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Grade 12

BetterBee Kits

Commercialization Plan

With the decline of bee species across the board, people need an accessible and inexpensive way to help their buzzing buddies. To help this cause, I came up with the BetterBee kits: better bee aid in your backyard.

Part 2: Executive Summary

Bee populations have been on the decline for the past few decades. Without bees to pollinate our crops and other plants, food will become scarce and thus more expensive. To combat this in a local area, I propose BetterBee kits. They are products that can be sold to create pollinator gardens in the user's yards. An increased amount of pollinator gardens in a local area will attract pollinators, increase biodiversity, and replenish plant life as well as insect life. The Suburban BetterBee kit's package is a makeshift bee nest where the user converts it to be suitable for bees (typically native bumblebees). Included are seeds for multicolored, part shade, fast-growing plants. As this is an urgent environmental cause, this product is inexpensive, as other "environmentally friendly" products can both be expensive and a hassle to use while anyone can use my products; all they need is an interest in the benefits of a pollinator garden. To combat accessibility issues in other build-your-own products, I implemented easy-to-use mechanics like screw-on tops, twist/pull mechanisms, and simple locks.

Part 3: Problem Summary and Proposed Solution

People need a way to help pollinators and native bees because I learned that people want to care about pollinators and bees, but need an engaging, inexpensive, and versatile option to help. Many turn to creating apiaries in their backyards, but this simply isn't an option for all types of homeowners and we need a universal solution. While people are interested in improving bee populations and local biodiversity, they don't know where to start. With the proposal of my products, I hope to provide a gateway for these struggling people. If nobody knows where to start when it comes to helping out native bees and other pollinators, local biodiversity will plummet and the lack of pollination will make food prices increase.

Plan Part 4: Summarize the STEM Concepts and Principles Underlying the Overall Plan

For this product, I am choosing to create an inexpensive and eco-friendly physical kit to help people get into environmental sustainability via bee protection. I hope to accumulate interest in environmental sustainability in northeast Ohio to improve the habitats of local pollinator populations. My proposal for the product is a box (preferably made of a type of wood) filled with native seeds that pollinators will flock to. The box can also be turned into a bumblebee nest, acting as a sort of pollinator/bumblebee "rest stop." Another product I hope to create alongside

the “bee rest stop” is an inexpensive shaker (similar to a salt or pepper shaker) that comes with native seeds like the rest stop. The seeds can then be emptied into the “shaker” and the user can deposit the seeds from the shaker into wherever they see fit, such as a yard or empty patch of land, creating biodiversity and food for pollinators.

The US Fish and Wildlife Service recommends native plants for pollinator gardens, saying, “Native plants are the ideal choice, because they require less maintenance and tend to be heartier.” Pollinators such as bees and butterflies won’t be attracted to flora outside of the area of Akron, Ohio since they will seem unfamiliar to the insects. When it comes to what seeds I will use in the kits, I wanted to aim for multicolored, part shade, fast-growing plants. Plants such as the Purple Coneflower, Blackeyed Susan, Clarkia, Catchfly, and Shasta Daisies seem to be ideal, both for practicality and budget. The seeds can be sprinkled easily and grow without too much maintenance. Bees and butterflies are easily attracted to these plants, fulfilling the purpose of the kit.

For the care package/bee nest hybrid itself, I wanted to pursue a design that is eco-friendly, inexpensive, and resistant to mold/fungus. I decided to use cedarwood for the material of the box, as it is inexpensive, sturdy, and resistant to mold. Perhaps I could soak the wood in a natural, bee-safe insecticide, but I need to do more research on the matter before I conclude. A constraint I faced is adhesive, which can be toxic to bees and other insects. So, instead of using synthetic adhesive, I propose to use beeswax to seal the bee nest instead of wood glue. Bumblebees and honeybees chew somewhat in their habitat to accommodate themselves or make space, and the ingestion of glue could kill them. Beeswax is completely harmless to insects and is waterproof as well. Mixing it with pine oil or sap can be an expensive process but it can improve the adhesion of the beeswax sealant/glue.

