

International Collaborative Design, Development and Evaluation of a MOOC on Data Analytics for Educators

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Abstract— This paper presents the systematic development and evaluation methodology of a Massive Open Online Course (MOOC) on data analytics for educators, created through an innovative international collaboration between Universiti Teknologi Malaysia and Liverpool John Moores University. The project uniquely adapts the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model to accommodate cross-cultural, inter-disciplinary teamwork while incorporating the Community of Inquiry framework to enhance online learning effectiveness. Our analysis phase revealed significant gaps in existing learning analytics courses through a comprehensive scoping review of 395 courses across major MOOC platforms. The development process showcases novel approaches to remote collaboration in content creation, including synchronized video production across international facilities and

standardized quality control measures. The evaluation framework combines multiple approaches: a newly developed Learning Analytics Literacy Scale (LALS), which synthesizes validated instruments for measuring data analytics competencies, and sophisticated learning analytics techniques to track learner engagement and predict course completion. This research provides a detailed roadmap for international MOOC development while addressing the critical need for data analytics training in education. The paper describes both the completed development phases and planned implementation strategies, offering insights for future cross-cultural educational collaborations.

Keywords— MOOC, Data analytics, Content development, Online learning, Instructional design

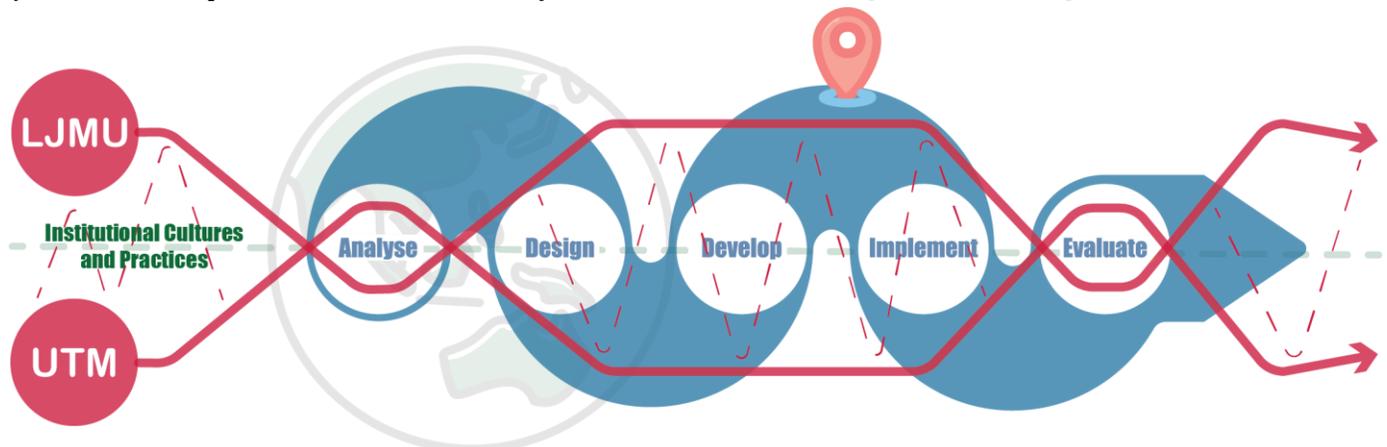


FIGURE 1. ADDIE Model adapted for the International Collaborative Project.

I. INTRODUCTION

The rapid digitalization of education has highlighted significant challenges in developing online learning resources that effectively serve diverse global audiences. While Massive Open Online Courses (MOOCs) have democratized access to education, they often reflect singular cultural perspectives, typically Western-centric approaches, which may not resonate with or meet the needs of learners from different cultural contexts. This limitation becomes particularly critical in the field of educational data analytics, where cultural differences in educational practices, data interpretation, and technological implementation can significantly impact learning outcomes.

The increasing importance of data analytics in education settings is evident globally, yet understanding and applying data analytics tools and concepts varies considerably across different cultural and educational systems [1]. Professionals need to know how to work alongside large scale, distributed systems and act in an adaptive way, ready to respond to fast paced technologically driven change. An emphasis on digital skills in education is central to this as acknowledged both in the Malaysia EXCEL framework and the UK JISC Building Digital Capability Framework. While analytical capabilities are becoming essential for educators worldwide, the approaches to data collection, interpretation, and application often differ between Asian and Western educational contexts. These differences stem from varying pedagogical traditions, institutional structures, and cultural approaches to data-driven decision-making in education.

