Universidad Pablo de Olavide (España)
International Journal of Educational Research and Innovation
número 21, 2024
ISSN: 2386-4303
DOI: 10.46661/ijeri.9606
Sección: Artículos
Recibido: 13-02-2024
Aceptado: 21-02-2024
Publicado: 30-06-2024
Páginas: 1-19

INTERNATIONAL JOURNAL OF EDUCATIONAL RESEARCH AND INNOVATION
REVISTA INTERNACIONAL DE INVESTIGACIÓN E INNOVACIÓN EDUCATIVA

Indicadores de calidad para e ldiseño y construcción de cursos MOOC

Quality indicators for the design and construction of MOOC courses

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RESUMEN

Este estudio tiene como finalidad la validación de un instrumento para recopilar datos que no solo permita evaluar un MOOC, sino que también incorpore criterios esenciales para el diseño y desarrollo de cursos en línea de este tipo. Se llevó a cabo un análisis para determinar la validez de contenido y la fiabilidad del instrumento. Para la validación de contenido, se empleó la técnica de "Juicio de expertos", utilizando un método para la selección de los mismos conocido como "Coeficiente de Competencia Experta" o "Coeficiente K". La fiabilidad del instrumento se calculó mediante dos medidas: la alfa de Cronbach y la Omega de McDonald. Los resultados confirmaron que el cuestionario estudiado es un instrumento válido y fiable para identificar subdimensiones críticas que facilitan el diseño y creación de cursos de esta naturaleza con calidad asegurada. Además, el estudio subraya la importancia del Coeficiente de Competencia Experta (CCE) como un elemento clave para una selección de expertos más precisa y con fundamentos sólidos.

PALABRASCLAVES

Calidad de la educación, Educación en línea, TIC, MOOC, Competencia experta.

ABSTRACT

The purpose of this study is to validate a datacollection instrument that not only allows the evaluation of a MOOC, but also incorporates essential criteria for the design and development of online courses of this type.An analysis was carried out to determine the content validityand reliability of the instrument. Forcontent validation, the "Expert Judgment" technique was employed, using a method for theselectionofe

Cómo citar: Fernández-Cerero, J., Cabero-Almenara, J., & Fernández-Batanero, J. M. (2024) Indicadores de calidad para el diseño y construcción de cursos MOOC. IJERI: International Journal of Educational Research and Innovation, (21). https://doi.org/10.46661/ijeri.9606

xpertsknownasthe"ExpertCompetenceCoefficient"or"K-

Coefficient".Thereliabilityoftheinstrumentwascalculatedusingtwomeasures: Cronbach's alpha and McDonald's Omega. The results confirmed that the questionnairestudiedisavalidandreliableinstrumentforidentifyingcritical-sub- dimensions that facilitate the design and creation of quality-assured courses of this nature. Furthermore, the study underlines the importance of the Expert CompetenceCoefficient(ECC)asakeyelementforamoreaccurateandsoundly based expert selection.

KEYWORDS

Qualityofeducation;Onlineeducation;ICT;MOOC;Expertcompetence.

1. INTRODUCTION

We find ourselves in an era where the educational landscape is constantly evolving, driven largely by the speed with which information appears and disappears, as well as by the expansion of Information and Communication Technologies(ICT)intheeducationalfield.Thisrealityhasledtotalkofaprocess of digital transformation in educational institutions. In this scenario of rapid change, Massive Open and Online Courses (MOOCs) have gained a prominent role in higher education, offering an inclusive approach that facilitates access to education to people of all levels, thus promoting social inclusion, knowledge dissemination and innovation in teaching. These courses represent a revolution inonlineeducation,providingtheopportunitytolearnautonomouslyandwithout the need for a face-to-face tutor.

MOOCs, defined as free and open courses based on Open Educational Resources (OER), allow anyone to learn independently through the Internet. Theyfallundertheconceptofe-learningandarebeginningtobeintegratedwith educational micro-credentialing policies. Over time, variants of MOOCs have emerged, such as transferMOOCs, madeMOOCs and synchMOOCs, which are mainly divided into two categories: xMOOCs and cMOOCs. The former follow a more traditional structure adapted to MOOC platforms, while the latter focus on connectivist learning, promoting content creation by users and autonomy in learning.Thet-MOOC,whichfocusesonpracticaltasksandpromotesactiveand collaborative learning, has also appeared.