Part 5. Commercialization Assessment of the Overall Plan

Problem:

People need a way to help pollinators and native bees because I learned that people want to care about pollinators and bees, but need an engaging, inexpensive, and versatile option to help. Originally, this project focused on honeybees and beekeeping specifically, but over time I learned that I was focusing on the wrong type of bee. Native bees have been overshadowed by their honeybee counterparts because of the ability to keep honey bees in captivity. Even on a

local level, native bumblebees and other pollinators are being outcompeted by captive honeybees. I switched my focus to helping native bees and other pollinators while having an interactive way for other people to enjoy it. People enjoy having lush backyards, flowers, and forests, but often don't know where to start when it comes to improving their environment. Therefore, I began to brainstorm a product that is accessible to them and makes it easy to start up your own pollinator garden and bumblebee haven.

Proposed solution:

My solution is two different products: BetterBee Urban and BetterBee Suburban. The urban kit is for people with limited access to outside areas or a backyard. It consists of a salt-shaker-like contraption made of cedarwood that houses packets of pollinator seeds when the buyer receives it. They unscrew the top and then dump all of the seeds into the shaker. Ideally, the user would go out to shake the seeds in empty areas or around their area. Once all of the seeds have been shaken out, the user can fill the shaker with water and sprinkle it over their plants. To secure the shaker after use, they simply twist the top to prevent anything from leaking out.

When it comes to the suburban kit, it consists of a large cedarwood box, pollinator seeds, chicken wire, and bedding (most likely consisting of natural straw/hay). The cedarwood box carries all of the plants the user needs, but the box itself can be a makeshift bumblebee nest. While I'm still thinking of the contraption itself, flexible PVC tubing runs through the box to allow airflow and an entrance/exit for the bees. The top of the box has a handle that when twisted and pulled, creates a main entrance for the bumblebees. The chicken wire is then folded by the user into a cup shape and set inside the box as well as the bedding. It is up to the user to bury the box properly, with the tubing exposed to air and the twist/pull entrance just above the soil. Over time and with patience, bumblebees will be attracted to the plants the user planted and the bees will gradually move inside of the box. The box can be referred to as a "rest stop," per se. An obstacle I am currently facing is glue or a sealant since bumblebees and other bees typically chew on their habitats to make adjustments to their space. I would rather not have bumblebees die from ingesting chemicals that are toxic to them. A natural form of adhesive that I propose is a beeswax/pine oil solution. Beeswax is not only extremely sticky with pine oil but it is completely waterproof as well.

Eventually, the BetterBee Suburban kit will be available in a variety of styles and colors to appeal to all lawn decorators.

Target customers and intended users:

This product can be used by anyone with a passion to save the bees. I'd like to make my products relatively inexpensive since plenty of "environmentally friendly" products can be expensive and a hassle to use. I aim to make my products functional with easy-to-use mechanics like screw-on tops, twist/pull mechanisms, and simple locks. Perhaps if I keep this philosophy, buyers can get their children involved and spread the influence. Having urban and suburban products will create a widespread user base, especially in the greater Akron area.

Part 6: Science and Technology Proof of Concept

Review and assessment of the scientific literature:

When it comes to what kinds of plants I'll use for the seed packets, I need to use plants that have colors bees are attracted to. According to research from Berger (2002), "Bees don't see the color red but are attracted to blue, violet, white and yellow." Not only will the plants have to be native to the greater Akron area, but they will also need to have select colors as well. The design for the suburban kit's bee nest needs to be well-equipped to deal with varying weather conditions. The roof part of the nest should be able to repel water from entering the nest, with the raised entrance further repelling water. In the design, I incorporated drainage holes in the bottom of the nest just in case any excess water seeps in. Cedarwood being used as the building material will provide an inexpensive, sturdy, and weather-proof safeguard for the bees nesting inside.

Hypothesis:

If I create urban and suburban bee care packages that are inexpensive, eco-friendly, and easily accessible, then local bee populations will flourish.

