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Enhancing Teacher and Student Understanding of Engineering in K-5 Bilingual Programs

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Data Management Plan

The following data management plan describes the manner by which expected data, metadata, and secondary products will be generated and how these products will be managed. In Phase 1, the Engineering Professional Identity (EPI) survey instrument will be validated through two different trials. For the first trial in, MABE and CeIBA will distribute the survey to 318 K-5 DLI and CB&I teachers in Massachusetts and Puerto Rico, and collect the data. For the second trial, MABE and CeIBA will distribute the survey approximately 250 teachers who will be participating in the annual MABE and CeIBA conference. The survey will be distributed through a Qualtrics anonymous link. Twelve *Cohort 1* Lead teachers will be recruited through follow up questions provided at the end of the EPI survey. MABE and CeIBA will collect 8-10 training videos to be used in instructional rounds. In Phase 2, *Cohort 1* lead teachers will attend an instructional rounds, and take the pre- and post- test EPI survey. Cohort 1 lead teachers will help identify participants at their schools for the *Cohort 2* lead teachers. *Cohort 1* lead teachers will lead the instructional round with Cohort 2 lead teachers. Training materials (videos, classroom materials, field notes, etc.) will be collected. In Phase 3, *Cohort 2* lead teachers will be recruited and instructional rounds will be led by Cohort 1 lead teachers. Teaching/policy document will be collected and analyzed, in order to develop more inclusive policy to integrate engineering contents in the math and science core curriculum. Refined instructional rounds materials will be developed and used by MABE and CeIBA for future instructional rounds implementation.

1. Expected Data

Phase 1

The **metadata** produced from this product are:

- Responses to the EPI survey for validation purposes, validation round 1.
- EPI survey instrument entries for validation round 1 entered into SPSS or other statistical analysis package for validation.
- Responses to the EPI survey for validation purposes, validation round 2.
- EPI survey instrument entries for validation round 2 entered into SPSS or other statistical analysis package for validation.
- Responses to demographics items found in the EPI survey instrument in round 1 and 2.
- Responses to the request for follow up participations (survey round 1 and 2) in the study to recruit the 12 Cohort 1 “lead teachers” for instructional rounds.

Secondary Products:

- About 8-10 video training materials for bilingual teachers in K-5, examples of integration of engineering concepts in the math and science core curriculum lessons.

Phase 2

The **metadata** produced from this product are:

- Recruitment of 12 “lead teachers” for Cohort 1, on the basis of follow up responses entered in phase 1.
- Responses to the EPI survey by the 12 Cohort 1 Lead Teachers (PRE-test, before instructional rounds)
- EPI survey instrument entries entered into SPSS or other statistical analysis package
- Transcriptions of discussion occurred during instructional round intervention with Cohort 1 Lead Teachers.
- Qualitative codes of these transcriptions will be developed through MAXQDA 12 or other mixed- method analysis package.
- Responses to the EPI survey by the 12 lead teachers Cohort 1 (POST-test, after instructional rounds)
- EPI survey instrument entries entered into SPSS or other statistical analysis package

- Transcription of discussion occurred during follow up phone-based focus group with Cohort 1 Lead Teachers, in order to co-create the second instructional rounds intervention for lead teachers' Cohort 2.
- Transcriptions of discussion occurred during focus group with Cohort 1 Lead Teachers.
- Qualitative codes of these transcriptions will be developed through MAXQDA 12 or other mixed- method analysis package.

Secondary products generated from this project will include:

- Videos of interactions between research team and lead teachers during instructional rounds.
- Lead teachers' reflection journals about resources and support needed to implement what learned in the instruction rounds.
- Lead teachers' budget and budget justification proposals.
- Photo, videos, journals, and classroom materials produced by teachers during the instructional rounds and shared on a private online platform with MABE and CeIBA.
- Materials for instructional rounds to be implemented with lead teachers' Cohort 2.
- Video, presentation, and handout training materials to support bilingual teachers integrating engineering contents in math and science core curriculum.
- Online repository, links and training materials for widespread use and dissemination across conferences such as the American Society of Engineering Education, National Association for Bilingual Education, American Educational Research Association, American Council on the Teaching of Foreign Languages.

