

Learner Satisfaction, Academic Performance, Micro-credential Design: A Case Study from European Universities

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Abstract: Recently, asynchronous distance learning has been gaining research attention at an accelerating pace, enabling digital transformation in education and helping learners acquire the necessary skills. Hence, micro-credentials have also raised significant scholarly interest. One of the main challenges in distance online learning is to keep the learners engaged throughout and satisfied with their learning journeys. This is especially true in micro-credentials, which, more often than not, come on top of regular studies and professional and social commitments of the learners. In general, a substantial body of research exists on student satisfaction with online distance learning and micro-credentials specifically. Researchers investigate the effectiveness of specific activities, create and compare varied course designs, and analyse factors affecting student satisfaction with online learning. However, the existing research is fragmented due to the different spectrums of learning activities analysed in different educational contexts. In addition, the research on innovative learning designs of micro-credentials is limited. To address these gaps, we present a case study of a micro-credential “AI for Business” which is proposed to students from 14 European universities collaborating under the European Consortium of Innovative Universities umbrella. The body of the micro-credential includes 51 learning activities, including hands-on small projects invoking artificial intelligence and process automation tools, discussions, interactive e-texts, memory cards, games with sound and motion, interactive videos, quizzes, peer assessment, experiential learning, challenge-based learning with challenges from real businesses – our social partners and, at the same time, leaders in their markets, and much more. Such a great variety of learning activities within the same micro-credential allows for comparing the learning activities by student satisfaction while ensuring equal environmental conditions and eliminating potential inaccuracies which otherwise could have arisen from different courses – that is, contexts – in which the activities are employed. In addition, we present the micro-credential design and explore whether the learner satisfaction rates correlate with the grades received. Therefore, this case study enriches the research on innovative learning designs for micro-credentials and learner satisfaction with online learning activities, both subjects which scholars have highlighted as needing deeper academic investigation.

Keywords: Asynchronous Distance Learning, Course Design, Innovative Study Methods, Micro-credential, Student Satisfaction

1. Introduction

Digital technology has changed the way we learn and teach. Flexible learning, self-directed learning, virtual learning, online learning, and similar key terms highlight the scale of this trend. The variety of digital resources and tools has also led to a change in the role of the learner from a passive receiver of information to an active, often self-directed learner. At the same time, new challenges arise, such as ensuring learner engagement (Lasekan et al. 2024, Moore et al. 2025), motivation to complete the course successfully (Stolk et al. 2021), balancing learning resources to address learner differences (Deng 2021), or how to align online tools with learning theories and learning environment (Kakouris, Sitaridis 2025).

Although there is a large body of research examining the relationship between learning resources and learner engagement or satisfaction, insufficient attention has been paid to the innovative learning designs of micro-credentials (Moore et al. 2025). With the scholarly support for active learning predominating (Barnett-Itzhaki et al. 2023), especially in distance learning (Lasekan et al. 2024), there is limited comparison between active and passive learning methods in distance learning versus online extracurricular learning. It is also necessary to consider the importance of learner profiles in assessing their engagement and motivation when taking an elective course compared to a required one (Deng 2021, Stolk et al. 2021). In addition, the research on authoring tools used to create the content for asynchronous online learning is scattered across diverse academic disciplines, geographic locations, and isolated educational techniques and authoring tools placed in these specific yet different conditions, making it challenging to develop a cohesive understanding of best practices in digital micro-credentials.

This case study aims to present a micro-credential as an instance of an asynchronous distance learning that gathers a broad variety of educational techniques and authoring tools within one course offered to learners from several universities. The cohesive and well-structured setting enables clear, objective comparisons of learner satisfaction with different educational methods and authoring tools, independent of most contextual influences.

2. Course Design

The micro-credential *AI for Business* is proposed to students of all cycles of the European Consortium of Innovative Universities (ECIU) network that unites 14 European universities. The course accounts for 2 European Credit Transfer and Accumulation System (ECTS) credits. While, in general, ECIU students have the options to either engage in an academic exchange for a semester, or attend short-term in-person gatherings, or participate remotely through online platforms, the *AI for Business* micro-credential is provided as an online asynchronous self-paced course with exact start and finish dates. Access to the learning materials on Moodle is granted from the start day of the micro-credential and withdrawn 1 week after the end day of the study period.