Inquiry or design-based discussion

My solution comes as two products- The urban and suburban kit. Both consist of being made of cedarwood. While the urban kit can be sealed with wood glue, the suburban kit will not. The urban kit is what can be described as a wooden salt shaker. The shaker contains packets of

native pollinator seeds. When the top of the shaker is unscrewed by the user, the user takes out the packets and empties the contents into the shaker. Once this is done, the user can use the shaker to deposit seeds in empty lots, around their neighborhood, and on empty patches of dirt. When the contents are emptied, the user can fill the shaker with water and use it as a makeshift watering can. After the user is finished with the urban kit, they can twist the top to seal the shaker to prevent anything leftover in the shaker from spilling out.

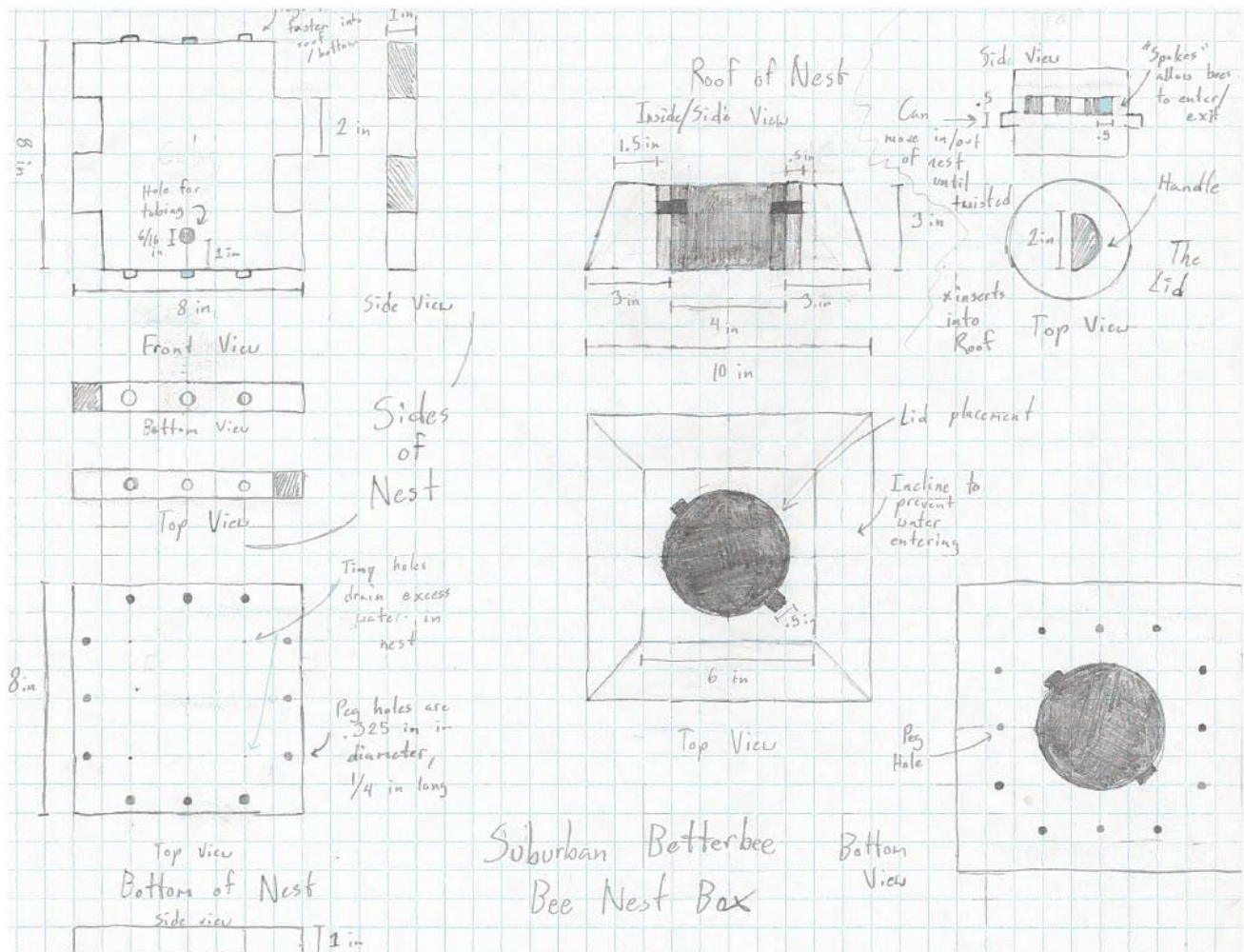
The suburban kit is similar to the shaker as it comes with pollinator seeds, but the kit itself can be turned into a bee nest with a few steps. Once the kit is purchased, the user can open the lid positioned on the “roof” of the box. After emptying the packets of seeds from the box, the user can plant them around the outside of their house. Chicken wire, PVC tubing, and bedding (made of straw and wood scraps) are also contained inside the box. The user then constructs a foundation for the bumblebee habitat by setting a hill of straw on the bottom of the box and folding the chicken wire into a cup-like shape to set it on top of the chicken wire. The PVC tubing is then cut in half, with the user running it through the holes on the sides of the kit. After the foundation is constructed, the user takes the lid of the kit and sets it about an inch inside of the roof. Then, the user gently twists the lid and the notches on it should lock themselves in place inside of the roof. The lid is now an entrance and an exit for bumblebees inside and out of the nest, with half-inch notches near the top half of the lid permitting it.

