Plan Overview

A Data Management Plan created using DMPTool

Title: Research Initiation: Exploring the Role of Project Authenticity in Engineering Technology Capstone Design Projects

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Template: NSF-ENG: Engineering

Project abstract:

The purpose of this project is to initiate research into the role of authentic learning theory in Engineering Technology (ET) capstone courses, specifically the connection between project-type and development of student professional competencies and design skills. Students enrolled in a multidisciplinary two-semester ET capstone course will be assigned either industry-sponsored or faculty-sourced projects. Student outcomes related to learning, application of professional competencies, design and project management tool use, final product quality, and satisfaction with course and project types will be evaluated via a convergent mixed methods research design. The research outcomes will help guide development of ET capstones and help to define how authentic the capstone design experience should be compared to industry design experiences.

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Research Initiation: Exploring the Role of Project Authenticity in Engineering Technology Capstone Design Projects

Products of Research

What types of data (experimental, computational, or text-based), metadata, samples, physical collections, models, software, curriculum materials, and other materials will be collected and/or generated in the course of the project? The DMP should describe the expected types of data to be retained, managed, and shared, and the plans for doing so. What descriptions of the metadata are needed to make the actual data products useful and reproducible for the general researcher? For collaborative proposals, the DMP should describe the roles and responsibilities of all parties with respect to the management of data (including contingency plans for the departure of key personnel from the project) both during and after the grant cycle.

This mixed methods research project will generate and/or collect quantitative and qualitative data. The anticipated data sources are the 1) student assessments (student deliverables, grades, rubrics, and surveys), and 2) exit interviews.

At the completion of each semester, select course data for the project will be de-identified by Dr. Turner and deposited into a working folder, within a password protected online commercial file hosting application (e.g., Microsoft OneDrive, Google Drive, Dropbox), which will be shared between the PIs. The anticipated data file types are text, number, and/or image.

At the completion of each spring semester, once grades are posted but prior to graduation, students will be presented with an opportunity to participate in a recorded exit interview with Dr. Webster. All recordings will be de-identified and deposited into the working folder. Both PIs and an undergraduate research assistant will transcribe and code the interviews into text files. The anticipated data file types are text and audio recordings.

Data Formats and Standards

In what format and/or media will the data or products be stored (e.g., hardcopy notebook and/or instrument outputs, ASCII, html, jpeg or other formats)? Where data are stored in unusual or not generally accessible formats, how may the data be converted to more accessible formats or otherwise made available to interested parties? When existing standards are absent or deemed inadequate, this should be documented along with any proposed solutions or remedies. In general, solutions and remedies to providing data in an accessible format should be offered with minimal added cost.

Student assessment data will be stored as one of a few standard text-based formats: plain text (TXT), Adobe portable document format archival (PDF/A), comma-separated values (CSV), and/or Microsoft Excel Extensible Markup Language (XML).

Audio interview data will be stored as one of a few standard audio-based formats: audio interchange file format (AIFF) and/or waveform audio file format (WAVE). Text interview data will be stored as one of a few standard text-based formats: plain text (TXT), Adobe portable document format archival (PDF/A), comma-separated values (CSV), and/or Microsoft Excel Extensible Markup Language (XML).

During the study, file names and directory structure will be used in lieu of metadata to organize the data produced by this project (project space). It is anticipated that the top-level folder will be the project title and the sub-folders will be organized by cohort, data source, and design project type. File version history will be controlled by the online commercial file hosting application.

Dissemination, Access and Sharing of Data

What specific dissemination approaches will be used to make data available and accessible to others, including any pertinent metadata needed to interpret the data? In this case, "available and accessible" refers to data that can be found and obtained without a personal request to the PI, for example by download from a public repository. What plans, if any, are in place for providing access to data, including websites maintained by the research group and contributions to public databases/repositories? For software or code developed as part of the project, include a description of how users can access the code (e.g., licensing, open source) and specific details of the hosting, distribution and dissemination plans. If maintenance of a website or database is the direct responsibility of the research group, what is the period of time the website or database is expected to be maintained? What are the practices or policies regarding the release of POST-AWARD MANAGEMENT data – for example, are they available before or after formal publication? What is the approximate duration of time that the data will be kept private? "Data sharing" refers to the release of data in response to a specific request from an interested party. What are the policies for data sharing, including, where applicable, provisions for protection of privacy, confidentiality, intellectual property, national security, or other rights or requirements? Research centers and major partnerships with industry or other user communities should also address how data are to be shared and managed with partners, center members, and other major stakeholders; publication delay policies (if applicable) should be clearly stated.

