Generative AI and Assessment: Design Principles for the Future of Teaching and Learning in Higher Education

A Data Management Plan created using DMP Assistant

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Template: McMaster General Purpose DMP Template

Project abstract:

This project aims to produce a set of design principles to empower university-level instructors either to incorporate the use of generative AI tools, such as ChatGPT, into student assessments effectively or to limit the impact of generative AI on the integrity of assessments, whether through reducing the tools' usefulness to students or convincing students of the benefits of not using such tools. These principles will emerge from a collection of assignments in university courses that either have been partially or fully redesigned in response to the emergence and growing student use of generative AI tools, or are perceived as being unimpacted by the availability of such tools. The research team will distribute an open call to university instructors for assignments that fit these criteria and that instructors intend to use in courses during the fall 2023 semester. A content analysis will be performed on all relevant submissions to identify key themes and areas of intervention in assessment (re)design. Analysis will be paired with select follow-up interviews to understand instructor motivations behind specific design choices and to determine instructor perceptions of (re)design outcomes (based on experiences from implementing assessments during the fall term). The data and findings from this research will be published in a report, and the concretized design principles emerging from the analysis will be theorized in a separate paper with potential assessment examples, templates, and frameworks as resources for instructors worldwide.

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Data Collection

In the first stage of the research (September–December 2023), the data collected will include participant institutional affiliation (name of university and department), discipline, years of teaching experience, status of employment (full-time, tenured; full-time, tenure track; full-time, teaching stream; contractually limited appointment; sessional; other), and email address (optional for follow-up interview).

Copies of assessments intended for use in fall 2023 courses will also be collected in various formats and converted to standardized PDFs that include accessible tags and searchable text, achieved through optical character recognition (OCR) processing. The content of these assessments will be analyzed by the research team to identify patterns or clusters of themes concerning generative artificial intelligence and assessment tasks, practices, approaches, descriptions, and overall discourse. Participants will also have the option to opt in or out of having their submitted assessments added to a public data repository via consent language with a check box, i.e., "give consent" or "do not give consent."

The data above will all be collected via LimeSurvey through McMaster's institutional license. Data collected through LimeSurvey is initially stored locally at McMaster until moved to the research team's own storage locations (detailed in Storage and Backup section).

In the second stage of the research (January–April 2024), virtual or in-person interviews with selected participants will be audio recorded and transcribed. The names of interviewed participants will be included with consent or de-identified if participants choose to remain anonymous.

In the first stage of the research, information about participants will be collected in plain text format and stored as either a comma separated values file (.csv) or a Microsoft Excel document (.xlsx). Sample assessments submitted by participants to be used as cases for analysis in the study will be collected in a variety of formats (.pdf, .doc, .docx, .rtf, .txt, .jpg, .png), ultimately to be converted to OCR-processed, tagged PDFs.

In the second stage of the research, interviews will be audio recorded through audio capture software on the researcher's device and encoded as .flac (an open and free format) files.

All file names will adhere to snake case (spaces replaced by underscores).

For internal project files requiring collaboration (such as document drafts and data tables), file names will follow a convention of including a standardized date (YYYYMMDD) indicating the last day on which the file was edited, a short description of the file, and the initials of the last team member to edit the file. For example, I might name a document for this data management plan draft "20230724_dmp_draft_BLT".

Internal project files that will not require collaboration include sample assessments submitted by participants and converted PDFs. The files will follow a different naming convention consisting of a unique document ID, the abbreviated institutional affiliation and discipline of the participant, and an indication of whether the assessment is an original submission or a converted submission. For example, a hypothetical original assessment submitted by a participant in physics at McMaster University might be named "01453_phys_mmu_orig.docx". Documentation will be created detailing the unique document ID generation process and providing a legend for all abbreviations.

Interview audio files will include a standardized date (YYYYMMDD) indicating the day the interview was conducted, the unique document ID associated with the assessment file originally submitted by the interviewee, and the initials of the team member conducting the interview. For example, an interview conducted on 28 January 2024 by Ben Lee Taylor with the participant who submitted the assessment in the previous paragraph's file name example would be named "20240128_01453_BLT".

For internal project files requiring collaboration and interview audio files, if a researcher has opted out of including identifying information, a random unique identified can be used in place of personal initials.