Over time, MOOCs are evolving towards more personalized formats such as POOCs,SPOOCsandNOOCs,whichseekmoreactivestudentparticipationand collaborativelearning.Despitetheiradvantages,challengessuchashighdropout ratesandtheneedtoadapt materialstothespecificinterestsofusershavealso been identified. The proliferation of these courses has led to the rise of web platformsofferingthem,withCoursera,edX,Udacity,andothersprovidingawide rangeofonlinecoursestaughtbyreputableeducationalinstitutions.Inthecontext of publicuniversities inAndalusia (Spain),platforms such asCoursera, edX and Miriada X are widely used, along with other online education platforms offering courses in a variety of subjects.

1.1. Qualityfactorindistancelearning. Background

In any educational context, quality is the keyelement that defines the possibility of effective and fruitful learning. Numerous researchers have emphasized the importanceofthequalityfactor,conductingstudiesonawiderangeoftopicssuch asthedevelopmentofnewonlinecourses,theimprovementofvirtual education platforms,theperceptionsofstudentsandteachers,andtheanalysis ofother

elements that impact participation. Authors such as Conole (2013, 18) suggest that quality is generally understood as the comparison of an object with other similar objects, essentially referring to the level of perfection achieved. Conole also states that "quality in e-learning is measured by the extent to which it facilitatesqualitylearning",implyingadirectreferenceto"excellence andvalue". He further stresses the need to differentiate between the key components of quality: audit, assurance and improvement. This approach includes the evaluationoftheinteractionbetweenqualityandtheuseofspecifictechnologies (Delgado-Morales and Duarte-Hueros, 2023).

Regarding how the quality of these courses should be evaluated, there are different opinions. Weller (2013) argues that traditional quality criteria are not adequate for MOOCs, given the disparity between the objectives and expectations of students and institutions in formal education compared to MOOCs. On the other hand, Rosewell and Jansen (2014) argue that quality assessment should be conducted in the same way. Contrarily, Downes (2014) considersthatthesuccess ofa MOOCis measuredmorebyitsprocess thanby its final results.

In the Spanish context, several methods, standards and principles have been proposed to assess the quality of MOOCs from different perspectives. Guàrdia, Maina and Sangrà (2013) identify ten fundamental principles in order to qualitatively understand the most important design aspects for learners in MOOCs:(a)competency-baseddesignapproach,(b) studentempowerment,(c) clarity in the learning plan and orientations, (d) promotion of collaborative learning,(e)useofsocialnetworks,(f) mutualpeersupport,(g)qualitycriteriafor knowledge creation and sharing, (h) consideration of different stakeholders, (i) peer assessment and feedback, and (j) learning enhancement through media technologies.

For other authors, success is nothing more than the results obtained from the process(Downes,2013).Inthissense,itisproposedthatthequalityofthecourse be assessed by the results obtained, taking into account four factors:Autonomy ofthestudentswhensettingtheirowngoalsandobjectives;Diversity;Openness (there are no limits and the contents are fluid) and Interactivity (mix between connection and interactivity). Following this line, authors such as Roig, Mengual and Suárez, (2014) developed an instrument to measure the quality of MOOCs thatconsistedof10dimensionsrangingfromthedevelopmentofadidacticguide to the adaptation of the course to the particularities of the student. These researchersshowthatreinforcementactivitiesareacrucialfactorinfluencingthe

pedagogicalqualityofMOOCs.Likewise,priorinformationaccessibletolearners, suchasthepresenceofateachingguideandtheexistenceofclearlyestablished and well-developed objectives, contribute positively to improving quality.

ThereportoftheConfederationofRectorsofSpanishUniversities(CRUE,2015) entitled "MOOC and quality criteria" makes a more generalized and direct approach using preferably quality indicators of the distance mode (eleaning), specifically, it includes: Planning; Design; Tutoring and monitoring; Evaluation: peer,self-evaluation,final,achievement;Includetrainingsupportandsupportfor teachers.The reportalso mentionsthat, inorderto measurethe quality of these courses,theeconomiccostofproductionandthenecessaryresources mustalso be taken into account.

