TLEF Project – Final Report

Report Completion Date: (2019/03/06)

1. PROJECT OVERVIEW

1.1. General Information

Project Title:	*Digging In*: An Educational Tool Promoting Science Citizenship for the Introduction to Soil Science Course		
Principal Investigator:	Maja Krzic		
Report Submitted By:	Maja Krzic		
Project Initiation Date:	Apr 1, 2016	**Project Completion Date:**	Mar 1, 2019
Project Type:	☐ Large Transformation ☒ Small Innovation ☐ Flexible Learning ☐ Other: [please specify]		

1.2. Project Focus Areas – *Please select all the areas that describe your project.*

☒ Resource development (e.g. learning materials, media)

☐ Infrastructure development (e.g. management tools, repositories, learning spaces)

☒ Pedagogies for student learning and/or engagement (e.g. active learning)

☐ Innovative assessments (e.g. two-stage exams, student peer-assessment)

☐ Teaching roles and training (e.g. teaching practice development, TA roles)

☐ Curriculum (e.g. program development/implementation, learning communities)

☐ Student experience outside the classroom (e.g. wellbeing, social inclusion)

☐ Experiential and work-integrated learning (e.g. co-op, community service learning)

☐ Indigenous-focused curricula and ways of knowing

☐ Diversity and inclusion in teaching and learning contexts

☒ Open educational resources

☐ Other: [please specify]

1.3. Project Summary

To know how to identify soil parent materials on which soils are formed, students need to learn how to perform specific field observations. Our past teaching experience has shown that this is difficult task for 1st and 2nd year students, especially for soils located in urban settings. The *Digging In* educational tool, including a campus-based lab activity, a citizen science-focused mobile app, and an open access web-based resource, will provide the means for students in APBI 200 – Introduction to Soil Science to "dig in" to the soils of Vancouver. This tool will be a valuable platform for enriching students' learning experiences through participation in novel information-gathering activities and engagement with community partners, soil scientists, and each other. *Digging In*, through its mobile app, will also draw upon the Soil Map of Vancouver (www.vancouversoils.ca), developed with a past TLEF grant, allowing students to contribute to improvements of the map's accuracy.

1.4. Team Members – *Please fill in the following table and include **students**, undergraduate and/or graduate, who participated in your project.*

Name	Title/Affiliation	Responsibilities/Roles
Melissa Iverson	Environmental Consultant, Integral Ecology Group	Content development
Nathan Sidles	Private Consultant	Development of website, mobile app and evaluation
Saeed Dyanatkar	Digital Media Producer, UBC Studios	Overseeing teaching & learning approaches and evaluation
Chris Crowley	Senior Manager, CTLT	Overseeing teaching & learning approaches and evaluation

1.5. Courses Reached – *Please fill in the following table with **past**, **current**, and **future** courses and sections (e.g. HIST 101, 002, 2017/2018, Sep) that have been/will be reached by your project, including courses not included in your original proposal (you may adapt this section to the context of your project as necessary).*

Course	Section	Academic Year	Term (Summer/Fall/Winter)
APBI 200 – Introduction to Soil Science	001, 002 and DE	2019/20 onward	Winter and Summer

2. OUTPUTS AND/OR PRODUCTS

2.1. *Please **list** project outputs and/or products (e.g. resources, infrastructure, new courses/programs). Indicate the current location of such products and provide a URL if applicable.*

Product(s)/Achievement(s):	Location:
Website update	https://vancouversoils.ca/
Digging In app	See Google Play & iPhone app store
Digging In campus-based lab activity for the APBI 200 course focused on types of soil parent material	https://wiki.ubc.ca/Course:APBI200/Lab_Assignments (see lab no.4)

2.2. Item(s) Not Met – *Please list intended project outputs and/or products that were not attained and the reason(s) for this.*

Item(s) Not Met:	Reason:
N/A	

3. PROJECT IMPACT

3.1. Project Impact Areas – *Please select all the areas where your project made an impact.*

☒ Student learning and knowledge

☒ Student engagement and attitudes

☒ Instructional team teaching practice and satisfaction

☐ Student wellbeing, social inclusion

☐ Awareness and capacity around strategic areas (indigenous, equity and diversity)

☐ Unit operations and processes

☐ Other: [please specify]

3.2. What were you hoping to change or where were you hoping to see an impact with this project? – *Please describe the intended benefits of the project for students, TAs, instructors and/or community members.*

The *Digging In* tool provides learning opportunities for students regarding soil and parent material classification and urban soil management through hands-on activities tailored to Vancouver's unique environment. *Digging In* incorporates the Soil Map of Vancouver into APBI 200 curriculum, creating the technical infrastructure for students to make improvements to this map, which will benefit future users of this map and ensure its long-term usability.

Short-term benefits to students:

1) Support and enhance students' comprehension of material covered in APBI 200 course.

2) Facilitate flexible learning activities that reinforce soil science concepts introduced in the classroom and laboratory through web-based (i.e., tutorial) and mobile activities, allowing students to work through real world applications of these concepts.

Sustainable benefits to students:

1) Enhancement of the Soil Map of Vancouver (www.vancouversoils.ca) by incorporating citizen science activities into the *Digging In* mobile app through which students will ground-truth and suggest edits to the Soil Map of Vancouver.

2) Setting groundwork for UBC students to join community partners in soil assessments and land-use advice based on identification of soil and parent material.

3) Production of shareable, objective data on the effectiveness of specific online learning tools in postsecondary curriculum. This data will support and enhance the effectiveness of future innovative LFS and UBC projects by providing guidance for maximizing their impact on student learning.

