WildTrack Design Practicum

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Executive Summary

Recommendations

1. Partnerships with local community and schools, including educator training and supports
2. Participation and integration with online citizen science platforms

Citizen science projects must consider youth motivations, interests, skill, affiliations, age, and demographics before actively involving teens and pre-teens as participants (Cunha et al., 2017, p. 89; De Moor et al., 2019; Seymour & Haklay, 2017; West & Pateman, 2016). A first step is to understand the age appropriateness for youth to carry out required tasks successfully. More straightforward tasks can involve younger children between ages 6-8 (Goforth & Peterman, 2018; Hidalgo-Ruz & Thiel, 2013). However, more complex tasks require extensive training to ensure the collection of valid data (Miczajka et al., 2015).

Diversity of participants, duration of enjoyment, intensity of the engagement and motives of altruism, achievement, sociality, esteem-building, and collaboration are linked with high engagement in citizen science projects (Chu et al., 2012; Nov et al., 2011). Prompt user feedback, regular support, and project tasks matching with participants' skill or ability are also associated with high engagement (Causer & Wallace, 2012).

While the above engagement conditions apply across demographics, factors such as project relevance and clout specifically elicit curiosity in children for new projects (Dubey et al., 2019; Dubey et al., 2021).

Recommendation #1: Partnerships with Local Communities and Schools

Depending on the scale and duration of the project, school and community participation in a citizen science project is a practical approach for accessing a high number of youth participants (Cunha et al., 2017, p 89; Freitag & Pfeffer, 2013; Schuttler et al., 2018). Local community partnerships also ensure the diversity of participants required to involve children from all social-economic statuses (Hidalgo-Ruz & Thiel, 2013).

Schools are more likely to partner with agencies engaged in citizen science projects mainly so that children can connect the science theory taught in the classroom with the natural world (Schuttler et al., 2018). However, it is important to understand educator needs, such as alignment with existing curricula and national standards, such as the Next Generation Science Standards in the United States (Hano et al., 2020). Indeed, Luehmann & Markowitz (2007) found that science teachers consider three factors when introducing new out-of-school enrichment into their curricula: practicality, congruence, and cost.

In our market analysis, 83% of top-performing citizen science apps allowed users to create groups based on affinity or location (*see Group Formation, Table 1*). Group creation allows educators to create student collaboration (and friendly competition) within their school or classroom and narrow the focus to the local environment, facilitating both clout-building and project relevance.

Educator Training and Support

As part of partnering with schools and community groups, educator training is crucial in involving children as citizen science participants. Schuttler et al. (2008) found that teacher training prior to involving students greatly improved student data collection accuracy (*see Case Studies*). Top performing apps provide extensive support for teachers and informal educators interested in citizen science participation, including professional development, curriculum alignment, library kits, lesson plans, and worksheets (*see Educator Support, Table 1*).

Recommendation #2: Participation in Citizen Science Platforms

Online citizen science platforms use different strategies to onboard and engage users. Attracting volunteers can be sought by joining well-established online citizen science platforms -- such as SciStarter, Zooniverse, Anecdata, or CitSci -- which give participants access to diverse projects to pick from (Sauermann et al., 2015). Extending participant engagement beyond data collection to other aspects of the scientific process such as data analysis and decision-making increases user participation (Pandya, 2012).

When engaging participants in citizen science projects in the field and online platforms, personalized UI design features idiosyncratic to user profile such as location, age, interests, demographics, and behavior have increased online engagement in citizen science projects (Nov et al., 2013). Rewards, incentives, and recognition foster engagement because they indicate the worth of one's efforts (Crawford et al. 2014; West & Pateman, 2016). In addition to tapping into an existing audience, participating in larger online citizen science platforms enable projects to take advantage of features such as user profiles, targeted recommendations, and incentives (such as badges and leaderboards) that they may not be able to offer on their own.

Implications for WildTrack

WildTrack’s data collection protocols require precision when measuring footprint size. It is critical to consider how much instruction is needed for young participants (pre-teenager to teenager age groups) to be successful. Here, we have recommended teacher training when partnering with schools. Other strategies include how-to videos, visual tutorials, and guides.

WildTrack’s users must be outdoors to collect photos. This aligns with our user survey that the third most popular activity reported by parents is “hiking” while the fifth is anything “outdoors” (*see Parent Survey Data, Appendix B*). However, it presents challenges for participation via phone due to internet connection access (*see Offline, Table 1*).

Beyond schools, Wildtrack should consider partnerships with existing spaces in the community for informal learning such as outdoor clubs, scouting organizations, nature camps, museums, libraries, science centers, zoos and aquariums, national and state parks, and public

gardens. These settings align with the findings of our user survey about exposure to nature being key to nurturing children's curiosity about nature (*see Parent Survey Data, Appendix B*).

