Plan Overview

A Data Management Plan created using DMPonline

Title: A Pedagogically Driven Approach to Designing Immersive Learning Experiences in Higher Education

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Project abstract:

Immersive technologies offer the potential to significantly enhance teaching and learning, but as an emerging technology future use cases are not yet fully realised. Despite becoming more accessible due to technical advances they are still to become mainstream. One reason for this is the difficulty of developing experiences which are of high quality and incorporate pedgological principles in order to be effective. This thesis proposes to develop a pedagogy driven design framework to support educators creating their own learning experiences while leveraging XR's affordances.

A **systematic and critical literature review** will synthesise research from educational psychology, learning theory, human computer interaction and XR design methodologies. This review will identify limitations *and gaps in current practice. Insights from this review will inform the development of XR prototypes which will be used to test the findings. Quantative data will be collected to measure* presence, engagement, and usability. Qualitative data will be gathered through observations, interviews, and reflective accounts from participants. Over the duration of the project new devices, techniques and tools that become available will be incorporated. The study will progress through **iterative cycles of analysis, design, implementation, and evaluation. This will culminate with a platform agnostic XR** evidence based design framework which educators can use to design and develop their own XR learning materials.

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A Pedagogically Driven Approach to Designing Immersive Learning Experiences in Higher Education

Data description and collection or re-use of existing data

How will new data be collected or produced and/or how will existing data be re-used?

Questionnaire and interview data will be collected using Maynooth Universities MSForms and OneDrive. Video and audio recording of user testing sessions will captures using screen casting from the HMDs and a video camera. All data will be initially stored on a secure OneDrive and then uploaded to a password protected repository like Zenodo. Immersive experiences made using Unity and the project files will be stored on GitHub.

What data (for example the kinds, formats, and volumes) will be collected or produced?

The project will generate audiovisual, quantitative, and qualitative data consisting of completed questionnaires, datasets, spreadsheets, research notes, consent forms, and analytical documents. These will be stored as DOCX, PDF, CSV and XLSX format. Estimated combined file size of 10 MB. Video recordings will stored in MP4 format, with an estimated total size of 2 to 5 GB per video with an estimated combined size of 10 to 100 MB. The total approximately 6 GB. Allowing for working copies, data processing, backups, and derived files, a total storage allocation of approximately 10 GB is anticipated.

Documentation and data quality

What metadata and documentation (for example the methodology of data collection and way of organising data) will accompany data?

Documentation describing the methodology, screener forms, consent forms, participants, procedure, data dictionary, questionnaire, participant information sheets, and ethical approval documentation. Each data file will be assigned a descriptive filename and stored in an organised folder structure. Video recordings will have the relevant recording metadata, date, duration, format, and associated session identifiers. Analytical spreadsheets and documents will include descriptions of the methods used to process, interpret, and analyse the data. A list of Unity files will also be stored with links to their GitHub repositories

What data quality control measures will be used?

Data quality will be maintained through consistent data collection procedures. Questionnaires/experiments will be reviewed and piloted. Responses will be checked for completeness, duplicate entries, invalid values, and inconsistencies before analysis. Video recordings will be checked for, audio-visual quality, correct file naming, and successful playback following recording. Files will be assigned unique identifiers and checked to ensure they correspond to the appropriate research session. Where recordings are transcribed or coded, a sample will be checked against the original recordings for accuracy.

Research files will be organised using consistent naming conventions and a documented folder structure. Original raw data will be retained unchanged, with cleaning and processing undertaken on working copies. Version control will be used for analytical documents and datasets where appropriate. Regular backups will be maintained, and file integrity will be checked periodically.

Storage and backup during the research process

How will data and metadata be stored and backed up during the research process?

10GB approximatly.

How will data security and protection of sensitive data be taken care of during the research?

All research data will be stored securely using institutionally approved, password-protected storage systems, with access restricted to the researcher, members of the research team (if any) and supervisors. Personal data will be minimised and they will be assigned

unique identification codes. Questionnaires and video recordings will be treated as potentially identifiable personal data, particularly where participants' faces or voices are captured.

