Typologies of (Open) Online Courses and Their Dimensions, Characteristics and Relationships with Distributed Learning Ecosystems, Open Educational Resources, and Massive Open Online Courses

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Abstract

This chapter analyses the different typologies of online courses. First, we start with a reflection about the key terms of online learning, online courses, and distributed learning ecosystems (DLE). In our literature review, we cannot identify any existing typology framework for online courses. Consequently, we analyse and compare dimensions and categories of online courses from different sources: first, from the collected publications and studies identified in our literature review, second, from the current practices and platforms for online courses, and third, from standards for online courses, including the first international quality norm for online learning ISO/IEC 40180. As our key result, a framework proposal for the different typologies of online courses

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is developed based on these discussions and a comparison of several dimensions. The integration of our comparison results leads to the Typologies of Online Courses (TOC) framework with eight dimensions. The aim of the TOC framework is two-fold. First, it should support designers in the design, quality development, and evaluation of online courses. Second, it should enable learners to differentiate online courses according to the dimensions of these courses in comparison with their own preferences and demands. In the conclusion, an outlook on future research needs is provided. Finally, we come full circle and briefly discuss how (open) online courses and especially the two currently most important types, namely, Open Educational Resources (OER) and Massive Open Online Courses (MOOCs), can contribute to DLE and to addressing the general need for (equity and collaborative) education for all.

1 Introduction

In this chapter, we analyse the contribution of online courses to distributed learning ecosystems (DLE) and introduce a typology of online courses for their categorisation and description. In recent years, particularly during the coronavirus (COVID-19) pandemic and its associated lockdowns, DLE have attracted increasing interest and grown in importance. Schools and universities have had to close their buildings and suspend traditional modes of providing formal education. Distance and online learning has become the new normal for many teachers and students. To facilitate emergency remote education, DLE have been established in diverse and often hasty ways. Consequently, teachers and public authorities have identified the need for related capacity building and competence development as well as for appropriate (digital) content and education. Technological and pedagogical competences are required for the design and accomplishment of distance and online learning.

The starting point for our discussion of the different categories of online courses and their dimensions is to reflect on the following key terms and their definitions: online learning, online courses, and DLE. Based on this reflection, we present the results of our explanatory literature review. Then, we analyse and compare the current practices and platforms used to deliver online courses. Furthermore, we present and compare the relevant standards and norms used in online learning and courses. The integration of our comparison results leads to our proposal for a Typologies of Online Courses (TOC) framework with eight dimensions. The aim of the TOC framework is two-fold. First, it should support designers in the design, quality development, and evaluation of online courses.

Second, it should enable learners to differentiate online courses according to the dimensions of these courses in comparison with their own preferences and demands. In the conclusion, an outlook on future research needs is provided. Finally, we come full circle and briefly discuss how online courses and especially the two most important types, Open Educational Resources (OER) and Massive Open Online Courses (MOOCs), can contribute to DLE and to addressing the general need for (equity and collaborative) education for all.

2 Online Courses and DLE

Online courses and DLE currently attract great attention and face an increase in demand and application. This is, particularly due to the COVID-19 pandemic.

2.1 Online Learning as the 'New Normal'

The COVID-19 pandemic has affected all countries and societies worldwide, including their education systems (World Health Organization, 2020). The direct impact has been unique, especially on formal education, as described and analysed in the first reports of such global organisations as the United Nations (2020), the Organisation for Economic Co-operation and Development (OECD, 2020, 2021a, b), and, in particular, the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2020, 2021), also in collaboration with the United Nations Children's Fund, The World Bank, and OECD (UNESCO et al., 2020, 2021). In many regions and countries, the sudden lockdowns and varying social distancing measures have led to an immediate shift towards online distance education without any experience, guidelines, or training in most cases (UNESCO, 2020, 2021). Progressively, online learning has become the new normal in school education (also called K-12) and higher education, increasing the inequity and digital divide between privileged and marginalised individuals (teachers, students, and students' families), rich and poor populations, social groups, and developed and under-developed regions and countries (UNESCO et al., 2020, 2021). Currently, under the COVID-19 pandemic, online education is at least partially gaining a potential to be a new normal (and during lockdown periods often the only full-time solution) (Stracke et al., 2021). Therefore, it is crucial to analyse how online courses as the central element and mode of online learning can support and facilitate such online education as the potential new normal in schools and universities.