The planned dissemination strategy for this project is as follows:

- Evaluation and Reporting I Stage (summer 2023):
  - Work in Progress (WIP) paper at the 2023 American Society of Engineering Education (ASEE) Annual Conference and Exposition, 2023 American Society of Mechanical Engineers (ASME) International Design Engineering Technical Conferences and Computers and Information in Engineering Conference (IDETC/CIE), or the 2023 Frontiers in Education (FIE) conference
- Evaluation and Reporting II Stage (summer 2024):

- Full paper at the 2024 ASEE Annual Conference and Exposition or submission to an archival publication, such as the Journal of Engineering Education (JEE), Journal of Engineering Technology (JET), or Advances in Engineering Education (AEE), and/or workshop at the 2024 Capstone Design Conference

During the study, preliminary data and internal documents will be stored privately within the project space on the online commercial file hosting application indicated in section 2. Only research group members will have access until study completion. After the final results are published in peer-reviewed literature, the data will be considered public products (suitable for dissemination beyond the research group) and made public digital assets on the Purdue University Research Repository (PURR). Use of PURR for these functions is centrally supported at no direct cost to the project.

PURR will be utilized for long term storage, curation, preservation, and dissemination of the project data. PURR utilizes HUBzero®, a web-mediated software platform designed for scientific collaboration and sharing of scientific data that was developed with support from the National Science Foundation and Purdue University. PURR provides workflows and tools for ingestion, identification, and dissemination of data as well as services to ensure data security, fidelity, backup, and mirroring. Purdue Libraries will consult with investigators to facilitate selection and ingestion of data with the application of appropriate descriptive metadata and data standards as well as to provide appraisal of data for long-term preservation and stewardship. PURR meets the standards for ISO 16363 Trusted Digital Repositories and is pursuing CoreTrustSeal certification for Trustworthy Data Repositories through the World Data System. PURR comes with a set of default policies and functionality that addresses privacy and confidentiality, intellectual property and copyright, and access and sharing of data. Data published using PURR will be assigned Digital Objects Identifiers (DOIs) and will be exposed to the web using open standards to maximize discoverability and scholarly reuse of data.

A copy of all published peer-reviewed journal articles and/or juried conference papers (either the final accepted version or the version of record) will be deposited in NSF-PAR, hosted by the Department of Energy (DOE), as required by NSF.

Re-Use, Re-Distribution and Production of Derivatives

What are your policies regarding the use of data provided via general access or sharing? For data to be deemed "re-usable," it must be accompanied by any metadata needed to reproduce the data, e.g., the means by which it was generated, detailed analytical and procedural information required to reproduce experimental results, and other pertinent metadata. Practices for appropriate protection of privacy, confidentiality, security, intellectual property, and other rights should be communicated. The rights and obligations of those who access, use, and share your data with others should also be clearly articulated. For example, if you plan to provide data and images on your website, will the website contain disclaimers or condition regarding the use of the data in other publications or products?

Data will be made available for re-use, re-distribution, and/or the creation of new tools, services, data, or products (derivatives) after being deposited into PURR. Users of the shared data should give credit to the PIs by data citation, published publication citation(s), and/or acknowledgement.

Archiving of Data

When and how will data be archived and how will access be preserved over time? For example, will hardcopy logs, instrument outputs, and physical samples be stored in a location where there are safeguards against fire or water damage? Is there a plan to transfer digitized information to new storage media or devices as technological standards or practices change? Will there be an easily accessible index that documents where all archived data are stored and how they can be accessed? If the data will be archived by a third party, please refer to their preservation plans (if available). Where no data or sample repository exists for collected data or samples, metadata should be prepared and made publicly available over the Internet and the PI should employ alternative strategies for complying with the general philosophy of sharing research products and data as described above

At project completion, data will be deposited into PURR, and retained therein, as digital assets, for a standard 10-year period.