementary students' literacy towards ecology and pollination. Additionally, the rise in self-reported confidence highlights the curriculum's role in fostering student engagement with conservation topics. However, the limitations of the small sample size and limited populations of students leads to recommendations to obtaining generalizable data towards this innovative approach to teaching pollination from the side of human impact and sustainable practices.

From these findings, the researchers suggest for future research to expand curriculum implementation to multiple schools and assessing retention of knowledge through a delayed-post test. Additionally, providing teacher training on pollinator, and science supported interdisciplinary learning could support effective curriculum delivery and sustainability. As pollinator populations continue to decline, equipping young students with conservation knowledge and confidence is essential for fostering environmental responsibility and long-term ecological awareness.

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