2.2 What are (Open) Online Courses?

We define the term ‘online course’ in its broadest sense through three key characteristics: any type of learning that (1) takes place online, (2) is designed with learning objectives and intentions (i.e., as formal education), and (3) is limited to a time period (i.e., a specific duration or has a start and end time). The first condition excludes face-to-face and any type of hybrid (so-called ‘blended’) learning, the second condition differentiates an online course from non-formal and informal learning, and the third condition distinguishes online courses from general online learning that can take place, for example, in open communities without any time constraints and limitations (a specific duration is the core part of a course concept). Further educational dimensions are not distinctive for online courses. With regards to synchronicity, online courses can happen synchronously and asynchronously (and in any combination of both). With regards to guidance, online courses can be educator-led or self-directed (and any combination of both). With regards to cooperation, online courses can be designed for collaborative or single learning (and any combination of both). Finally, open online courses are a subset of all online courses: ‘open’ in this context means more than free and easy (open) access to courses— it means a philosophy of openness in the pedagogical design, implementation, and achievement of the online learning opportunity, facilitating self-responsible, collaborative, and non-hierarchical learning experiences.

2.3 Relation Between Online Courses and DLE

DLE transfer the concepts of ecosystems (Bronfenbrenner, 1979) and social constructivism (Luhmann, 1995) to learning scenarios and processes (Blaschke et al., 2021; Gütl & Chang, 2008). As a generic term, ‘DLE’ might stand for a synonym of any kind of distance education as it requires (as a minimum condition) at least two distributed individuals (this could be learners and teachers) at a distance and who are building a learning ecosystem. These minimum requirements are the same for any distance learning (Ruppert & Duncan, 2017). In this view, online courses would be special cases and a sub-group of DLE. However, DLE is normally defined as and connected to specific types of distance learning, namely, collaborative learning in communities and online (Blaschke et al., 2021). From this perspective, online courses can be considered theoretically as a generic umbrella term that includes all DLE with formal learning objectives. In this chapter, we use

this latter definition of DLE to emphasise the communication, exchange, and collaborative aspects of DLE for online learners and educators. This dynamic aspect of DLE is also characteristic of open courses.

3 Typologies and Dimensions of Online Courses

For the identification of the dimensions of online courses, we started with an explanatory literature review.

3.1 Review of Literature on Online Courses

We conducted a literature search using the Web of Science Core Collection as the main database for scientific articles. Surprisingly, the search string on title entries "((TI = ("online cours*")) AND (TI = (typolog*)))" resulted in only one article. The broader search string "((TI = ("online cours*")) AND (TI = (typ*)))", which allows also type or types as results, produced only four articles. Therefore, we decided to broaden our search strategy. We included keywords leading to 23 articles as results for ((TS = ("online cours*")) AND (TS = (typolog*))). Furthermore, we used additional search terms that are directly connected to online courses such as 'design', 'quality', and 'evaluation' and applied the snowball approach—that is, we additionally analysed the references from the most beneficial articles.

For face-to-face (on-site) education and courses, Merrill (2002) created five basic methods and learning principles (problem-centred, activation, demonstration, application, and integration) and introduced three requirements of instruction, namely, it has to be effective, efficient, and engaging (Merrill, 2009). Based on a theoretical analysis of four main educational philosophies, namely, instructionism, constructionism, socio-cultural learning, and collaborative learning, Laurillard (2009) developed a conversational framework with guiding questions for designing (collaborative) online learning. She considered collaborative learning to be a key opportunity offered by digital technologies and courses. In addition to the three traditional interaction types, which are learner-to-learner, learner-to-teacher, and learner-to-content, as originally defined by Moore (1989), online learning enables a fourth interaction type (group-to-group interaction), and the latest research by Stracke et al. (2018a) highlights the high importance of all four online interaction types.

In a review study, Kebritchi et al. (2017) analysed the issues and challenges facing or online courses in higher education, and recommended the integration of multimedia, peer collaboration, online tutorials, automated feedback, discussion groups, and learning communities when transitioning from face-to-face (on-site) to online courses. Baldwin et al. (2018b) compared six guidelines and rubrics for designing high quality online courses to identify commonalities, which were then used by Martin et al. (2021) for the development of the Online Course Design Elements instrument. The Asian Association of Open Universities (2020) published the quality assurance framework, without giving any information about its development. The European Commission has developed several initiatives and guidelines around digital learning and online courses, including the Digital Education Action Plan (2021 to 2027) and, most recently, online consultations on digital education and micro-credentials (European Commission, 2020).