The instrument developed by the University of Murcia contained indicators to considerandassessthepedagogicalqualityofMOOCcourses.Three

fundamental dimensions were included : Planning/ Management;Learningdesign and Communication-interaction (Guerrero, 2015). For this author, it is essential to have indicators that can be used to assess the level of impact of this type of courses on educational quality.

Morerecently,Cabero,Serrano,PalaciosandLlorente(2022),proceededtothe evaluation of a t-MOOC by university students and experts, emphasizing the educational materials developed, where the results support the way the course was designed, where the materials have been conceived with a multimedia approach, abandoning the notion that the resources designed for virtual training are simply a digital transposition of printed materials. For their part, Infante, Infante, Torres and Martínez-López (2017) focus on student satisfaction.

Wecannotleaveasidethetechnologicalperspective,asitisanessentialeleme nt when selecting a particular MOOC platform. In this sense, it is essential to consider certain criteria to ensure an effective learning experience.Accessibility and Usability (Morales, 2019);Adaptability and Mobile Devices (Qinn, 2011); Interactivity and Collaborative Tools (Berk, 2009); LearningAnalytics (Siemens, 2007); Integration with Learning Management Systems (LMS) (Ruano et al..., 2016); Security and Privacy (Rocha Freire & Ortiz Sánchez, 2023); Instructional DesignandUserExperience(Tinajero,etal.,2019);EmergingTechnol ogiesand Continuous Updating (Atiaja & García Martínez, 2021); Technological Sustainability (Cano, 2015).

In this line, authors such as Zapata (2017), also refer to three technological aspects to measure quality in innovation: 1) equipment technology, 2) operation technology and 3) product technology. Based on the above structuring, the technological indicators are raised, for the selection of MOOC platforms.

As a result of the above comments, it is clearthat there is no certain consensus on those fundamental indicators that MOOCs should have to assess their educational quality, knowing that a quality indicator "is a quantitative measure that can be used as a guide to control and assess the quality of

Claro, aquí tienes el texto con las palabras divididas correctamente:

different activities" (Ardila-Rodriguez 2022:192). In this situation, we believe that further progress is needed in the creation and validation of tools to guide the pedagogical planning of these courses. It is also essential to determine the role that platforms play in this process and whether they influence the components of educational designs. In this sense, we consider our study important because it develops and validates a questionnaire designed to evaluate and improve the quality of MOOC courses, considering crucial aspects such as pedagogical planning, design, and production of these courses. Through a rigorous process of expert selection and evaluation, the study establishes quality indicators that allow not only to evaluate existing MOOCs but also to guide the development of future online courses. This approach contributes significantly to the improvement of educational quality in the e-learning environment, ensuring that MOOCs are more effective, accessible, and tailored to the needs of learners, thus promoting inclusive and high-quality education.

Thus, the objective of this study is to design and validate an instrument to collect information on quality indicators in MOOCs for their design and production. The research questions are the following: What are the main quality indicators when designing and building a MOOC c o u r s e c o u r s e ? Is it possible to have valid and reliable instruments to measure different quality factors that are the starting point for the design and construction of online learning courses?