The course spans over 6 weeks: intro week, four subject-dedicated weeks, and outro week. However, the initial pilot course, offered during the autumn semester of the 2024/2025 academic year, encompassed the full six-week curriculum within a four-week timeframe, assuming the workload is around 13.5 hours per week. The consistent structure and design are preserved throughout the course as demonstrated in Figure 1.

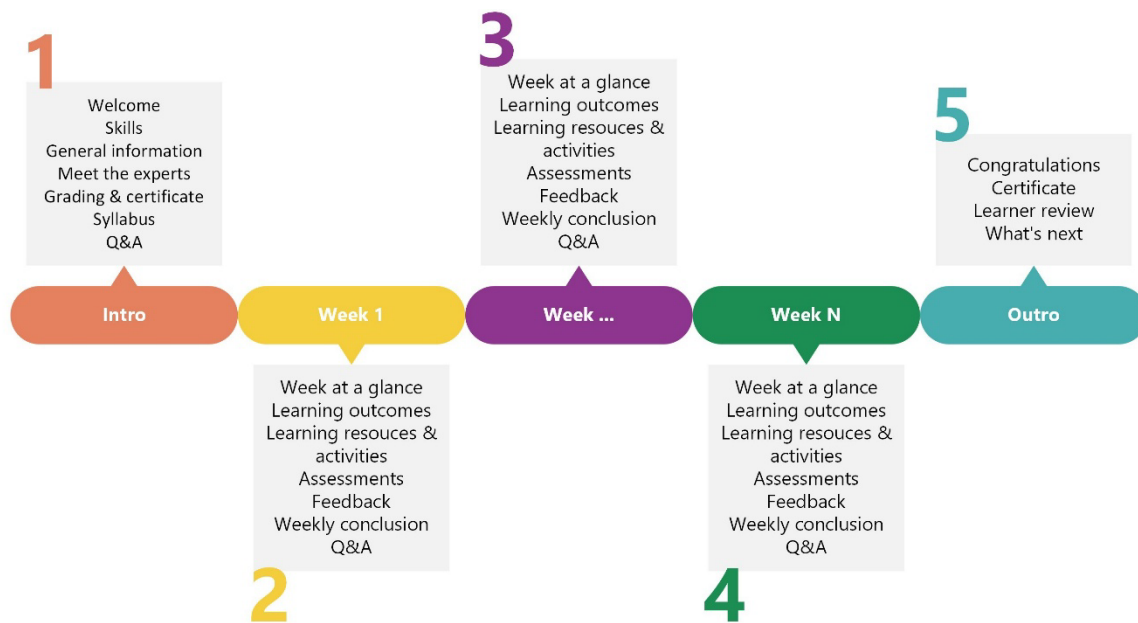


Figure 1: Micro-credential design

Every course topic begins with a flipbook reading – an immersive publication with audio, video, images, links to external sources and Moodle exercises – to engage the learners while acquiring topic-specific knowledge. The reading is followed by varied learning activities which are presented in more detail in the next section. Each subsequent activity opens when the previous activity with completion status is marked complete – either automatically, where possible, or by students manually. Each week, learners have access to multiple video lectures, typically consisting of two to five videos, each lasting 5-15 minutes. These videos elucidate the core theory and provide practical examples to illustrate real-world use cases and to support varied learning preferences. The videos are professionally recorded, featuring the teacher speaking, accompanied by background music, slides displayed, subtitles, and various visual effects. The total duration of the course videos is 120 minutes. Every topic is accomplished by a feedback survey where learners assess the activities and leave comments on a voluntary basis.

However, topics should not be confused with weeks, as weeks 1 to 3 include two topics each, while the last content week includes one topic, thus embracing seven subject topics in total. Moving up to the weekly structure, every week encompasses a hands-on project designed to enhance students' proficiency in the application of AI tools. These projects provide a valuable blend of theoretical understanding and real-world problem-solving skills. Further, through peer assessment, students engage in evaluating two hands-on projects submitted by peers, thus fostering dynamic and interactive learning. The collaborative learning environment is also enhanced by discussion forums which serve as platforms to exchange ideas and perspectives with fellow participants. Two discussion topics are suggested by real-life enterprises and arise from the challenges businesses face.

3. Course Contents

The learning activities and resources implemented in the micro-credential are crafted to facilitate the attainment of anticipated learning outcomes, enabling the acquisition of new knowledge and the development of expected skills and competencies. Several activities are developed and supported by such acknowledged institutions as the Massachusetts Institute of Technology, UK National Crime Agency (NCA), and Queen Mary University of London, with support from Google and the UK Engineering and Physical Sciences Research Council (EPSRC).