Additionally, while MOOCs are becoming common, the methodology for cross-cultural, inter-institutional development is not well documented. The lack of established frameworks for international collaborative MOOC development, particularly between Asian and Western institutions results in lack of MOOC design that is culturally sensitive. This paper presents an innovative approach to addressing these cross-cultural challenges through the development of a MOOC on data analytics for educators, created through a strategic collaboration between Universiti Teknologi Malaysia (UTM) and Liverpool John Moores University (LJMU). This partnership deliberately brings together Asian and Western perspectives to create more culturally inclusive and globally relevant educational content. Therefore, the following research questions were formulated:

- How can an international collaborative MOOC be developed between institutions in different cultural contexts?
- How can international collaborative MOOC be evaluated?

As an International collaborative project our choice for an instructional design approach to MOOC development was influenced by a need for hybrid engagement from the team in face to face and online settings, completion of the project within a set and limited timescale and alignment of the curriculum with delivery in a MOOC setting. We describe our process of decision making in the selection of this approach within this paper which led us to take influence from the ADDIE approach [2] and the Community of Inquiry framework [3]. The experience and creativity of the research team was key for

supporting this process which was funded through a UK-Malaysia University Partnerships Catalyst grant provided by the British Council.

We will also present the methodology planned for our evaluation of the MOOC before, during and after engagement from our participants. This has been collaboratively designed to create a questionnaire suitable for MOOC participants to complete prior to learning as well as qualitative and data analytics processes. The questionnaire design is described in this paper as a pre-view of the process we plan to implement.

II. ADDIE DEVELOPMENT MODEL

In planning our development activities, we reviewed different approaches to the instructional design of MOOCs by drawing on the SWOT (Strengths, Weaknesses, Opportunities and Threats) and compared this to the list of our key requirements for a model:

- Compatibility with hybrid online and face to face research practices.
- Simple and adaptable for engagement of an interdisciplinary and international team.
- Learners as professional individuals engaging asynchronously and flexibly.
- Completion within a set and structured timeframe.
- Alignment of the curriculum with delivery in a MOOC setting.
- Compatibility with a Community of Inquiry pedagogy.

We applied a scale rating to key categories of review for different approaches in Table I. with a rating of 5 indicating the highest suitability and 1 indicating the lowest.

Table I. Review of Instructional Design Models in comparison with key requirements of the project team.

Instructional Design Approach	Key Requirements						Total Score
	1	2	3	4	5	6	
<i>ADDIE Model</i>	5	5	5	5	5	4	29
<i>Dick and Casey Model</i>	5	4	4	4	4	4	25
<i>Jonassen Model</i>	3	2	3	3	2	1	14
<i>Gagne's Nine Events of Instruction</i>	5	3	3	2	3	3	19
<i>ARCS Motivational Model</i>	4	3	2	5	3	4	21

This highlighted ADDIE as a long-standing approach which is flexible, versatile and compatible with emerging technologies. The ADDIE model for Instructional Design is the generic foundation for a number of other instructional design processes, such as ASSURE and the Dick and Carey Model. This shows its adaptability for new educational settings and diverse

research teams. The meta-analysis of Spatioti, Kazanidis and Pange (2022) found that the application of ADDIE led to the development of online educational environments that included good teaching practices. This also applies in the development of MOOCS where ADDIE has been effectively used [2].

Therefore, our process for MOOC development is described in this paper in alignment with the key broad stages of the ADDIE model, applied in the context of an international team based in Malaysia and the UK (see Figure 1).

The process begins with the Analysis phase, where the team identifies the content, reviews similar courses, and determines the course objectives, and delivery platforms. In the Design phase, the course content is structured, learning activities are planned, and assessment strategies are developed. This is followed by the Development phase, where content creation takes place, including writing scripts, producing videos, and designing multimedia elements. Once the course is ready, it is delivered to learners in the Implementation phase through the learning management system. Finally, the Evaluation phase involves assessing the course's effectiveness and gathering feedback to make any necessary improvements for future iterations. This ADDIE model ensures that each stage is thoughtfully executed to produce a high-quality learning experience. We describe how these phases were supported despite the challenges of distance between developers and associated time differences and also discrepancies in available technologies to support the process.