3.3. Were these changes/impacts achieved? How do you know they occurred? – *What evaluation strategies were used? How was data collected and analyzed? You are encouraged to include copies of data collection tools (e.g. surveys and interview protocols) as well as graphical representations of data and/or scenarios or quotes to represent and illustrate key themes.*

Evaluation was according quality check-list (shown below) based on eCampus Alberta & UBC's quality rubrics.

Writing

√ The level of language used is appropriate for the intended audience.

√ The writing is free of bias relative to age, culture or ethnicity, gender, and sexual preference.

Technical Standards

√ The learning resource multimedia has been optimized for size and use with standard computer systems.

√ Multimedia elements do not exceed minimum hardware/software requirements.

Layout (Visual Design) Standards

√ The content in a clear, concise, easy to navigate.

√ A simple, consistent, and accessible structure for navigation is provided.

√ Learning resource provides learners the opportunity to proceed at their own pace.

Instructional Design and Pedagogy Standards

√ The learning resource is academically rigorous, relevant, current and has open access.

√ A variety of instructional strategies are used to ensure compatibility with learners' learning styles.

√ The learning resource meets universal design principles.

√ Information presented in the learning resource is accurate.

√ Content is presented in a logical sequence based on the learning objectives.

Assessment Standards

√ Content activates prior knowledge of the learner.

√ The learning resource provides opportunities for practice and transfer of learning in a variety of ways.

√ The learning resource provides background information required by the learner for successful understanding of the material covered.

3.4. Dissemination – *Please provide a list of **past** and **upcoming** scholarly activities (e.g. publications, presentations, invited talks, etc.) in which you or anyone from your team have shared information regarding this project.*

Several dissemination activities (i.e., 4 presentations at national and international conferences and 1 peer-reviewed scientific paper) have been carried out to inform the community of learning about this educational resource.

1. Brevik, E., Hannam, J., Field, D., and Krzic, M. 2018. What Undergraduate Degrees are Students Earning to Pursue Careers in Soil Science? Proceedings of the 2018 Annual Conference of the European Geoscientists Union. Apr 8-13, 2018, Vienna, Austria.
2. Krzic, M., Yates, T., Basiliko, N., Pare, M.C., Diochon, A., and Swallow. 2018. Introductory Soils Courses: A Frontier of Soil Science Education in Canada. Proceedings of the Annual Conference of the Canadian Society of Soil Science. Jun 10-14, 2018. Niagara Falls, ON.
3. Krzic, M., M. Iverson, S. Dyanatkar, and N. Sidles. 2017. Science Citizenship in postsecondary curriculum. UBC Open Learning. May 2, 2017. Vancouver, BC.
4. Iverson, M., M. Krzic, N. Sidles, S. Dyanatkar, S. Smukler, and C. Crowley. 2016. *Digging In*: An educational tool promoting citizen science for Introduction to soil science course. Proceedings of the Annual Conference of the Canadian Society of Soil Science. Kamloops, BC. May 14-19, 2016. p. 86.

In addition, this educational resource was also featured in this peer-reviewed paper:

1. Krzic, M., T. Yates, A. Diochon, M. Swalow, N. Basiliko, and M. Pare. 2018. Introductory soils courses: a frontier of soil science education in Canada. Canadian Journal of Soil Science 98:343-356. https://doi.org/10.1139/cjss-2018-0006.

4. TEACHING PRACTICES – *Please indicate if **your** teaching practices or those of **others** have changed as a result of your project. If so, in what ways? Do you see these changes as sustainable over time? Why or why not?*

The overall goal of this project was to create an educational tool, *Digging In,* for the APBI 200 – Introduction to Soil Science course. The *Digging In* provides evidence-based, technology-enriched teaching and learning opportunities through (i) a campus-based activity on soil formation and parent material, (ii) open access web-based resources, and (iii) a self-guided mobile activity where students act as citizen scientists. These resources are also enriching the multimedia soil map of Vancouver (www.vancouversoils.ca), which was developed by past TLEF funding.

This project is part of an ongoing national initiative on innovations of the soil science curriculum, instigated in 2004 with the establishment of the Virtual Soil Science Learning Resources (VSSLR) group (www.soilweb.ca) under Dr. Maja Krzic's leadership. This program has become a focal point for collaborative teaching efforts among scientists, students, and multimedia experts from 11 universities and 4 research institutes across

Canada resulting in the development of 20 web-based open access educational tools, 2 online courses, 1 multi-institutional soil classification field course, 1 cross-disciplinary graduate training program, and 18 national and international educational awards.

The whole teaching team of the APBI 200 course, which included 2 instructors and 7 Teaching Assistants (TAs), had an opportunity to observe students' engagement with the *Digging In* tool during the lab session focused on soil formation and parent material, which were developed during this project. It was interesting to observe how students approached gathering soil-related information via the *Digging In* app at the various sites throughout Vancouver and their interpretation of the information gathered to soil types in the city of Vancouver. This is definitely something that we will continue to implement in this course in the future.

5. **PROJECT SUSTAINMENT** – *Please describe the sustainment strategy for the project components. How will this be sustained and potentially expanded (e.g. over the next five years). What challenges do you foresee for achieving the expected long-term impacts listed above?*

We hope that our ongoing dissemination efforts may spawn similar teaching and learning initiatives, leading to an even greater number of students who would benefit from this project in the long term. In 2014, Dr. Maja Krzic initiated Soil Science Education Committee within the Canadian Society of Soil Science (see http://csss.ca/education-committee/), which is one of very few such committees in the world. Working in a close collaboration with that committee, Dr. Krzic has organized education sessions in 2016, 2017, and 2018 (and will organize one in July 2019) at the annual conferences of the Canadian Society of Soil Science. These conference sessions, together with the annual meetings of the Soil Education Committee, provided valuable platforms for sharing of key findings of this project (and our past TLEF-funded projects), further solidifying our team and UBC as leaders in innovations in soil science education.