Most relevant to our research objectives is the European initiative for quality and massive open online courses, also called MOOQ (http://mooc-quality.eu). The initiative focuses research on open online education and analyses current practices revealing great differences between the expectations of online learners and what is produced by designers of online courses (Stracke et al., 2018a). Based on the findings from the Global MOOC Quality Survey and the involvement of thousands of MOOC learners, designers, and facilitators in many iterative cycles (Stracke & Tan, 2018), the Quality Reference Framework (QRF) for the quality of MOOCs (see Fig. 1) was developed as a globally representative instrument (Stracke et al., 2018b). QRF distinguishes five dimensions (presented in Fig. 1) that must be addressed for the design, quality, and evaluation of online courses; namely, analysis, design, implementation, realization, and evaluation. The elements of the five dimensions cover the full range of potential options for online learning and courses; thus, they are not mandatory, but they need to be selected according to the given learning objectives and situation (Stracke et al., 2018b).

Furthermore, QRF contains the QRF Quality Checklist with guiding questions for beginners in (taking or developing) online education as well as the QRF Key Quality Criteria with the full list of potential quality criteria for designers and experts in online education.

As a first result from our literature review, we can conclude that a precise typology and specific, commonly agreed dimensions for online courses cannot be found in the literature; this denotes a research desideratum. Comparing the QRF with the analysed literature, we can only conclude that some dimensions can be considered a minimum as they are mentioned in almost all scientific publications and in the QRF structure—these dimensions are analysis, design, implementa-

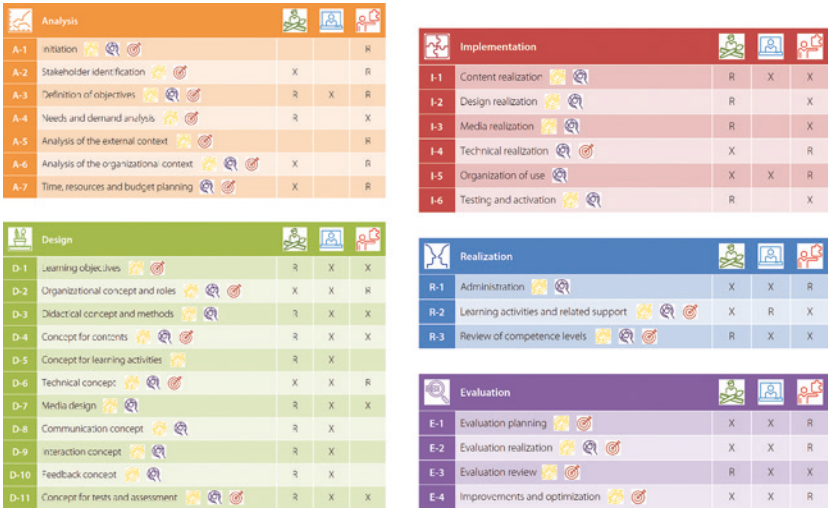

Fig. 1 The Quality Reference Framework (QRF) (Stracke et al., 2018b)

tion, realisation, and evaluation. In the following section, we will enrich our analysis and compare the current practices and platforms offering online courses.

3.2 Online Courses: Current Practices and Platforms

Since the 2000s, online learning and courses have become increasingly popular and mainstream especially in higher education (Garrett et al., 2020). However, interviews by Baldwin et al. (2018a) have revealed that designers of online courses often simply followed the principles of the traditional (face-to-face or on-site) ADDIE model, which refers to the five phases of analyse, Design, Develop, Implement, and Evaluate. This is considered a limitation. Designers of online courses differ from designers of face-to-face courses as they set different priorities—they value and facilitate interactions amongst learners but often do not address special needs and do not offer self-assessment (Bolliger & Martin, 2021). Nevertheless, broad and, especially, longitudinal studies on online learning and courses are still missing although they are much sought after. Thus, we will summarise the current practices through an overview of various platforms offering

online courses that claim to be lead in terms of the number of courses, learners, and quality.