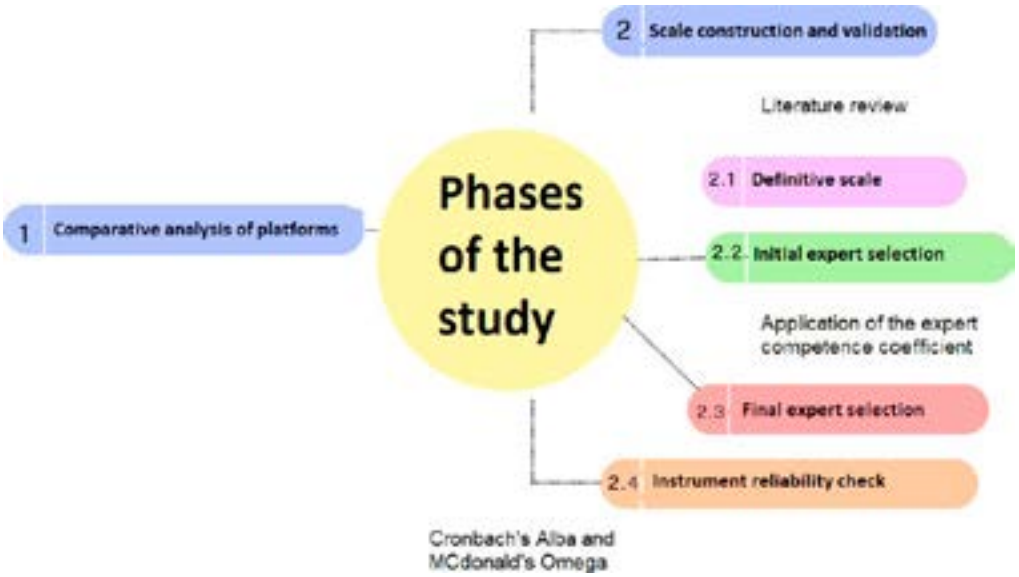
2. MATERIALYMETHOD

This study is part of a larger research entitled "Training ofAndalusian university facultyintechnologicalskillstosupportstudentswithfunctionaldiversity". Oneof its key purposes is to "Create, implement and advance aTraining Plan adjusted to theAndalusian environment, aimed at providing university faculty with digital skills to assist students with disabilities". With this objective, and before starting thetrainingplanusingthet-MOOCmodel,weseektoidentifyindicatorsorcriteria thatguide the designand developmentof theMOOC thatunderpinsourtraining plan.Therefore, the main goal of this study is the design and validation of a tool for the collection of data on quality indicators in MOOCs, thus facilitating their design and production.

Procedure

Our research is developed in two key stages: In the first, we carry out a comparative analysisof the main MOOCplatforms in order to identify those that offer greater functionalities. The second stage focuses on the adaptation and validation of a tool designed to evaluate the quality of virtual courses delivered through MOOCs.

Figure1.Phasesofthestudy.



Phase1.Platformbenchmarking.

For our analysis, we selected platforms that are free and open source, which facilitates their comparison. This approach allows such platforms to be installed and configured without incurring costs. The platforms chosen include: Moodle; Canvas, which offers a free version customizable to specific needs; Claroline; ILIAS; Open edX; and Chamilo.
In our case, the platform selected for the development of the TMOOC was Moodle. This is compatible with a wide range of devices, ensuring that users can access the course content from anywhere and at any time. On the other hand, it follows guidelines such as the Web Content Accessibility Guidelines (WCAG), which define the standards that ensure the accessibility of web content for people with educational needs. This platform will be useful to us as it is highly customizable and flexible according to the content of our course, allowing us to adjust to the objectives of the research.

Phase 2. Construction and validation of a scale to measure the quality of thetMOOCs.

The instrument used to evaluate t-MOOCs was developed from the review of previous tools, such as Bournissen, Tumino and Carrión (2019), enriched with contributions suggested by Ardila-Rodríguez (2011); Conole (2013); Martín, González and García (2013); Roig, Mengual and Suárez (2014); CRUE (2015); Guerrero (2015); Cabero, Serrano, Palacios and Llorente (2022); and Rozo (2023). The quality standards recommended by these authors were meticulously considered in its construction..

The final questionnaire is composed of 65 questions distributed in four areas: DigitalTechnologicalEnvironmentforLearning(16items);Didactic-Pedagogical Aspects(23items);Didactic Resources(15items);and Attention to Diversity(11 items). The instrument was administered via Internet and can be viewed at the following web address: https://bit.ly/validacion-mooc.

After finalizing the definitive version of the instrument to collect information, we moved on to its content evaluation using the expert judgment technique. To choose the experts, we implemented a dual method: biogram analysis and the coefficient of expert competence (CCE). Initially, we sent e-mails to several academic units, both public and private, in the Autonomous Community of Andalusia specialized in continuing education, as well as to companies in the training sector, requesting recommendations of potential experts who met the previously established criteria. Subsequently, we contacted 32 candidates by e-mail, of whom 26 agreed to participate. In order to select the experts, it was necessary to establish a series of criteria that would allow us to identify individuals who are truly considered experts by the scientific community. To this end, four criteria were established, of which at least two had to be met:

– Throughout his/her professional life, he/she has taught courses/contents/subjects/training actions related to the field of Educational Technology and training.