The teaching techniques applied in the micro-credential are summarised in Figure 2. The amount of time required to accomplish weekly activities was calculated using the course workload estimator by the British Columbia Institute of Technology, Learning & Teaching Centre (BCIT LTC n.d.). While the subject-dedicated weeks account for 52.5 hours, the rest is dedicated to the intro and outro weeks.



Figure 2: Teaching techniques by week

As mentioned in the abstract of this case study, the number of learning activities under the analysis reaches 51. However, because several learning activities include a few educational techniques, the number of educational techniques presented in Figure 2 exceeds 51. For instance, the Intelligent Piece of Paper activity, developed by Peter McOwan and Paul Curzon from Queen Mary University of London (Computer Science for Fun, N.d.), includes two parts in the micro-credential: first, the learners are asked to reflect on the activity's situations and questions in a written form (structure strip); and second, the learners are invited to play a game with a digital piece of paper which sequentially provides its pre-coded moves.

Another example of a learning activity involving several educational techniques is challenge-based learning, where learners are presented with real-world challenges provided by actual regionally and globally leading businesses. To present the solutions, students need to record a video presentation and submit it to the Moodle forum. In addition, the learners assess the presentations of at least two peers, provide ratings and comments, thus developing their collaborative and critical thinking skills.

The proposed educational techniques enhance both active (e.g., exercises, tests, games, presentations, etc.) and passive (e.g., reading, video watching) learning, with the active learning dominating in the course. A variety of authoring tools are used in the course: Moodle quizzes for tests, forums for discussions and presentations, database for registering field research results; Sharable Content Object Reference Model (SCORM) packages for video-based case studies; H5P (Hypertext Mark-up Language 5 (HTML5) Package) for exercises, including

structure strip, image slider, guess the answer, drag and drop, interactive video, sort the paragraphs, crossword, fill in the blanks, image sequencing, memory game; Open eLearning (SCORM) for gamification with audio, motion, and video. Figure 3 demonstrates the authoring tools used.



Figure 3: Authoring tools by week

In addition, external applications are used to offer learners hands-on opportunities to apply theoretical knowledge and gain practical experience in utilising AI tools. These hands-on projects are designed to enhance the learners' proficiency in applying AI tools, providing a valuable blend of theoretical understanding and problem-solving skills.

4. Learner Satisfaction

4.1 Methodology

The micro-credential was offered to 31 registered ECIU network learners from October 15th till November 12th, 2024. The learners' affiliations concern the following universities: Hamburg University of Technology (Germany), Lodz University of Technology (Poland), Universitat Autònoma de Barcelona (Spain), University of Twente (the Netherlands), Linköping University (Sweden), Dublin City University (Ireland), University of Trento (Italy), and Kaunas University of Technology (Lithuania). At the end of each topic, the learners were asked to provide feedback about each topic's activity using a Likert scale ("Please rank your experience with ..."). The answers were then encoded numerically as follows: 1 – very disliked, 2 – disliked, 3 – neutral, 4 – liked, 5 – very liked. Microsoft Excel's PivotTable and Analyse Data functionalities were utilised to conduct descriptive statistical analysis and get insights. For the correlation analysis, Visual Studio Code with Python programming language were employed. Statistical significance measures are disregarded due to the small sample size and the unique study context.

4.2 Learner Satisfaction Analysis Results

4.2.1 Active Versus Passive

Frequent research findings (Holbrey 2020, El Sadik & Al Abdulmonem 2021, Barnett-Itzhaki et al. 2023) confirm that active learning methods lead to higher levels of learner engagement and more effective assurance of

learning. However, the results of this study suggest that passive learning methods have almost the same average rating (3.67) as active ones (3.70), contradicting the idea that active learning is way more engaging and satisfying, especially in distance learning (Lasekan et al. 2024).

This finding could be explained by multimedia and animation embedded into the course readings, thus making them more interactive and engaging, or by good-quality and rich-content video recordings. It is important to note that a large part of previous studies investigate one or more active approaches, such as educational escape rooms, game-based learning, experiential learning, blogs or similar, in isolation. Thereby, the results of this study shed more light on learners' satisfaction with active learning from the comparative perspective. Another assumption for such a result is the fact that the micromodule under investigation is extracurricular, which has likely led to the learners being more motivated to acquire new knowledge passively. The results may also reflect the need to consider not just interactivity, but also discipline specificity, learning environment, and learning style and modes, as noted by Kakouris (2009) and Kakouris and Sitaridis (2025).