The online platform Class Central is, according to its advertising, the biggest online search engine platform for MOOCs ('The #1 Search Engine for MOOCs'). It lists more than 40,000 online courses, but the courses can only be selected and filtered according to basic categories: subjects, providers, rankings, and (self-curated) collections (Class Central, 2021). Udemy lists more than 183,000 online courses according to its own promotion, but it specialises in offering only video-based courses. When searching Udemy, you can select only by topic (only a single category is offered); but within that topic, you can select from several categories: levels, languages, prices, features (consisting of a diverse mixture of categories, namely, subtitles, quizzes, coding exercises, and practice tests), ratings, video duration, and (foreign) subtitles (Udemy, 2021). edX (2021) offers more than 3000 online courses and follows the same structure. You can choose only from subjects listed on the start page (plus direct links to programmes and providers in the top navigation) but, subsequently, you can select from several categories in the search results (subject, provider, programme, level, language, availability, and learning type). Coursera does not explicitly state how many courses it offers, but its latest impact report states there are more than 5000 (Coursera, 2021). Coursera has established a similar structure to that of Udemy: on its landing page, you can directly search all courses or choose links to providers, certificates, degrees, skills, free courses, and subjects (plus direct links to goals and subjects in the top navigation), while in the search results, you can select from several categories (language, level, duration, subject, skill, partner, and learning product). Other platforms providing online courses offer even fewer categorisation and filter options than the platforms listed above. In MOOC List, you can only search for subjects and formal conditions (MOOC List, 2021). The private provider FutureLearn (2021), which formerly belonged to UK's Open University, differentiates only between sizes of online courses: 'Short courses', 'ExpertTracks', 'Microcredentials and programs', and 'Online degrees'. Fordham University (2021), as an example of a private university (with the highest Google ranking), distinguishes only between three modes: asynchronous online, synchronous online, and hybrid courses (also known as blended).

In Table 1, we compare definitions and categorisations of online courses that are used by online platforms to differentiate the online courses offered.

It is obvious that the online platforms use different terminologies and numbers of categories. They mainly distinguish the online courses by content (whereby

Table 1 Categories of online courses differentiated in online platforms

	Class Central	Udemy	edX	Coursera	Khan Academy	MOOC List	FutureLearn	Fordham University
Objectives				Goals				
Target group		Levels Languages (Foreign) subtitles	Program Level Language	Skills Language Level	Levels Languages (Foreign) subtitles	Formal conditions		
Pedagogies			Learning type					Modes
Content	Subjects Collections (self-curated)	Topics Duration Price	Subject Availability	Certificates Degrees Subjects Duration Learning products	Topics Duration	Subjects	Sizes	
Assessment		Quizzes Coding exercises Practice tests			Quizzes Coding exercises Practice tests			
Context	Providers	Price	Providers/ Partners	Free courses Providers/ Partners	Price			
Evaluation	Rankings	Ratings			Ratings			

subjects or topics are addressed as well as content size or duration) and focused target groups (the levels and languages addressed).

Surprisingly, online platforms do not use categories related to design and technologies to distinguish their offered online courses. Furthermore, the categories related to objectives (only once) and to pedagogies (only twice) are not often

used. It seems that categories of educational dimensions and didactics are not important for online platforms, which is in stark contrast to the scientific literature and studies. In the following section, we change our perspective again to further broaden our comparison by introducing and analysing existing standards and norms that are relevant for online learning and courses.

3.3 Standards and Norms for Online Learning and Courses

There is a mix of terminology related to norms, standards, and guidelines. To avoid this confusion, we distinguish between norms developed by de-jure and legitimated standardisation bodies, standards developed by authorities, and guidelines developed by any other institution or (group of) individuals. Several national and regional standards are published and available, such as the so-called standards by the International Association for K-12 Online Learning (2011). This name is misleading as the standards are merely a second version of a national US standard originally developed and published by a few American authors (and not by an international association or large group of authors).

The first international standard that is relevant for online courses was published by the Institute of Electrical and Electronics Engineers (IEEE, 2003) as IEEE Std 1484.1. It specifies all components of a Learning Technology Systems Architecture (LTSA) and their relations in a completely technology-independent description (see Fig. 2 below).