– Have directed or participated in any research related to aspects of virtual training, distance learning, e-learning, teacher training in ICT, digital literacy

– Has made or participated in any publication related to aspects of virtual training, distance learning, e-learning, teacher training in ICT, digital literacy,

– Have you taught during your professional life any subject/content/subjects/lectures/lectures/conferences related to ICT training?

The next step consisted of applying the Expert Competence Coefficient (K) to these 26 candidates to select the definitive ones, following the method proposed by Fernández Batanero, Tadeu & Cabero (2018); López Gómez (2018); Martínez et al. (2018), including in the questionnaire the questions of Annex I. The so-called Expert Competence Coefficient (K) is calculated with the formula: K = ½ (Kc + Ka), where Kc is the "knowledge coefficient", based on the expert's self-assessment in question A of Annex I, and Ka is the argumentation coefficient, derived from the expert's answers in the table of question B of Annex I. The criteria for defining the expert's competence are

0.8< K< 1.0for high competence.

0.5<K<0.8formediumproficiency

K < 0.5 for low competence

Therefore, those experts wit has core of 0.8 or higher were selected forthisstudy, resulting in 19 participants (67.8 %), a number that agrees with the recommendations of several authors who suggest between 15-20 (Malla & Zabala, 1978), 15-25 (Landeta, 2002); or 15-25 (Witkin &Altschuld, 1995).

The expert judgment process was performed by individual aggregation, i.e., collecting information individually without the need for interaction bet-

ween experts (Robles & Rojas, 2015). Finally, the validation of the instrument concluded with the verification of its reliability through two statistical measures: Cronbach's alpha and McDonald's Omega.

3. RESULTS

Experts were asked to rate, on a scale of 1 (not at all) to 10 (extremely), the impact that each of the sources listed below has had on their knowledge and perspectivesonICTteachertrainingandICT-relatedtechnicalskills(see Table 1).

Table 1. Teachers' self-assessment of their mastery of different technologies.

Variable	Media	S.D
How do you rate your training in the technical use of ICTs?	8,91	1,37
How do you rate your training in the educational use of ICT?	8,80	1,29
How do you rate your training in the technical handling of online platforms?	8,96	1,30
How do you rate your training in the educational use of the Internet?	8,89	1,11
I believe that ICTs are a very important resource for training.	9,98	,30

Table 2. Characteristics of the experts with respect to degree, institution where they work and professional activity.

Variable	Levels	f	%
Age	between 31 and 40 years old	7	36,8%
	between 41 and 55 years old	10	52,6%
	More tan 55 years old	2	10,5%
Qualification	Degree	10	52,6
	Master	4	21,05
	PhD	5	26,3

Ownership of the work center	Public	11	57,8
	Private	5	26,3
	Associated center	4	21,05

A series of questions related to their field of work are also asked, presented in Table 3.

Table 3. Characteristics of the judges selected on the basis of SCC ≥ 0.9.

Variable	R	f	%
Have you taught during your professional life any subject/content/subjects/training actions related to the field of Educational Technology and training?	Yes	14	73,6
	No	5	26,3
Have you directed or participated in any research related to aspects of virtual training, distance learning, e-learning, teacher training in ICT, digital literacy...?	Yes	15	78,9
	No	4	21,05
Have you published or participated in any publication related to aspects of virtual training, distance learning, e-learning, teacher training in ICT, digital literacy, ...?	Yes	13	68,4
	No	6	31,5
Have you taught in your professional life any subject/content/subjects/lectures/lectures/lectures related to ICT training?	Yes	14	73,6
	No	5	26,3

The resultspresented inTable3 indicatethatmost of theexperts consulted had experienceinteaching,aswellasinpublishingandresearchontopicsrelated to Information and Communication Technologies (ICT), and in teachers' digital competence and literacy. Subsequently, the experts or judges were asked to evaluatetherelevanceofvariousitemsforinclusionintheinstrumentdeveloped and their congruence with the dimension to which they were assigned. This evaluation was based on a six-level scale, ranging from MN=Very negative/very unwelcome (1) to MP=Very positive/very much agree (6). The mean scores and standard deviations obtained are shown in Table 4, 5, 6 and 7.