Passive learning was evaluated more consistently ($SD = 0.88$), though not necessarily more favourably. Active methods, in turn, have higher variability in learner satisfaction ($SD = 0.98$). While active learning is supposed to be more engaging, it is often also more demanding. This results in divided learner opinions depending on preparedness, support, preferences and other individual factors (Noesgaard & Ørngreen 2015, Ma & Lee 2021).

4.2.2 Top Learning Activities

The top 5 learning activities, based on their average ratings, are as follows: a concept-reinforcement crossword created with H5P within the topic AI-Powered Financial Management and Analysis (4.26); the moral machine (4.11) (the Max Planck Institute et al., n.d.) developed by scientists from the Massachusetts Institute of Technology (MIT), University of Exeter, the Max Planck Institute, Toulouse School of Economics, and the University of British Columbia (UBC); Moodle quizzes in the topics Enhancing HR and Workforce Management with AI (4.1) and AI-powered Financial Management and Analysis (4.05), each consisting of five closed questions of diverse types; fill in the blanks created with H5P – a video with a subsequent sentence aiming at solidifying the knowledge on linear versus matrix production systems (4.05). Hence, the top learning activities vary in terms of both the authoring tools used to digitize them and the educational techniques applied, thus making it impossible to make any conclusions on which educational techniques or authoring tools are most preferred by learners.

4.2.3 Learner Satisfaction by Educational Techniques

The analysis of activities grouped by educational techniques (Table 1) provides more meaningful insights into what kind of learning activities are more and less enjoyed by learners.

Table 1: Average learner satisfaction by educational techniques

	Average	SD	Description
Test	3.96	0.70	Closed tests, five questions of varied type each, digitized with Moodle quiz
Field research	3.86	0.71	Learners search for counts of combinations of AI with relevant theories (agile, lean, six sigma, etc.) in LinkedIn and register the findings in the Moodle database
Gamification	3.83	0.87	Intelligent Paper (described in chapter 3, digitized with H5P image slider), the Moral Machine (described in this chapter), CSC Cyber Games (NCA, n.d.), memory game created with H5P, level-up game developed with Open eLearning with motion, audio, and video
Case study	3.76	0.87	Process mining and Wall Street Journal (videos with SCORM packages for questions)
Discussion	3.69	1.08	Moodle forum: at least one post and two replies
Reading	3.68	0.69	Digital flipbooks created in Heyzine, featuring images with a jumping animation effect, videos, and links
Exercise	3.68	0.98	Varied short learning activities, mostly H5P as described in chapter 3
Video lecture	3.66	1.00	Recorded professional videos featuring the teacher, slides, animation
Project	3.42	1.31	Hands-on small projects invoking artificial intelligence and process automation tools (external)
Reflection	3.38	1.09	The first part of the intelligent paper activity, H5P structure strip

	Average	SD	Description
Presentation	3.18	1.12	Solutions to challenges proposed by actual enterprises; submitted to Moodle forum; peer assessment is involved

Activities rooted in structured or guided formats, such as tests, case studies, or gamified learning activities, perform best in terms of average satisfaction and consistency. This aligns well with the educational theory (Holbrey 2020, Poondej & Lerdpornkulrat 2020, Martinez et al. 2022, Khaldi et al. 2023, Lasekan et al. 2024).

Readings, while consistently rated, received more moderate evaluations, suggesting they were accepted, but not strongly favoured by the learners. The fact that videos, on average, score lower than readings is a fascinating insight and one that might seem counterintuitive given how much educational theory and practice emphasise video as an engaging study format (Lackmann et al. 2021, Seo et al. 2021, Liao & Wu 2023). A reason could be that the videos were mostly dedicated to difficult and niche aspects of the subject and could have been attention-fatiguing. Another clue behind the lower videos' rating is related to the non-traditional format of the readings, as the latter are enriched by multimedia. These results raise the possibility that interactive readings could be more positively received than video content by learners. The results confirm the need to analyse not only the format of the resources used, but also their features, such as visual clarity, the use of infographics (Lackman et al. 2021), quizzes embedded lecture videos (Kovacs 2016), or the visual presentation.

