Redesigning Agricultural Education

A UX Approach to Vertical Farming Awareness Case Study

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Introduction

The world faces an unprecedented food crisis driven by conflicts in the economy and climate extremes. This leads to an estimated 2.3 billion people lacking access to sufficient, safe, and nutritious food for a healthy life (Mead et al., 2024). Seasonal crops prevent consumers from receiving the best-quality produce all year round. However, the adoption of vertical farming in urban areas aims to solve environmental and food security issues. Vertical farming is an indoor farming system that uses artificial development techniques like hydroponics, aquaponics, and other approaches in soilless agriculture (Jiang, 2023). The implementation of vertical farming in urban areas not only presents a sustainable solution to the global food crisis but also opens a host of economic opportunities. This innovative farming system requires less rural land, is less susceptible to pathogen contamination, and could lead to job creation. Furthermore, it offers the potential for year-round production, reduced water usage, and the ability to grow crops closer to the point of consumption. These factors could significantly decrease transportation costs and emissions.

The Issue

Vertical farming could solve food security and environmental issues, but public awareness is minimal. Survey data showed that 50% of participants had never heard of vertical farming, and those who had couldn't explain how it works or its benefits.

> How could we create educational content that informs and motivates communities to support vertical farming in urban areas?

User Research: Personas & Journey Maps

Persona #1

Name: David Martinez

Age: 46

Occupation: Urban Policymaker

Education Level: Master's degree in urban education

Annual Salary: $83,505

Location: Austin, Texas

Goals and Motivations: Address food deserts

Pain Points and Challenges: Budget constraints, zoning issues

Needs: Return on Investment (ROI) data

Tech Comfort: Moderate comfortability

- Uses few social media apps
- Relies on using computers rather than mobile phone
- Mainly uses technology for work

Stages	Awareness	Research	Consideration	Planning
Actions	Hears about VF at a meeting.	Quick Google search. Read numerous articles.	Discuss with financial advisors. Run cost calculations.	Create proposal. Set stakeholders meeting.
Thoughts & Feelings	"Sounds interesting, but is this realistic? This could solve	"This is a lot of information to sift through." Overwhelmed.	"Is this possible for us financial? Not my area of expertise"	Motivated. Purpose driven.

	the issues in our food desert areas” Hopeful and curious, but skeptical		Concerned about zoning constraints and financing.	
Questions	What is Vertical Farming?	How many urban areas have implemented VF? How does it work and how can we do this?	What does it cost? What is the ROI?	How can I raise support among the community? Where can we find funding for VF?

Pain Points: Information jargon creates immediate confusion for user.

Opportunities: Search results could lead to educational video overview of Vertical Farming

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Persona #2

Name: William Davis

Age: 30

Occupation: Entrepreneur

Education Level: Bachelor’s degree in entrepreneurship

Annual Salary: $70,569

Location: Fort Worth, Texas

Goals and Motivations: Understanding startup costs

Pain Points and Challenges: Risk assessment

Needs: Financial projections

Tech Comfort: High Comfortability

Stages	Awareness	Research	Consideration	Planning
Actions	Discover vertical farming when listening to a podcast.	Quick YouTube Search.	Attempt to calculate the costs.	Search for suppliers. Contact urban planning department.
Thoughts & Feelings	“This sounds like a great business idea” Intrigued	Confused by the technical jargon.	Financially concerned.	“Can I get the community on board?”
Questions	How can I make this into a start up?	Is there a market for vertical farms?	What would be the startup cost? How can I build this? Do I need certifications to create one?	Do I need city permission and zoning certificates?

Pain Points: Unsure where to begin in creating a vertical farm. Worried there will be no return on investment.

Opportunities: Include supply and cost information for both small and large vertical farms.

Persona #3

Name: Sara Miller

Age: 25

Occupation: Elementary School Teacher

Education Level: Bachelor's degree in education

Annual Salary: $45,450

Location: East Austin, Texas (food desert)

- 30-minute drive to nearest fresh produce grocery store
- Mixed income level community

Goals and Motivations: Access to fresh produce, healthy eating, & saving money.

Pain Points and Challenges: groceries affordability, no current access to fresh produce.

Needs: Clear benefits and affordable food insecurity solution

Tech Comfort: High comfortability

- Uses many different social media apps
- Comfortable with online learning

Stages	Awareness	Research	Consideration	Planning
Actions	Sees social media post about VF.	Find more information on social media posts and videos. Online search.	Share with parents and school contacts. Discusses with community members on forums.	Organize a signature petition. Attend city council meeting.

