

Small TLEF Project – Final Report

Report Completion Date: (2017/11/07)

1. PROJECT OVERVIEW

1.1. General Information

Project Title:	Making a big difference with very little: Creating a community resource for hands-on math and science activities on a "shoestring budget"		
Principal Investigator:	Dr. Marina Milner-Bolotin		
Report Submitted By:	Dr. Marina Milner-Bolotin		
Project Initiation Date:	April 2016	Project Completion Date:	August, 2017

1.2. Project Summary

1.3. Team Members – (Please fill in the following table and include students, undergraduate or graduate, who participated in your project).

Name	Title/Affiliation	Responsibilities/Roles
Dr. Marina Milner-Bolotin	Associate Professor, EDCP	PI
Dr. Sandra Scott	Instructor, EDCP	Collaborator
Dr. Doug Adler	Instructor, EDCP	Collaborator
Gerald Tembrevilla	Graduate student	Graduate RA
Carlos Marotto	Graduate student	Graduate RA
Solmaz Khodaeifaal	Graduate student	Graduate RA
Davor Egersdorfer	Graduate student	Graduate RA

1.4. 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)
EDCP 352	301/302/303	2017-2018	Fall
EDCP 357	032	2017-2018	Fall
EDUC 450/451	All secondary sections	2017-2018	Fall-Winter
PHYS 101*	All sections	2017-2018	Fall

Undergraduates in introductory Physics course (Physics 101) use our resource as well (their professors use it during the lectures).

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:
We were able to create a database with 50 videos of science experiments that are relevant for K-12 mathematics and science teaching. The database is used by all UBC teacher-candidates, as well as by our former students who are now teachers. It is also used outside of UBC. It has thousands and thousands of hits a month! In addition, it is used by UBC faculty members both in the Faculty of Education and in the Faculty of Science. Thus, the project has even a bigger reach than we expected! The feedback from our students is overwhelmingly positive.	http://blogs.ubc.ca/mmilner/outrach/math-science-education-for-all/
Student engagement with video creation and interest in Camtasia training. We collaborated with our colleagues at the Educational Technology Support Services in our Faculty who helped us conduct Camtasia Training. More than 70 teacher-candidates participated in it and learned how to create their own videos resources.	In UBC Faculty of Education Science and Mathematics methods courses for secondary teacher-candidates.

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:
We have achieved more than what we expected.	

3. PROJECT IMPACT

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

Our goal was to create a resource of science and mathematics experiments that reflects new BC Science Curriculum to help future teachers learn how to engage their students in inquiry learning. We wanted to help them build skills and confidence in communicating science to K-12 students and the general audience. We also wanted to motivate teacher-candidates to learn how to use video editing software, such as Camtasia and to design their own educational resources. As BC school boards are embracing flipped classroom concept, this is a very useful skill for future teachers. This will set our Teacher-Candidate apart from all others.

The project had an enormous impact on the engagement of in science outreach of both elementary and secondary teacher-candidates. Thanks to the availability of the resource, the participation of teacher-candidates in Faculty-wide outreach event (Family Math and Science Day - <http://blogs.ubc.ca/mmilner/2017/11/05/3674/>) almost doubled. We have almost 140 volunteers this year, as opposed to 75 last year. This affected elementary teacher-candidates, who were able to watch the videos and prepare for the experiments in advance. The resource helped improve their science communication and engagement in informal science education.

As a result of this project, our science methods courses have changed their syllabi. We introduced Camtasia (free to UBC community) training in the syllabus and now our secondary teacher-candidates create their own videos of science experiments as part of the courses. This is an example of one of the Teacher-Candidate's feedback: "Videos for teaching science are very useful for helping students see with their own eyes how a concept works. Also, having more videos can help increase student engagement and interest in science." (Molly). Having online videos available is a valuable educational resource for teachers, students and their families. I hope you can have more of them available in the near future. Keep up the good work. (Carlos)

The fact that our students use this resource continuously as part of their course assignments and the preparation for the Family Mathematics and Science Day shows that it is used. The instructors successfully integrated the resource into their science methods courses. The resource will keep growing beyond the TLEF year.

The project had an unexpected impact on the graduate students in our Faculty. Three of our graduate students (Carlos Marotto, Kwesi Yaro and Gerald Tembrevilla) are now investigating different aspects of science and mathematics outreach and how we can create effective resources to promote mathematics and science learning. In addition, as the result of this resource being available online and widely used, we have more applications for graduate studies in our program. This is very important for us. This is now part of our research and science outreach efforts. The resources we have created make a difference in the UBC Faculty of Education community and at the UBC community at large. This would not have happened if we didn't receive this support.

3.2. Were these changes/impacts achieved? How do you know they occurred? – *To what extent were intended benefits achieved or not achieved? 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.*

- 1) We have collected feedback from the teacher-candidates and from the instructors. We have conducted interview with them about their confidence in engaging their own students in hands-on science and after the Family Math and Science Day. We also conducted focus groups. We also interviewed Teacher-Candidates individually and now Carlos Marotto is analyzing the data. The analysis is the purpose of his M.A. thesis (will be finished in May, 2018).
- 2) Course syllabi in the Department of Curriculum and Pedagogy were changed to incorporate our resources and new assignments were introduced that use our resources.
- 3) The level of engagement of Teacher-Candidates in the Family Mathematics and Science Day have increased significantly. We could see it by the doubling of the number of volunteers in our events.
- 4) We will also be measuring how Teacher-Candidates are using these hands-on experiments during their long practicum – February-April, 2018.

3.3. 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.*

- 1) As mentioned above, Carlos Marotto is working on the thesis that focuses on the analysis of Teacher-Candidates engagement with science outreach. A big part of this analysis is their use of our online resource. We hope to have a number of publications as a result.

2) The resource is also available online: <http://blogs.ubc.ca/mmilner/outreach/math-science-education-for-all/>

3) Dr. Milner-Bolotin edited a special issue of *Physics in Canada*, where she published a paper on the Family Math and Science Day at UBC and the resource. The issue is coming out in November, 2017.

Milner-Bolotin, M., & Milner, V. (2017). Family Mathematics and Science Day at UBC Faculty of Education. *Physics in Canada*, 73(3), 2.

Milner-Bolotin, M., & Johnson, S. (2017). Foreword to the Science Outreach Issue. *Physics in Canada*, 73(3), 3.

Milner-Bolotin, M., Scott, S., Adler, D., Tembrevilla, G., Khodaeifaal, S., & Egersdorfer, D. (2017). *STEM education videos for teachers and students*. Paper presented at the UBC CTLT Celebrate Learning Week Conference, UBC.

Milner-Bolotin, M. (2017). Science & Math Education Videos for All. *YouTube Channel of Online STEM resources*. Retrieved from https://www.youtube.com/channel/UCHKp2Hd2k_dLjODXydn2-OA

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?

We described it above. Yes, it had a direct impact on our teaching practices.

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?

The project modeled how to create educational videos and now it became a part of our courses. From now on, our Teacher-Candidates will be contributing to the growth of our resource.