All files will be organized into folders with descriptive names for ease of access. Initial folders might include "Project Documentation", "Data", "Data/Submissions/Original", "Data/Submissions/Converted", and "Data/Interviews". Folder structure will be reassessed and adapted as needed.

Documentation and Metadata

A guidebook will document the data collection and storage process and include a guide for understanding how to read tables containing participant information. Since assessment submissions are a key qualitative data source for this project, the guidebook will also include a description of the patterns or themes emerging from the analysis of such data and how they have been consistently categorized across the dataset. Finally, the interview questions and process will be documented in the guidebook. Any abbreviations or technical terms will be defined in an appendix to the guidebook.

In addition to this internal documentation, a more concise README file will be developed once the project is complete to help others read and interpret the data set in the future—i.e., how the data have been categorized, quantified or qualified, organized, etc., to allow for analysis.

An initial research team meeting will establish documentation procedures and expectations to ensure efficiency and consistency. This meeting will include, for example, a tutorial on file naming conventions and the living guidebook to be maintained throughout the project. Digital tools that enable collaboration (such as Microsoft Teams and OneDrive, Zotero group libraries, and the Open Science Framework) will be leveraged to support such efficiency and consistency across the research team. Regularly scheduled team meetings will include an agenda item focused on evaluating current levels of documentation and identifying gaps to be addressed.

Dublin Core standards will be used for metadata tagging and description. The project will be partly managed through the Open Science Framework, which will facilitate with maintaining data documentation and description.

Storage and Backup

Depending on the number and type of assessment submissions, storage needs could range from 5–10 GB on the low end to 25–30 GB on the high end. Lossless audio recordings will require the most storage space, but we only anticipate conducting 5–10 such interviews.

Participant demographic information (institutional affiliation, discipline, employment status, and years of teaching experience) will be stored securely for one year after the conclusion of the study.

Interview recordings will be stored until transcribed, after which the audio files will be deleted. Full text transcriptions of interviews will be stored securely for five years after the conclusion of the study.

Assessment submissions fall into two categories: those from participants who give consent to have assessments made public as part of a teaching and learning repository, and those from participants who do not give such consent. Those submissions that fall into the former category will be stored indefinitely in a database connected to a publicly available website, and those that fall into the latter category will be stored securely for five years after the conclusion of the study.

All data will be stored in three locations:

1. Microsoft OneDrive (encrypted) through McMaster University's institutional license;
2. MacDrive (encrypted) file storage and sync;
3. External hard drive (encrypted) in the PI's possession.

Locations 2 and 3 will act as backup for location 1.

Initially, data collected via LimeSurvey will be stored locally on McMaster's surveys. These data will be exported weekly and replicated to the three locations above. Once the first phase of the study is completed and the LimeSurvey form is closed, data will be deleted from McMaster's surveys and only stored on the three locations above.

Similarly, audio recordings of interviews will initially be saved to the PI's laptop computer (provided by the MacPherson Institute). The audio files will then be moved to the three locations above and deleted from the PI's laptop. Audio files will only be stored until text transcription of audio has been completed and the corresponding interviewee has reviewed and approved of the transcription. After this, audio recordings will be deleted from all storage locations.

Microsoft OneDrive will be the point of access to data for the research team and other collaborators. Other tools that will facilitate file and knowledge sharing as well as project management include Microsoft OneNote, OSF, and Zotero group libraries.

On all platforms, individuals will be appropriately limited through sharing and permissions settings.

Preservation

Participant demographic information has no reuse value and will be deleted one year after the conclusion of the study.

Participant interview transcriptions will be stored securely and accessible to the PI for five years, as this form of data may be useful for future research.

Assessments from instructors who have not given consent to have their submitted assessment(s) made freely available to the public will be stored securely and accessible to the PI for five years, as this form of data may also be useful for future research.

All other assessments will eventually be moved to a database and made publicly available through a researcher website (to be requested through the Office of the Vice-President at McMaster). For longevity, these assessments (in converted PDF format with accessible tagging and optical text recognition) will also be deposited into a research data repository, such as McMaster University Dataverse or ICPSR.