Phase 3

The **metadata** produced from this study are:

- Recruitment of 12 Cohort 2 Lead Teachers (snowball sampling based on Cohort 1 indications).
- Responses to the EPI survey by the 12 Cohort 2 Lead Teachers (PRE-test, before instructional rounds)
- EPI survey instrument entries entered into SPSS or other statistical analysis package
- Transcriptions of discussion occurred during instructional round intervention with Cohort 1 and Cohort 2 Lead Teachers.
- Qualitative codes of these transcriptions will be developed through MAXQDA 12 or other mixed- method analysis package.
- Responses to the EPI survey by the 12 Cohort 2 Lead Teachers (POST-test, after instructional rounds)
- EPI survey instrument entries entered into SPSS or other statistical analysis package.
- Teaching/policy guidelines about the integration of engineering contents in the math and science core curriculum lessons.
- Qualitative codes of these transcriptions will be developed through MAXQDA 12 or other mixed- method analysis package.

Secondary products generated from this project will include:

- Video recordings of Cohort 1 Lead Teachers implementing engineering concepts into the math and science core curriculum lessons.
- Video recordings of instructional rounds led by Cohort 1 Lead Teachers, with lead teachers' Cohort 2 attending.
- Video, presentation, and handout training materials to support bilingual teachers integrating engineering contents in math and science core curriculum.
- Teaching/policy guidelines to integrate engineering contents in the math and science core curriculum lessons

- Refined instructional rounds materials for future instructional rounds to be implemented by MABE and CeIBA.

2. Standards for Data Format and Content

a) Metadata: To maintain the participants' confidentiality, identifying information will not be collected and pseudonyms will be used in transcriptions during all phases of the project. Prior to any upload (audio or video), written permission will be attained from the participants before use in any venue (research or non-research). No data will be uploaded until this permission has been attained. Any additional data to be used for publications and presentations will be de-identified and analyzed in composite. All data and files (including MAXQDA and SPSS files) will be stored in a restricted access folder in Box.com, USU's encrypted, cloud-based storage system, and it will only be accessible by the research team. Data will be kept for at least five years after the data has been published or 5 years after the project completion, whichever comes first.

c) Secondary Products: Any secondary products to be disseminated broadly (e.g., online repository) will be done upon receiving written consents from the participants at each site.

3. Policies for Access and Sharing

According to USU's Institutional Review Board (IRB), other researchers can view the data after the project is over and after identifying information has been removed. Although we will not provide open access to the participant data, the PI can make it available upon written request (and permission) to any researchers who might want to view it one year after the project phases pertinent to the data has been completed and/or the information has been analyzed, de-identified and submitted for publication. As noted previously, all identifying information will be removed before the data is made available to any researcher and all data to be used in the workshops will be done in composite form with non-identifiable information. No teachers' names representative, or student names will appear in any website or repository. The external evaluator consultants (Ms. Martinez-Guadapakkam and Dr. Karen Mutch-Jones) will be responsible for collecting the evaluative data under the Utah State IRB oversight. The results of data analyses will be shared through publications and conference presentations, but all participant identifiers will be removed from all data excerpts prior to publication. In the unlikely case that the journal editors request access to raw data or metadata, the PI will make the following items available to them: (a) tabular or graphical comparisons of participant entries; and (b) raw de-identified data, such as instructional rounds session transcripts.

4. Policies for Re-Use, Re-Distribution, and the Production of Derivatives

Secondary products generated by the proposal, such as the dissemination of the video training materials, will be made widely available for all bilingual educators and student support personnel of charge. The training materials and content will include the condition that all educators using these products can copy the materials, and distribute them freely in their own instruction, but cannot sell or use them to make a profit. Any data collected to draft manuscripts and reports will be shared at annual conferences including American Educational Research Association, Frontiers in Education, and American Society of Engineering Education Conferences.

5. Plans for Archiving Data

Hard copies of data will be destroyed immediately after identifiers have been removed. A secondary copy of these data will be kept restricted access folder in Box.com, USU's encrypted, cloud-based storage system, and it will only be accessible by the research team. Five years after the completion of the project, any items with identifiers (e.g., consent forms) will be destroyed. De-identified data will remain in the cloud-based storage system for five years after the project has concluded to enable future analyses.