Legal and ethical requirements, codes of conduct

If personal data are processed, how will compliance with legislation on personal data and on data security be ensured?

Not applicable to the research to be undertaken during this project. Note that there is no sensitive personal data as defined by the General Data Protection Regulation act.

How will other legal issues, such as intellectual property rights and ownership, be managed? What legislation is applicable?

This intends to be as open-access as possible so all applicable data will be available upon reasonable request. There is no private intellectual property rights involved with the research, and no associated legislation.

How will possible ethical issues be taken into account, and codes of conduct followed?

Data collection protocols will be assessed by the ethics committees of Maynooth University and the Institute of Art Design and Technology Dun Laoghaire.

Data sharing and long-term preservation

How and when will data be shared? Are there possible restrictions to data sharing or embargo reasons?

In the spirit of open-access, all data will be available upon reasonable request. There are no known restrictions to data sharing or embargo issues.

How will data for preservation be selected, and where will data be preserved long-term (for example a data repository or archive)?

The data will be backed-up on the OneDrive network at Maynooth University. For all data types, in order to ensure public and permanent open data access, use a third-party data repository like Zenodo.

What methods or software tools will be needed to access and use the data?

There are no specialised software or tools required to view or access the data. Github will be used to store and allow access to immersive experiences built using Unity so Unity which is free software will be needed to access them.

How will the application of a unique and persistent identifier (such as a Digital Object Identifier (DOI)) to each data set be ensured?

Datasets and all files will be uploaded to Zenodo which automatically generates a DOI for them.

Data management responsibilities and resources

Who (for example role, position, and institution) will be responsible for data management (i.e. the data steward)?

The principal researcher, Robert Griffin will manage the research data throughout the project. The PhD supervisors in Maynooth University and IADT will provide oversight in accordance with the agreed research arrangements and relevant institutional policies. The researcher will seek advice from the relevant institutional Data Protection Officer, research ethics committee, and research support services where required.

What resources (for example financial and time) will be dedicated to data management and ensuring that data will be FAIR (Findable, Accessible, Interoperable, Re-usable)?

Data management will be integrated into the research process from the start and maintained throughout the PhD. Dedicated time will be allocated at each stage of the research to organise, document, store, review and prepare research data for long-term preservation and potential reuse.

No significant additional financial resources are anticipated specifically for data management. Existing institutional resources provided by IADT and Maynooth University, including secure data storage, institutional software, research infrastructure and relevant research support services, will be used wherever possible. Any additional costs associated with data storage, software or long-term preservation will be reviewed as the project progresses.

Time will be allocated throughout the research lifecycle for:

- Establishing a structured data management system, including consistent file naming conventions, folder structures, version control and metadata documentation.
- Maintaining accurate records of data collection methods, research instruments, methodologies and analysis procedures.
- Ensuring data are stored securely, with appropriate access controls, backups and version management.
- Reviewing and documenting datasets to support their future discoverability, interpretation and reuse.
- Preparing appropriate research outputs, including anonymised datasets, documentation and supplementary materials, for deposit in a suitable institutional or recognised research repository, where ethical, legal and consent requirements permit.

The FAIR principles will be addressed through the use of standardised file formats where practical (e.g. CSV, TXT, PDF and open-source formats), descriptive metadata, clear documentation and appropriate persistent identifiers, such as DOIs, where supported by the selected repository. Data will be made accessible in accordance with ethical approval, participant consent, GDPR and institutional data protection requirements. Where raw data cannot be openly shared due to confidentiality or personal data considerations, appropriately anonymised or aggregated data, together with supporting documentation, will be made available where feasible.

As the research involves the development and evaluation of educational XR experiences, particular attention will also be given to documenting prototypes, research instruments, evaluation frameworks and design processes to support transparency, reproducibility and potential reuse by other researchers and educators.

Data management practices will be reviewed periodically in consultation with the PhD supervisors and relevant institutional research support services to ensure that the data remain appropriately managed and aligned with FAIR principles throughout the project.