Thoughts & Feelings	Curious. “This could help my community”	Confused on technical jargon.	Interested but skeptical. Concerned for community	“I think this could improve our community. Our children can have access to healthier options” Unsure but motivated.
Questions	What is vertical farming?	Where can I find comprehensible information? What is hydroponics?	Would we see an increase in high-income residents? How would that change this community?	How does this get implemented? Who can I talk to?

Pain Points: Concerned about possible gentrification.

Opportunities: Emphasize community benefits: job creation and affordability data

UX Approach

After conducting baseline research with user personas and journey maps, I created an instructional script based on the users' pain points, needs, and motivations. The script followed a linear structure of an introduction, definition, types of vertical farming, benefits, drawbacks, outlook, and a conclusion. The script prioritized using plain language to accommodate to a variety of users and used a second-person perspective to create a personal connection to the user. The script then underwent usability testing where participants' comprehension level, perceived feasibility, support level, and ability to identify benefits were measured. After the completion of the two-part usability test on the instructional script, I created an instructional video based on the script and the key findings during testing.

Usability Testing

Methodology

To test the usability of vertical farming, four applicants answered a survey of twenty-three questions broken down into three sections. Before the survey began, there was a brief definition of vertical farming and the definition of urban, rural, and suburban areas. The initial survey aimed to gauge the user's initial knowledge and support. The second usability test was a survey of twenty-three questions with the same definitions and an instructional script on vertical farming. The second survey is designed to scope how beneficial the instructional script was to the knowledge and support of each user. The study involved collecting demographic data such as age groups and locations to find whether there was any correlation between the support found in geographical locations such as rural, urban, and suburban areas for vertical farming in urban areas. Once the two surveys were conducted and the users had read the instructional script, four post-test questions were distributed after completing the second survey. These questions aim to explore the effectiveness of the technical documents and find ways to improve them. The questions for the post-test are as follows:

1. Did you find a specific section of the instructions confusing?
2. Did you find the order of the instructions applicable?
3. Do you have any suggestions on how to improve the instructions?
4. Was there anything unclear or final thoughts?

Results

The two-part usability test conducted on four users concluded that a fifty percent split of users were neither familiar with the concept of vertical farming nor somewhat familiar with it. This suggests that due to the little to no coverage of vertical farming, the community, whether rural or urban, is unaware of the concept and benefits of this new agricultural process. The first part of the hypothesis was proven from the initial survey. Once applicants read the instructional scripts, the second survey illustrated an improvement in their knowledge of the benefits and drawbacks of vertical farming. In the survey, users could scale how feasible vertical farming would be in their area. The results reveal that seventy-five percent thought vertical farming would be “somewhat feasible,” and the latter thought it was “feasible.” The consensus of the group was that vertical farming would be possible in suburban and urban areas, considering set-up costs, zoning, and regulatory issues. Based on their ranking of the top three benefits, it can be inferred that these were the reasons for their support. The top three average benefits of vertical farming were its efficient use of space, lower water usage, and its production of year-round crops. The instructional script emphasizes additional advantages such as the decreased reliance on pesticides, the lower environmental impact in terms of carbon footprint, and the efficient use of water resources, which were the test groups’ top takeaways. The results from the post-test gave feedback on how useful the instructional script was in gaining newfound knowledge on vertical farming. The four users’ answers concluded that the script’s most confusing section was cost effectiveness, as it needed a more straightforward explanation and comparison to rural agriculture. The user’s feedback on the script was to add information on the zoning regulations, as it was only stated as an issue rather than explained how it was.

What I’d Do Differently

- Conducted usability with a larger sample size
- Conduct usability testing on instructional video, not just the script
- Use A/B testing for different types of educational pathways

Call to Action

Considering the limited information available on this new modern farming method, the instructional script has proven beneficial in informing the public about different aspects of vertical agriculture. A common weakness in the script was the lack of in-depth explanation. Users could get a general idea of vertical farming but could not understand the topic further than the provided information. The users suggested adding more details on the cost and benefit outlook, as these were ranked as two of the most critical factors to agriculture in the test group. Corrections to the technical document have been made to enhance the performance of the instructional script. The methodology used to

measure the usability of vertical farming and the instructional script based on the topic generated a well-functioning document and demonstrated its performance through the volunteered test group.

References

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