Table 4. Means and standard deviations obtained in the dimension "Digital technological learning environments".

	M	S.D
1. Dimension "Digital technological learning environment".		
1. The platform used is easy to navigate and find resources.	5,15	1,24
2. The user interface is intuitive and user-friendly.	5,20	1,15
3. The platform and resources are accessible to participants with different devices and internet connections.	5,10	1,05
4. Measures have been implemented to ensure accessibility for participants with disabilities.	4,78	1,48
5. The platform is compatible with a variety of web browsers.	5,50	1,67
6. Interactive tools (forums, chats, quizzes) function smoothly.	4,85	1,89
7. The quality of the videos, presentations and other multimedia resources is adequate.	4,98	1,33
8. The platform guarantees the security of the participants' data.	5,02	1,76
9. There are measures in place to prevent and address potential security issues.	5,37	1,23
10. Clear instructions have been provided on how to use external tools if necessary.	4,69	1,33
11. A clear and effective channel for receiving technical support has been provided.	5,22	1,24
12. The platform is regularly updated with new content and resources.	4,79	1,09
13. Participants are notified about updates and changes to the platform.	4,79	1,13
14. The platform experiences significant outages or outages.	4,51	1,23

	Media	S.D
15. The platform is accessible and easy to use on mobile devices.	5,02	1,65
16. Allows or has the ability to resume the learning process where the previous session left off (Persistence).	5,53	1,33

Table 5. Means and standard deviations obtained in the dimension "Pedagogical Didactics".

2. Dimension "Pedagogical Didactics".	M	S.D
17.The objectives of the course are clearly defined.	5,04	1,23
18. The objectives of each module/lesson are understood.	3,02	1,22
19.The proposed topics respond to the learning objectives.	4,88	1,93
20. The quality of the content is relevant and up-to-date.	4,97	1,60
21. The sequence of topics is logical and easy to follow.	4,98	1,87
22. The contents offered by the MOOC contribute to the development of the expected competencies.	4,87	1,20
23. The didactic guide describes the way in which the contents are integrated in the teaching-learning process.	5,09	1,24
24. Some contents emerge as a result of activities or questions posed in the course.	3,20	1,29
25. The contents are presented with an increasing level of complexity in correspondence with the progress of the course.	4,78	1.10
26. The learning activities are varied and stimulating.	5,30	1,87
27. The activities proposed in the different modules of the MOOC arouse the interest of the participants.	5,21	1,60
28. The open-ended activities encourage creativity.	4,67	1,37
29. The activities make it possible to achieve the learning objectives.	3,99	1,44
30. The activities promote the intervention of the students in the selection of new contents and/or activities according to their interests.	4,89	1,78
31. The times available for academic progress are adapted to the rhythms of each student.	4,97	1,19
32. The format of the lessons (videos, readings, exercises) is effective.	3,98	1,32
33. Evaluations (tests, homework) are fair and measure the knowledge acquired.	4,79	1,23

34. Assessments (quizzes, essays, essays) promote reflection on learning.	3,78	1,26
35. The proposed self-assessment is useful to reflect on academic performance.	3,34	1,56
36. Contrasting information from different sources of information is encouraged.	5,21	1,90
37. The objectives, contents and evaluation are coherently related to each other.	4,98	1,43
38. The time required to complete the activities of the course is adequate.	5,02	1,20
39. The duration of the lessons and modules is balanced.	4,93	1,29

Table 6. Means and standard deviations obtained in the dimension "Teaching resources".