Case Studies

Schuttler et al. (2018)

An eMammal citizen science project involved school children from ages 9 -16 setting camera traps in wildlife conservation areas for taking pictures of mammals. Before involving students, they initially recruited and trained some school teachers to set camera traps to take clear pictures—teachers were able to teach and guide students during the execution phase.

A significant limitation in the eMammal project was the high cost of acquiring quality camera traps for each child; children had to share devices, three children to a camera which posed a challenge. However, children benefited from collaborating during the project, which induced more participation and learning. This illuminated the need for consideration of resource constraints but also the potential of augmenting experiences for the target demographic to engage with citizen science.

West & Pateman (2016)

As WildTrack explores partnerships with the local community and organizations, West and Pateman's research from volunteering literature might be useful in learning about the intrinsic motivators that influence people to take part in citizen science projects. For instance, West and Pateman's findings show *understanding* (e.g. wanting to learn and wanting to share) and *values* (helping the environment, science, and others) as two important motivations that influence participants' involvement in projects. WildTrack might design citizen science projects that complement the intrinsic motivations of local partnerships to increase participant engagement.

User Survey

We collected user survey data for parents, educators, and teenagers to better understand how the populations view nature through different lenses. Parent survey data (77 respondents) indicated that nurturing curiosity, exposure to the outdoors, and socializing with friends were the main factors that can encourage their children to engage with nature. Almost all parents have indicated that outdoor activities and school settings were the main environments that they believe will encourage their children to learn more about nature (*see Parent Survey Data, Appendix B*).

In the teenager survey data (2 respondents), both respondents shared an understanding that changes in nature were influenced by human action. The respondents specifically mentioned, "don't throw out trash out the window, reduce plastic, help clean the environment" and "just participate in the communities." The respondents indicated collective action as impactful ways to engage with nature and inference of a preconceived idea on the complex realities of human and environment interactions (*see Teenager Survey Data, Appendix B*). The

educator survey data (1 respondent) also noted that their students were “sensitive and motivated by ways to help our planet that can make an observable change” (*see Educator Survey Data, Appendix B*). The survey data holistically shows potential for citizen science projects due to awareness of human activity with nature and the need for collective effort to create positive changes for the environment.

Market Analysis

A two-part market analysis was conducted to assess best practices and innovative strategies from top-performing citizen science projects (*see Methodology, Appendix A*). The greatest differentiators for projects with dedicated mobile apps are described below.

Table 1. Key Features from Citizen Science Mobile Application Market Analysis

Group Formation	A majority (83%) of top-performing apps allow for group formation. **eBird** offers custom portals (e.g. eBird Mexico “aVerAves”; Mass Audubon eBird) which are “managed by local partners and [that] provide local information and birding expertise.” **iNaturalist** allows truly granular group formation (“projects”) based on affinity (e.g. LGBTQ+ Naturalists, Girl Scouts) or location (e.g. Trinidad & Tobago Bioblitz). These overlap with events, as some projects are limited in time. NASA’s **Globe Program** (with associated app Globe Observer), allows for both public and private “team” formation.
Educator Support	All leading projects offer resources for educators. The **Globe Program** offers in-person and online training for teachers, as well as an informal education toolkit for integration into programming at “museums, science centers, zoos and aquariums, parks, public gardens, libraries and more.” **FrogID** offers lesson plans (aligned to Australian Curriculum standards), slideshows, fact sheets, and activities. Loss of the Night, in cooperation with **Globe at Night**, offers both activity sheets and alignment with US Next Generation Science Standards (NGSS). **Marine Debris Tracker**, through partnership with National Geographic, offers an online professional development course for teachers as well as a student action journal.
GPS	By automatically pulling up maps, species, and groups close to the user, apps which enable GPS permissions increase relevance and facilitate connection to local groups. 90% of apps that asked users to make observations about ecology or the environment used localization.
Events	All top-performing apps offered timed events such as competitions, blitzes, and campaigns. Examples include the aforementioned user-initiated projects in **iNaturalist**, “eBirder of the Month” competitions and campaigns celebrating World Migratory Bird Day in **eBird**, monthly challenges and yearly campaigns for Earth Day for **The Globe Program**, Frog ID Week by **FrogID** (including a Top Frogger competition), and constellation campaigns in **Globe at Night** / Loss of the Night. Many events offer physical prizes in addition to clout.
Offline	Some apps prompt the user to download local information packets to their device to enable use without an internet connection, including a “local bird pack” when opening **eBird** and offline frog call recordings and photos in **FrogID**. Several apps also allowed for offline collection of data or photos that could be uploaded and synced once an internet connection was re-established.
Platform Integration	Several apps we reviewed were not only affiliated with SciStarter (an online citizen science hub with over 3,000 projects and approaching 100,000 registered users), but were integrated so that users could log in with their SciStarter credentials (**Marine Debris Tracker**) or sync data to their SciStarter account (**Globe Observer, CitiSci**). SciStarter also has existing library kits, including quick start guides, promotional materials, and certificates.

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