III. ANALYSIS PHASE

During the process of creating the MOOC "Learning Analytics for Educators," the analysis stage was essential in laying the groundwork for creating content that meets the demands of educators. A scoping review was conducted at the start of this phase to look at current online courses on learning analytics and related topics [4]. This was carried out by team members at UTM with the key findings shared with UK team members in an online Teams meeting. The process started from reviewing online platforms like Coursera, Udemy, edX, and LinkedIn Learning to investigate course offerings. A three-step scoping review methodology was used, which involved identifying learning platforms, defining selection criteria, and conducting targeted searches using relevant keywords such as "learning analytics" and "analytics and education." This approach ensured a comprehensive understanding of the current landscape of available courses.

The selection criteria for reviewing courses focused on key factors, such as the language of instruction (English), the duration of the course (at least 8 hours), and a clear focus on topics relevant to learning analytics in education. The scoping review identified 395 potential courses, of which only 10 met the specified criteria. These courses were further scrutinized based on the depth and range of their content, duration, and the

types of learning materials used. This analysis revealed that while the courses offered a wide range of durations, from less than 8 hours to over 16 hours, they primarily focused on introductory and intermediate-level content, with limited exploration of more advanced topics.

The findings from this analysis phase helped to highlight the gaps in current online learning analytics courses. For example, many courses relied heavily on recorded videos and reading materials but lacked interactive or practical components that would enhance learning for educators. The analysis revealed a need for more advanced, comprehensive content that delves deeper into data literacy and learning analytics, particularly for educators seeking to apply these skills in their teaching practices. This stage prepared the framework for creating a course that fills in these gaps, emphasizing giving teachers the knowledge to use and analyze learning analytics in real educational settings.

IV. DESIGN PHASE

Within the design phase our goal was to create a course containing the interactive and practical components that were identified as missing in our analysis. To this aim we employed the Community of Inquiry (CoI) framework to design the MOOC learning environment aiming to foster meaningful online learning among the participants [5]. The framework comprises of three presences: Teaching Presence, Social Presence and Cognitive Presence. Teaching presence focuses on the importance of instructors' role in building the learning materials, establishing and providing the mechanism for facilitation and monitoring students' interaction and learning during the course offering [3]. In a recent study, Social Presence consists of two constructs; the degree of 'realness' of the other in communication and secondly, social space which refers to the degree to which social interpersonal relationships are salient [6] which were used in this project. Finally, Cognitive Presence means the extent to which students are engaged with the learning material that can be demonstrated through four phases of triggering event, exploration, integration, and resolution [3]. Cognitive presence is usually found in written posts among the MOOC participants in which they co-construct knowledge together during discussion of course-related tasks [7].

These three presences interact to create a community of inquiry by fostering meaningful online learning and it has been used in many MOOC developments in recent years [8, 9, 10]. For this project, CoI presences are identified, and learning activities are designed based on the CoI framework. The mapping of the MOOC design and CoI presences are explained in Table II.

TABLE II. Mapping of MOOC design with Community of Inquiry Framework

CoI Framework	CoI Implementation in MOOC	Implementation in Data Analytics for Educator MOOC
<i>Teaching Presence</i>	Setting course expectation	Curriculum and Learning outcomes development workshop held with both UK and Malaysian team members in person at UTM following the structure of their course information spreadsheet.

	Develop learning materials	Development of : <ul style="list-style-type: none"> • instructional videos by topics • learning notes in the platform • assessment in the form of short quizzes in each topic • case studies that relates to real-world implementation.
	Provide facilitation and scaffolding	Facilitation is provided in the form of hints at Case Studies. Setting expectations in the course at the beginning of the course: About the Course. This section describes the requirements to complete the course
Cognitive Presence	Triggering event	Case Study of Greenfield High: Students have to reflect on the possible challenges to apply prescriptive analytics at own institution. Case Study on Selecting Approaches to Analyse Educational Data at Rimba Jaya Secondary School: Students have to select the learning analytics approaches and justify their choice.
	Collaborative exploration of concepts	
	Integration	
	Resolution	
Social Presence	Encourage open communication	Ice breaking session at the beginning of the course: Getting to Know Each Other. This session allows participants to select their own data analytic-related imagination (such as If you were a data-related book, which one would you be?) Other participants have to vote their most favourite imagination and ask their friends why.
	Nurture affective expression	Netiquette section is provided in the course to promote respect among each other.
	Build group cohesion	Encouraging voting and commenting on each other's sharing

V. DEVELOPMENT PHASE

Following the ADDIE model, the development phase is where the course is built. In our case this began with video script and storyboard development, followed by recording videos and then a process of editing and enhancing. Finally, we worked together to assign tasks, assessments and resources to each module.