The only potentially personally identifying data used in this study are the demographic information collected in the initial

recruitment survey. These data will be securely stored and deleted according to the process indicated in previous questions.
Items added to the public assessment repository will have already been standardized in PDF format with accessible tagging and text with optical character recognition. Backups will still be maintained to ensure file integrity.

Sharing and Reuse

Assessments from instructors who have given consent to have their submitted assessment(s) made freely available to the public may be shared in a slightly processed format (converted to accessibly tagged PDFs with optical character recognition performed) as part of published study results and/or a publicly available data repository.
Assessments from instructors who have not given consent to have their submitted assessment(s) made freely available to the public will only be referred to as part of the analysis presented in published study results and not shared in full (for example, a small percentage of the assessment's language may be cited or the assessment may be included as part of a demographic category, e.g., as part of a statistic associated with submissions received from a particular discipline or university).
Data associated with institutional and disciplinary affiliation will also be shared in published study results. This may include indicating or visualizing the number of times a particular phrase or theme occurred in assessments by institution and/or discipline.

Participants who indicate that they would like their assessment submissions to be included as part of a public data repository will be required to consent to licensing their submission as public domain. The repository itself will be licensed under the Open Data Commons Public Domain Dedication and License (PDDL). Participants will be given the option to have their assessment submissions attributed to them in the data repository or to remain completely anonymous and still share their assessment with the public.

The opt-in data repository of submitted assessments would be hosted on its own website with a simple database backend, such as MySQL. Research web hosting will be requested from the Office of the Vice-President Research at McMaster. For longevity, assessments (in converted PDF format with accessible tagging and optical text recognition) submitted by participants who have opted in to the public data repository will also be deposited into a research data repository, such as McMaster University Dataverse or ICPSR.

Responsibilities and Resources

The principal investigator (Ben Lee Taylor) will be responsible for managing the project's data throughout the entire lifecycle. Major tasks will include initial data collection through LimeSurvey, encryption and storage of data, regular data backup to secondary cloud and local drives, deletion of data (for reasons of participant withdrawal or otherwise), ensuring consistency of file naming and organizational structure, recording and transcribing interviews, post-study data management, and creation of data repository.
The research team currently consists of co-supervisors Erin Aspenlieder and Kim Dej as well as two student researchers. Student researchers will be responsible for assisting with several of the above tasks based on interest, skillset, and availability. Student researchers will report to the PI who reports to co-supervisors.

Processes and procedures will be documented before initiating the study to facilitate the transition of data management activities in the case of personnel changes. Other members of the research team will also be able to support such a transition by temporarily taking on data management tasks.
If the PI is unable to complete parts of the project or must step back at anytime from managing and conducting the research, co-supervisors Erin Aspenlieder and Kim Dej will take responsibility and may delegate work within the MacPherson Institute as they see fit. The PI's postdoctoral fellowship is housed under the MacPherson Institute, so ultimately the Institute will take responsibility for the research.

Ethics and Legal Compliance

All medium- to high-risk data will be encrypted before being uploaded to cloud-based and local drives. The PI will maintain physical possession of the local drive, and the cloud-based drives will have permissions and sharing settings configured to allow for the minimum level of access necessary for each member of the research team. No others will have access to the cloud-based drives.
There is little potentially identifying information involved in this study, although email addresses will be collected from those

participants willing to be involved in a follow-up interview. These email addresses may be initially unpaired from submissions prior to assessment content analysis and stored separately, linked through a unique document ID. This could further strengthen the separation between data types and allow for even more granular permissions and sharing settings.

Moreover, basic cyber security best practices will be followed, including the use of strong passwords, a password manager (Bitwarden), and two-factor authentication, when possible.

Consent language will be prepared and included in submission form distributed via LimeSurvey. Such language will address whether participants would be willing to have their assessment submission(s) included in a public data repository under a public domain license, and, if so, whether they would like such assessment(s) to be attributed to them by name or not.

Such licensing will be compliant with the McMaster University Faculty Association's (MUFA) current policy framework for the ownership of instructional materials. Participants will be given the option to withdraw materials from the data repository at any time.

Consent language will also be clearly stated during potential follow-up interviews, asking interviewees if they consent to being audio recorded during the interview and informing them of the interview data may be used as well as how long it will be stored. Interviewees will be given the option to withdraw from the study up to the point that results are published.

No sensitive data will be shared.