A digital discussion was also rated moderately positive. However, its high SD suggests an uneven learner experience. Although the scientific literature strongly supports the benefits of forums, discussion boards, chat sessions and blogs in e-learning and highlights the need for camaraderie feeling and avoiding the "nobody" perspective (Bender 2023), online discussions may appear among the least engaging activities. This points to the need to further investigate the impact of learner profiles and discussion characteristics on learner satisfaction. Similarly, the data show that learners generally appreciate exercises; however, their satisfaction varies, which could point to differences in quality or relevance across the activities.

The lowest-rated learning activities demand the highest levels of critical thinking, creativity, problem-solving skills, and effort. However, despite the benefits of applying real-world challenges, "bringing students closer to the real world" and thus increasing learners' motivation and engagement (Gaskins et al. 2015, Conde et al. 2017), these tasks often require learners to invest more time and navigate ambiguity (De Stefani & Han 2022), all of which can lead to discomfort or resistance, especially in self-paced or digital environments. As Ebbini (2023) states, „self-paced learning can be challenging for students who struggle with time management and procrastination" or prefer more structured or guided learning.

In addition, problem- and challenge-based learning has mixed reviews, possibly depending on how self-directed or supported learners felt. This suggests a potential gap between pedagogical intention and learner perception and highlights the need for greater scaffolding in implementing higher-order learning experiences. On the other hand, these activities are characterised by higher SDs, suggesting greater polarisation in learner satisfaction in comparison to less effort-requiring activities.

4.2.4 Learner Satisfaction by Content-authoring Tools

The average learner satisfaction by content-authoring tools is presented in Table 2.

Table 2: Average learner satisfaction by authoring tools

	Average	SD
Moral Machine	4.111111111	0.657342198
Cyber Games	4	0.816496581
Moodle	3.77722083	0.892863
SCORM	3.757142857	0.866913671
Open eLearning	3.75	0.766485486
Heyzine	3.68289772	0.686489993
Recorded/YouTube	3.656587302	0.998155202
H5P	3.647424116	0.999501853
External	3.419312169	1.308083356

In the analysis, the Moral Machine (Max Planck Institute et al. n.d.) and Cyber Games (NCA n.d.) interfaces were classified as unique authoring tools. These tools offer well-integrated, immersive multimedia, and learners found them intuitive and engaging, leading to the highest ratings. On the contrary, other external applications relate to the hands-on projects aimed at enhancing learners' proficiency in the application of AI tools for project management, video content creation, automated document handling, and financial analysis and forecasting. These tools attained the most polarised learners' opinions, with ones being very satisfied, others – and dominating – dissatisfied, and hence scoring, on average, the lowest. This finding suggests that due to differences in learners' previous experiences with AI tools and varied self-direction levels, the success of subject-specific external authoring tools is fragile and difficult to sustain in a self-paced asynchronous learning environment. Previous e-learning experience, digital literacy, online learning experience or utilising user-friendly technology are factors often identified as determinants of the effectiveness of e-learning (Noesgaard & Ørngreen 2015, Regmi & Jones 2020, Castro & Tumibay 2021). Without immediate support, using new software can overwhelm learners and reduce satisfaction.

As the results indicate, Moodle and SCORM offer a more consistent and reliable user experience, while H5P has more variable reactions. Although Moodle, SCORM and H5P are all widely used in digital learning (López et al. 2021), Moodle and SCORM-based activities were rated slightly higher than H5P, and their SDs were lower, meaning learners found them more consistently satisfying. Moodle and SCORM support structure, predictability and clarity, which are especially valued in digital learning contexts. H5P is more interactive and has a high potential for engagement and interactivity, but its success depends on design quality, technical execution, and alignment with learning readiness and objectives (López 2021, Rama Devi 2022). The data suggests H5P was less consistently effective, aligning with theoretical concerns about learner overload.

The slightly higher ratings of Heyzine than those of recorded videos resonates with the previous insights that interactive readings could be more positively received than video content by learners, which contradicts a broadly supported video-based learning (Lackmann et al. 2021, Seo et al. 2021, Liao & Wu 2023). As mentioned earlier, different video characteristics can also lead to different levels of student engagement and satisfaction.

