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Collaborative Research: STEM Career Connections: A Model for Preparing Economically-Disadvantaged Rural Youth for the Future Workforce

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DATA MANAGEMENT PLAN

The University of Colorado as the research partner will be managing data collection, storage, and related activities. Our plan for data management will conform to the NSF policy on the dissemination and sharing of research results. The purpose of this plan is to ensure the integrity and vitality of the data collected, to protect the rights of our research subjects in accordance with the privacy policies and institutional review board criteria under which this work is conducted, and to ensure that research data can be shared appropriately and disseminated as widely as possible. For the purposes of this data management plan, we will discuss data that is collected from project partners, OST facilitators and youth in detail below. Over the duration of the project, we will report on results as they become available in academic conferences and journals. During the last six months of this effort, we will issue a formal project report to be published on the collaborating organizations' websites and disseminated at conference presentations. The report will describe the project, co-designed curriculum, advancements to theory, project outcomes, and lessons to be considered for future work. In the remainder of this plan, we describe the types of data to be collected, the standards under which our data is collected and stored, the access and sharing of private data, the plan for data sharing and dissemination, and data preservation.

I. Types of data. The project will collect data from participating partnership members, out of school time (OST) facilitators and the youth they work with. From facilitators, the project will collect demographic data, videotaped observations of enacted sensor integrated STEM activities, resources and artifacts from the OST STEM activities, facilitators' written curriculum adaptations, videotaped observations of the OST program, and interviews. From youth, we will collect STEM Career Connections journals with prompts and survey items, Individual College and Career Plans (ICAP), conduct interviews with a subset of youth, digital artifacts of youth work, and video observations during OST program sessions. Interviews and journal prompt/survey responses will be entered and stored in a common spreadsheet format and then merged into a relational database. The videotaped observations will be filmed using a SWIVL and stored electronically as video files. Video, digital artifacts of youth work, and artifacts from the PD sessions, including photographs will be stored on a secure third-party hosting site.

II. Standards for data and metadata. *Data formats.* Data will be stored in commonly-used file formats as well as a relational database. For record matching purposes, the data may include personal identifiers. If this is the case, these identifiers will be destroyed and replaced with anonymous IDs, in accordance with IRB protocol. Project staff will write scripts to export cleaned and linked data from the database into a series of spreadsheets (e.g., a spreadsheet of student data and a spreadsheet of teacher data) so the data can be easily imported into major statistical software packages. There are no applicable metadata standards that will be applied to these data.

III. Policies for access and sharing including provisions for appropriate protection of privacy, confidentiality, security, intellectual property, or other rights or requirements. This work will involve gathering or processing personal (private) information and UCAR, the University of Colorado Boulder, and Utah State University will be required to manage such information in accordance with the UCAR's Information Security policy as well as all applicable federal and Colorado state privacy laws.

All electronic data collected for the project will be maintained on secure servers that are backed up at regular intervals. Only clearly identified individuals responsible for linking and de-identifying data will have access to data files containing identifiers; all files containing identifiers will be destroyed after all data is cleaned and merged into the study database. Project staff may need to download de-identified data from the server to a laptop or a desktop to conduct data analysis. These computers must be password protected and local copies of project data must be deleted once analysis is concluded. UCAR and the University of Colorado Boulder will take specific steps to ensure the data are kept secure and confidential as evidenced, at minimum, by the following:

- Personal data, while being transmitted electronically, must be encrypted.
- Any physical or digital repository for the data will be secured and have access restricted to those personnel that are authorized to access the data and have signed a confidentiality agreement.
- Access to electronic data systems will require authentication and authorization mechanisms.
- Access permissions will be restricted via the principle of least privilege.
- Computers will maintain current service pack, security updates, and antivirus definitions.
- Data backup are performed regularly and stored securely.

UCAR will also cooperate fully with any formal threat assessment or security audit by an appropriately qualified third party engaged by University of Colorado Boulder. We intend this work to be a fruitful intellectual relationship in which each partner benefits from the value added by the other partners.

IV. Dissemination of data and results. Project data will be made available, upon request, to other researchers after initial publication of the project's findings. Data sharing will be in aggregate views. When sharing any human subject data, we will remove from the dataset any identifier that could compromise the confidentiality and anonymity of a participant. Data files will be transferred electronically via a secure file-sharing protocol. Coding documents that specify the fields of data files will be created to accompany each type of data file to ensure that the data files are meaningful to other investigators. Technical documentation will be created providing details of the project's instruments, data collection process, data validation and analysis processes. The design of this documentation will be informed by technical documentation prepared by NAEP, TIMSS and PISA. We will disseminate results of our research through scholarly publications, practitioner publications, and academic conferences. The following venues will be targeted for publications and conferences: International Society for Technology in Education (ISTE), National Afterschool Association, Click 2 Science PD for OST Time Program Providers webinars, National Rural Education Association, Journal of Learning Sciences, Journal of Research in Science Teaching, Journal of Connected Science Learning, Conference on Computer-Supported Collaborative Learning (CSCL), National Association for Research in Science Teaching (NARST) Conference, International Conference of the Learning Sciences, Conference of the American Education Research Association (AERA), and the Special Interest Group on Computer Science Education (SIGCSE) Conference. Our publications will ensure that resulting knowledge, design guidelines, and lessons learned are disseminated to a broad and multidisciplinary audience.

V. Policies and provisions for reuse, redistribution, and the production of derivatives. We intend that the data will be able to be re-used and possibly extended by the University of Colorado Boulder and UCAR and this will be covered in the joint intellectual property agreement that will be created.

VI. Plans for archiving and preservation of access. The data will be kept for ten years beyond the life of the project before all the files are destroyed, to allow for future longitudinal studies. While the data are kept for these additional years, the same storage protocols described above will be followed.

VII. Roles and responsibilities of project staff. The Principal and Co-Principal Investigators will ensure that all persons assisting with the research are informed about the protocol and their research-related duties and functions through face-to-face meetings, as necessary. Should the Principal or Co-Principal Investigators leave the project or their institution, this responsibility will be assumed by the research associates on the project. All research staff will be required to read the appropriate documents related to this project, including the grant proposal, Human Research Committee documents, consent forms, etc., before beginning to work on the project. In addition, senior staff will meet (individually or in small groups) with the research staff to ensure that they appreciate the importance of maintaining the confidentiality of all communications and research records.