Mobile-Enhanced Field Research: BioCore Plant Identification

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Purpose

We use a case to compare mobile technology with traditional methods for field research activities to answer: 1) Can using mobile devices make field research data collection more efficient? 2) Can using mobile devices make field research data collection more accurate?

Context, Tool, and Data

In Autumn 2013, we piloted a mobile-enhanced field research activity for a college course where students engaged in field activities to learn the ecology of native ecosystems. Three lab sections (ten students each) focused on plant identification. While the mobile application was inspired by traditional dichotomous keys used in field guides, it also employs unique affordances of mobile design and user experience conventions.

The app (Figure 1) displays plant components such as “Leaf Shape” and “Flower Color.” Touching a component displays fixed options such as “Elliptic” and “Oval” with associated illustrations. For open-ended or numerical components, such as flower width, a text field is presented. Users select options to progressively narrow possibilities. The species details page includes descriptions and relevant images.

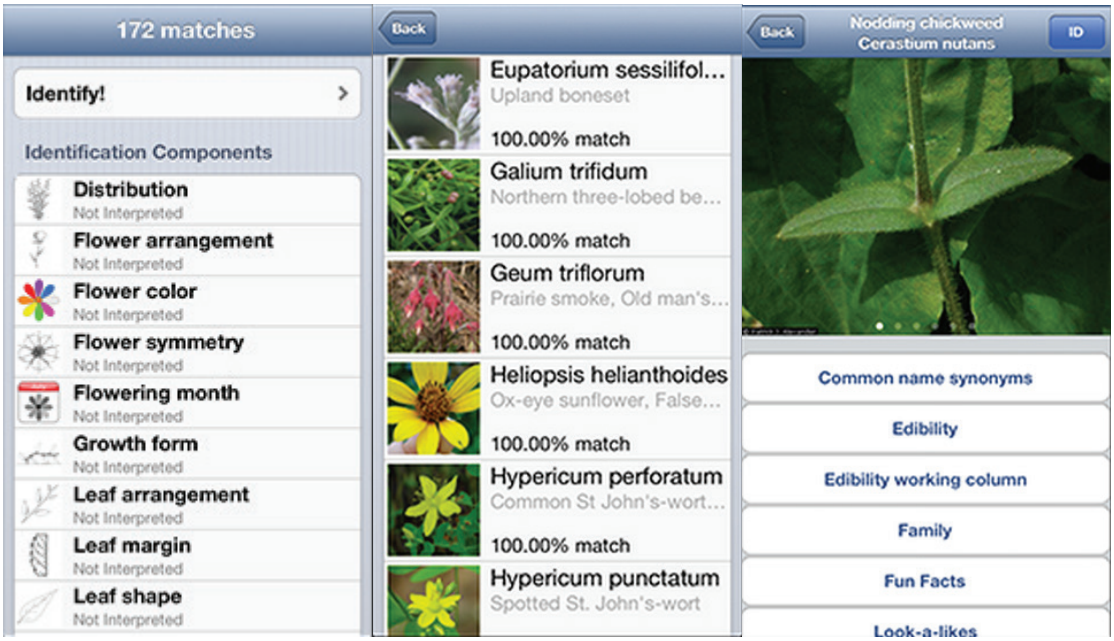

Figure 1: Mobile App screen.

In the design experiment (Brown, 1992), we compared across mobile device, mobile device/book, and book conditions. In each, five pairs of students identified ten plants. To also capture efficiency and accuracy across conditions, students reported times they began and finished identifying each. Additionally, to evaluate how mobile technology impacts students’ *discourse* about plants, we compared students’ self-generated content-related vocabulary across conditions.

Mobile technology versus book technology

Across quantitative items (efficiency, accuracy, and content knowledge), we used a Kruskal-Wallis test to determine differences between the three conditions. Where appropriate, we followed up with a Tukey’s HSD post-hoc test to specifically identify where differences lie.

Efficiency: Mobile-based methods seemed to enable filtering and sorting information more quickly than book-based methods. Mobile-only pairs took ~43.4 minutes to complete the task; mobile/book pairs took ~57.8; and book-only pairs took ~78.8. Analyses revealed a significant difference [p=.000] between mobile-only and book-only pairs, and [p=.010] between mobile/book and book-only pairs. This suggests that providing novices with mobile devices for field research activities increases efficiency in identification tasks.

Accuracy: An expert botanist evaluated whether students correctly identified the plants. Mobile-only pairs averaged 72% accuracy; Mobile/book pairs averaged 66%; and book-only pairs averaged 20% accuracy. Both the mobile-only and mobile/book pairs achieved significantly higher accuracy than book-only pairs, p=.007 and p=.016, respectively. This suggests that novices who use a mobile device to complete field research activities make more accurate identifications than those with a traditional field guide.

Content knowledge: After the plant identification activity, students wrote or drew terms or ideas related to plant identification. Interestingly, mobile-only and book-only pairs averaged a similar number of words or drawings — 5.1 and 7.2, respectively. Yet, mobile/book pairs averaged 13.8 words or drawings — significantly higher than other conditions, p=.000 for both. This suggests that having two resources available to each pair (one with book, and other with mobile), may increase their ability to build discourse, as students were constantly checking and confirming with each other. This may significantly improves *learning*, as defined as picking up and using expert *discourse* of plant identification. To explore this further, we may next compare groups where every student has a resource, rather than pairs of students sharing.

Takeaways

In this pilot study, we found solid evidence that both variables are significantly improved through mobile use, and found evidence supporting one-to-one ratio structure of implementing field research activities. With this, we are designing field research activities that immerse learners in both the practice and discourse of *actual* scientists in a given field. Thus, we gathered a range of feedback and evaluative data of the mobile field research application in order to further development of a generalized field research platform.

References

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