3. Dimension "Didactic resources"	M	S.D
40. The information provided in the resources is relevant to the course objectives.	5,02	1,24
41. Different formats of resources are used, such as videos, readings, infographics, simulations.	5,65	1,45
42. The resources offered by the MOOC are up to date (no more than 5 years old), except for those of a historical nature.	5,76	1,65
43. The didactic resources present the information in a clear and understandable way.	5,46	1,32
44. Visual content organizers such as maps or conceptual diagrams are included.	4,89	1,32
45. The didactic resources allow interactivity or student participation.	4,87	1,19
46. The variety of formats contributes to maintaining student interest and participation.	4,67	1,14
47. Resources are accessible to all learners, including those with special needs.	4.55	1,13
48. Tutorials are presented for a better understanding of the topics proposed.	4,87	1,34
49. The level of difficulty of the resources is appropriate for the target audience.	5.02	1,23
50. Additional resources are provided for those who desire a greater challenge or deeper understanding.	4,54	1,32
51. Resources provide immediate feedback on learner performance.	5,55	1,22
52. Case studies or real-world examples are included to help apply the theoretical knowledge	5,67	1,65
53. Case studies reflect real-world situations related to the course topic.	5,78	1,51
54. Resources presented encourage collaborative learning	5,54	1,22

Table 7. Means and standard deviations obtained in the dimension "Attention to diversity".

4. Dimension "attention to diversity"	M	S.D
55. Course content is presented in a manner that is accessible to participants with varying levels of prior knowledge.	4,56	1,76
56. Options are provided for participants to choose among different learning activities or approaches according to their preferences.	5,55	1,43
57. The course offers resources and activities that accommodate different learning styles (visual, auditory, kinesthetic, etc.).	4,98	1,32
58. Measures are implemented to ensure that participants with disabilities have access to the technological resources used in the course.	4,78	1,12
59. The course offers flexibility in terms of scheduling and timing to accommodate the needs of participants with work or family commitments.	5,67	1,22
60. Personalized feedback is provided that takes into account participants' individual strengths and weaknesses.	4,78	1,67
61. Communications from the instructor and course team are inclusive and respectful of participants' cultural and linguistic diversity.	3,56	1,54
62. Discussion forums and collaborative activities encourage participation by all participants, regardless of their background or skill levels	4,56	1,43
63. Assessments are designed so that all participants have a fair opportunity to demonstrate their understanding	4,67	1,25
64. The course allows participants to track their own progress and adjust their approach as needed	5,06	1,29
65. It incorporates a Frequently Asked Questions (FAQ) and/or Help section.	5,56	1,12

The results obtained indicate 3 main aspects: (a) that except for two items "The objectives of each module/lesson are understood" and "The proposed self-assessment is useful for reflecting on academic performance" and "The format of the lessons (videos, readings, exercises) is effective", which obtained a score representing a rating of "Fair negative/moderately disagree", the rest were rated very positively, and (b) that a certain elevation has been identified in the standard deviations obtained, which may suggest to us a certain dispersion of data.

With the data obtained, we also proceeded to calculate the Gwett's AC Coefficient. Gwett's AC coefficient is an indicator of the level of agreement that incorporates a penalty for casual agreement; however, it is not affected by what is known as Kappa's paradox. This paradox, which impacts not only Cohen's Kappa, but also other coefficients (such as Fleiss' Kappa or Krippendorf's Alpha), manifests itself when the distribution of experts' evaluations is significantly biased towards one of the categories. In such situations, even though the percentage of agreement is high, the values of Cohen's Kappa and other mentioned coefficients tend to be very low, in some cases

even reaching negative values (Gwet, 2014). In our case, we obtained a percentage of agreement of 91.23 %; that is, 0.90 according to Gwett's CA coefficient. Therefore, the items that make up our modified questionnaire after such assessment have validity criteria in terms of sufficiency, clarity, coherence, and relevance.

The evaluation carried out by experts by summing the items ensured that the instrument had an appropriate level of content validity.

We also sought to verify the reliability of the instrument, which was evaluated by means of two statistics: the Cronbach's alpha coefficient (0.911) and the McDonald Omega index (0.909) (Cohen and Manion, 2002; Ventura-León and Caycho-Rodríguez, 2017). These results indicate that, according to the measurements and following the approach of O'Dwyer and Bernauer (2014), we observed significantly high levels of reliability, both in the general set of the instrument and in its various dimensions. It is important to note that item-total correlation was carried out to assess whether the exclusion of any item would improve the reliability of the instrument, but no such improvement was evident.enced.