4.2.5 Consistency in Learner Satisfaction

Ultimately, it is obvious from the table that there is a clear inverse relationship between average learner satisfaction by authoring tool and consistency of ratings: the higher the satisfaction rating, the more consistent the feedback ($r = -0.77$). Highly rated tools are reliably well-received across different learners, while lower-rated tools are more divisive — some love them, and others dislike them. This could reflect differences in user experience, learner preferences and readiness, or inconsistent implementation (Noesgaard & Ørngreen 2015, Regmi & Jones 2020, Castro & Tumibay 2021). It is important to note that consistency in satisfaction may be just as important as the average satisfaction itself. High variance can signal accessibility issues, unclear expectations, mismatched learning styles, etc. In general, as the results indicate, platforms with higher learner satisfaction tend to have lower variability, while platforms with lower satisfaction are more polarising.

4.2.6 Correlation with Grades

The Pearson correlation between grades and satisfaction ratings is approximately 0.53, suggesting a moderate positive relationship, as shown in Figure 4.

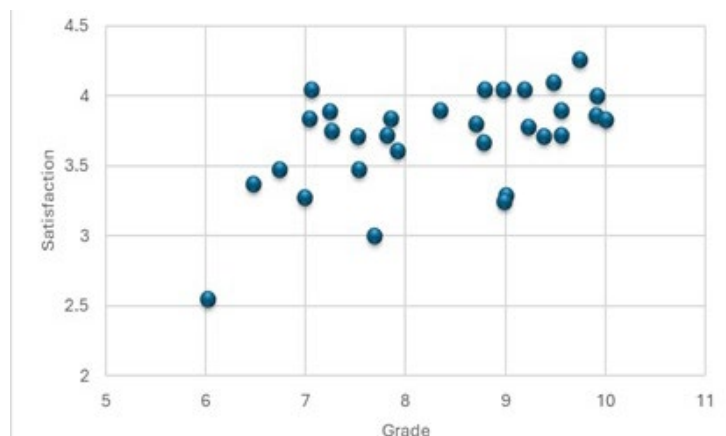


Figure 4: Scatter plot of learner satisfaction and grades

Activities that rank higher in grades also tend to rank higher in satisfaction, but with some variation. Interestingly, in case studies, higher grades were associated with lower satisfaction ($r = -0.6$), possibly suggesting a mismatch in expectations. For Moodle quizzes, a very weak positive correlation is observed (0.09), meaning that received grades and satisfaction do not relate much, possibly due to quiz objectivity.

On the contrary, in hands-on projects, the relationship between received grades (i.e., performance), and learner satisfaction is very strong ($r = 0.99$), supporting the assumption that learners derive satisfaction from success in complex tasks (Chis 2018, Wang & Wu 2022). However, the relatively high standard deviation in project satisfaction indicates that while some learners find projects highly rewarding, others struggle. This underscores the importance of scaffolding, particularly in asynchronous, self-paced online environments where learners navigate complex tasks independently. This highlights the need to further explore the use of complex tasks with CBL or PBL formats in e-learning (Ebbini 2023).

5. Conclusion

The findings of this case study, on the one hand, support several general statements established in educational research, such as: active learning is more dependent on learner profiles than passive learning; learners derive satisfaction from success in complex tasks; there is a need for greater scaffolding in implementing complex learning experiences, such as challenge-based learning. On the other hand, several findings oppose the common trends and might be specific to micro-credentials. For instance, passive learning activities were found to be almost equally satisfactory as the active ones, thus suggesting that, in elective asynchronous distance learning, passive means of acquiring knowledge are as attractive as the active ones. In addition, when evaluating learner satisfaction, it is not enough to rely on the activity format. Since learner satisfaction is affected by the content and specific features of offered activities, the comparison of activities requires a more complex approach and further research. Hence, as opposed to mainstream research, readings gained higher learner satisfaction rates than videos in the examined micro-credential.

From the perspective of the micro-credential design, it is important to mention that, in general, learners appreciate the rich variety of learning activities which invoke different educational techniques and authoring tools to better satisfy various learners' needs. Nonetheless, it is also true that well-integrated platforms which include multimedia and gamification elements are reliably well-received across most learners, while lower-rated tools divide learner opinions. Hence, an online micro-credential requires a balanced and thoughtful approach towards the variety, types and characteristics of its constituents.

Ethics Declaration

The authors declare that they have no conflict of interest and that all ethical standards regarding research integrity and participant consent were strictly observed throughout the study.

AI Declaration

The authors used Grammarly to improve the readability of the article. The authors reviewed and edited the content and take full responsibility for the content of the published article.

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