My product follows a 5 E Principle. The 5 Es help guide me through the process of how my user interacts with my product. First, how will my product Entice my user? Using social media advertisements and physical ads, I can pull in a user to my product at local farmer's markets. Secondly, how does the user Enter/begin using my product? My products will be purchased from local farmer's markets, where the user will take their purchase home and follow the given instructions. Thirdly, how will my product Engage the user? After following the instructions such as planting the seeds and setting up the bee nest, the user can check on their plants and nest over time. Fourthly, how will the user Exit/stop using my product? Once the user is finished with the product, they can simply leave it in the ground (suburban kit) or recycle it (both kits). Fifthly, what Extends the user's experience? The user can continue buying more products, monitor plant/nest progress, or promote my products through their friends or social media.

Additional research, design, prototyping or analyses:

I intend on creating a low-tech prototype that creates the basis for my product. To keep the spirit of my product, I want to retain the partial self-assembly that the user participates in. Perhaps I can use something similar to a birdhouse that can come with chicken wire and straw, with a user testing out the basis of my product. This way, I can get user feedback and make my product easier to use for the user. As I make the prototype closer to my product, I can refine the final product according to user feedback and modify it further. On top of the prototype, I need to further research into creating a bee-safe adhesive. Since bumblebees chew on their habitat to specify the habitat to their needs, I would rather not have them ingest glue that could kill them.

Figure 1: Blueprint for the Suburban Betterbee Kit



Part 7: Acknowledgements

I would like to thank my learning coach Kathleen Metcalf for guiding me through this research paper as well as giving me the ability to conceptualize these products. I'd also like to thank my mother who inspired me to keep going even if I was unmotivated, or if a challenge seemed too great. Finally, I would like to thank my father for helping me understand how I can capitalize on my ideas.

Part 8: References Cited

U.S. Fish and Wildlife Service. (2021, April 9). Fish and Wildlife Service. How to Build a Pollinator Garden. Retrieved November 5, 2021, from

<https://www.fws.gov/midwest/news/PollinatorGarden.html>

Wikipedia contributors. (2021, October 25). Beeswax. Wikipedia. Retrieved November 5, 2021, from <https://en.wikipedia.org/wiki/Beeswax>

How to make a bumblebee nest box. (2016, April 11). [Video]. YouTube.
<https://www.youtube.com/watch?v=DYKAvRsS3uo>

Berger, C. B. (2002, August 1). NWF. National Wildlife Federation. Retrieved November 18, 2021, from

<https://www.nwf.org/Magazines/National-Wildlife/2002/Bee-Houses-for-Your-Garden>