4. CONCLUSIONS

The project has successfully achieved its objectives. The findings obtained represent a significant advance in the field of t-MOOD course quality assessment by providing an effective and reliable tool that can be used both in the design stage and in the development of these courses. Validation of the tool by experts in the field further supports its usefulness and relevance. The developed tool offers key indicators that can be of great use to t-MOOD course designers and instructors, providing clear guidance for improving the quality of the online learning experience. The inclusion of these indicators at the initial stage of course design and development can contribute significantly to the creation of more effective and engaging online learning experiences for learners. Despite the success of the project, the need for certain adjustments to the developed tool was identified. Specifically, the elimination of three items from the questionnaire was suggested to avoid excessive lengthening of the instrument. This recommendation is based on the observation that the inclusion of these items significantly increases the length of the instrument, which could affect the efficiency and participation of users when using the tool. By making these adjustments, it is hoped to optimize the usefulness and applicability of the t-MOOD course quality assessment tool, while ensuring its effectiveness and relevance in educational practice. Finally, it is necessary to highlight the importance of continuing to conduct additional research to further validate and improve the developed tool. Continued user feedback and additional data collection can provide valuable information to refine and adapt the tool to the specific needs of different educational contexts and types of t-MOOD courses.

5. LIMITATIONS

One of the limitations of this study lies in the changing nature of the technological context in which MOOC courses are developed. Educational technologies are evolving rapidly, with new tools, platforms and pedagogical approaches constantly emerging. This may affect the long-term relevance of the quality indicators identified in this study. In addition, updates and enhancements to online course platforms may influence how quality indicators are implemented and assessed. Therefore, the generalizability of long-term results may be compromised due to the dynamics and constant change in the educational technology landscape. Another significant limitation of this study is the difficulty in generalizing the results to different educational contexts and MOOC course platforms. Although quality indicators relevant to the design and construction of MOOC courses have been identified in the specific context of this research, it is important to keep in mind that the effectiveness and applicability of these indicators may vary depending on a number of factors, such as the sample, the subject of the course, the teaching methodology and the characteristics of the platform used. In addition, institutional policies and cultural differences between educational institutions may influence the implementation and effectiveness of the quality indicators identified. Therefore, caution should be exercised in attempting to extrapolate the findings of this study to other educational settings without careful evaluation of the relevance and appropriateness of the quality indicators in those specific contexts.

Authors`scontribution

All authors contributed to the conception and design of the study. Material preparation, data collection, and analysis were performed by [José Fernández Cerero], [Julio Cabero Almenara], and [José María Fernández Batanero]. The first draft of the manuscript was written by [José Fernández Cerero], [Julio Cabero Almenara], and [José María Fernández Batanero] and all authors commented on earlier versions of the manuscript. All authors read and approved the final manuscript..

Funding

The authors declare that they have received the following financial support for the research, authorship and/or publication of this article: The publication is part of the project PID2022-138346OB-I00, funded by MCIN/AEI/10.13039/501100011033/FEDER, UE.E

Acknowledgements

This study is part of a doctoral thesis developed within the framework of the Doctoral Program in Education at the University of Seville (Spain). It has also received support from the Programa Predoctoral de Formación del Profesorado Universitario (FPU2022/00106).

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APPENDIX

Questions asked to obtain the expert competence coefficient

A) Mark in the appropriate box the degree of knowledge you have about the following topics: teacher training in ICT, ICT and inclusive education, disability, accessibility, ICT and disability, ... Rate yourself on a scale of 0 to 10 (0 as having absolutely no knowledge and 10 as having full knowledge of the state of the art).

0									10

(Note: The Kc score is obtained (Knowledge coefficient - value from 0 to 10).).

B) Self-assess the degree of influence that each of the following sources has had on your knowledge and criteria on the subject of teacher training in ICT, ICT and inclusive education, disability, accessibility, ICT and disability, ...

	Low	Medium	High
Theoretical analysis performed by you	0,2	0,2	0,1
Your experience gained from your practical activity	0,5	0,3	0,2
Work study on the subject by Spanish authors.	0,05	0,05	0,05
Study of work on the subject by foreign authors.	0,05	0,05	0,05
Your own knowledge about the state of the problem abroad.	0,05	0,05	0,05
Your intuition on the subject.	0,05	0,05	0,05

Note: The Ka score is obtained (Coefficient of argumentation - value the sum of the answers given by the expert, according to the score is detailed).