A. Development process-Video script and storyboard development

Writing video scripts and accompanying storyboards took place initially as an individual process with each team member working in different settings either in the UK or Malaysia. Each team member used the same template from UTM Center for Advancement in Digital and Flexible Learning which provided structure to align the video timing (minute by minute) with a storyboard description and transcript for the video. Team members drew on associated literature and professional practice experience to draft scripts that aligned with the learning outcomes negotiated in the design phase. With our teams we

shared scripts via email and edited and adapted the texts prior to filming. This enabled us to share expertise and offer critical feedback on the text. Once the text was reviewed and agreed on, plans were made for carrying out video recording.

B. Development process - Recording Video

As a team we negotiated on the video quality and style aims which could be achieved using facilities at both UTM and LJMU. At UTM the Centre for Advancement in Digital and Flexible Learning hosts a soundproof video recording studio with green screen, autocue and separate control room. LJMU team members were given a tour of the facilities during their visit to UTM for the design workshops. At LJMU the Liverpool Screen School offered the TV News studio which had similar technical provision to that available at UTM. Therefore, we were able to project manage the process of video recording separately at each institution. In order to maintain style guidelines post-recording, the green screen videos were shared online through a collaborative site which enabled the transfer of large files from LJMU to UTM multimedia production staff.

C. Post-production-Editing and enhancement

Following the details provided in the storyboards for each video, the UTM instructional design team worked to edit the videos and enhance them with background graphics and text relating to the video scripts. Having this action performed by the same staff team at a single institution was helpful in maintaining a consistent style for the format. The final edited videos were shared for joint review though a private YouTube channel accessible to all members of our development team.

D. Assigning tasks, tests and additional resources

Concurrent with the video development, all team members worked online in the MOOC learning management system to enrich the content associated with each learning outcome. The MOOC learning management system format enabled the addition of tasks, tests and resources such as weblinks to open text and video media associated with each topic. A video conference meeting was held online through Teams for all members to collectively review the content and identify any discrepancies in style or quality. This was one of the longest phases of development as this academic enrichment is critical to maintaining the quality of the course and providing opportunity for collaborative knowledge sharing on the topics of the learning outcomes.

VI. IMPLEMENTATION AND EVALUATION PHASE

The implementation phase of the ADDIE approach is where we stand currently with our research project. We have completed the content review and are now negotiating on the approach to take with distribution, dissemination and evaluation.

A. MOOC Launching

The MOOC is available at: <https://mooc.utm.my/courses/data-analytics-for-educators>. To complete the MOOC, participants have to complete three quizzes and three assessments during the offering of the course that lasts for 4 weeks.

B. Evaluation Plans

Evaluation of the MOOC will be carried out through a questionnaire for participants before and after completing the MOOC and also through data analytics review of participants engagement. The nature of the investigation will come from a pragmatist research positionality with respect to ontology, epistemology and axiology, with pragmatist axiology being key, given the degree to which a multidisciplinary and distributed research team will provide a plurality of value bearing positionalities which might influence the nature of the enquiry [11].

C. Participants evaluation

Reviewing the literature which has addressed data literacy in educators, indicates that characterisations of literacy in this area are contested, and some definitions will focus purely on statistical analysis, whilst others incorporate a more pedagogy-oriented perspective, though the consensus is that the requirement for data literacy in this area is of increasing focus [12].

The study also incorporates a modified form of the Student Expectations of Learning Analytics Questionnaire (SELAQ) [13], which focuses more on expectations and responsibilities of the higher education institution (HEI) rather than an emphasis on the skills of the learner. The questionnaire has been modified in its wording to reflect those participants being educators in addition to being students. The synthesis of these two frameworks, one an existing validated instrument, is intended to provide a Learning Analytics Literacy Scale (LALS) which will be used for participants to complete pre- and post MOOC engagement to evaluate learner capability in addition to their expectations and attitudes towards the use of LA within their experiences of learning.

VII. SUMMARY AND CONCLUSIONS

To summarise, our project team have adapted the structured and systematic instructional design approach of ADDIE to work within the context of an International collaborative group in Malaysia and the UK with diverse backgrounds, experience and resources. We have produced and launched a MOOC on Data Analytics for Educators which will be openly accessible and promoted within UTM and LJMU for participation. Our plans for evaluation include a newly developed questionnaire for pre- and post- MOOC engagement and the process of data analytics review. Following this evaluation we will review the MOOC design to incorporate improvements that meet the needs of the learner community.

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