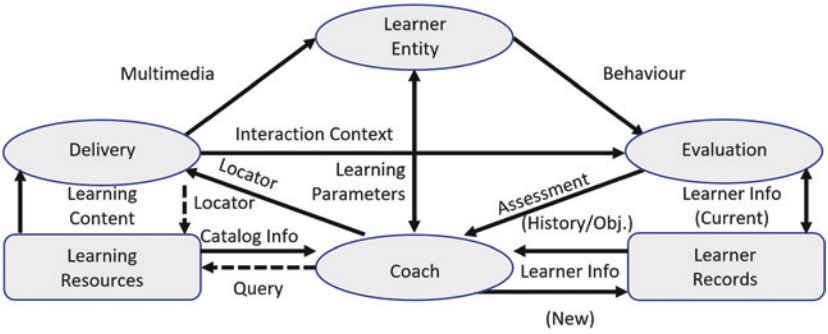

Fig. 2 IEEE 1484.1: LTSA system components (IEEE, 2003)

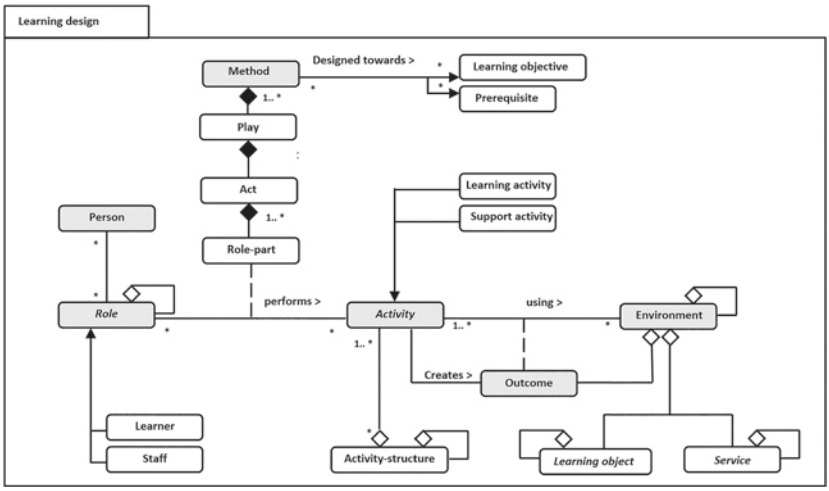

Fig. 3 IMS learning design (IMS, 2003)

It is remarkable how useful and adequate this norm still is, considering its age (18 years old now) and the technological developments that have occurred since its creation.

In the same year (2003), another international standard, IMS Learning Design (LD), was published by IMS Global Learning Consortium, Inc. (IMS), based on the Educational Modelling Language (EML) (see Fig. 3 above).

An extension of IMS LD was developed from 2003 to 2004 and published as publicly available specification 1032-2 by the German Institute for Standardization. It enhanced the IMS LD specification by three components, namely, context, experience, and metadata.

However, none of these standards are internationally approved or broadly implemented as a norm. The single exception was and still is the unique international quality norm ISO/IEC 40180 (2017), developed and approved by all national delegations from the International Standardization Organisation (ISO) and the International Electrotechnical Commission (IEC). ISO/IEC 40180 is a regular revision of the former standard ISO/IEC 19796-1 (2005) that was published as the first e-learning norm by ISO and IEC. It was developed by the international standardisation committee SC36 under the ISO and IEC, managed by the elected SC36 Convenor Christian M. Stracke, and approved by all participating national delegations from approximately 60 countries in a consensus. ISO/

ID	Category	Process	Description	Relation
Sub-processes/ Sub-aspects				
Objective				
Method				
Result				
Actors				
Metrics/Criteria				
Standards				
Annotation/Example				

Fig. 4 ISO/IEC 40180: QRF Descriptive Model (ISO, 2017)

IEC 40180 defines the QRF for e-learning that contains two models: the QRF Descriptive Model (as a master template, presented in Fig. 4) and the QRF Quality Model that describes all relevant dimensions and processes relevant for online learning and courses (presented in Fig. 5). As it is based on the QRF of ISO/IEC 40180, MOOQ chose to use the same abbreviation, QRF, for its specific QRF for MOOCs (see above).

The QRF Descriptive Model provides a template for defining and describing selected processes relevant in a given situation and for a specific task, such as designing an online course. The QRF Quality Model contains all potential processes that are relevant and must be defined in technology-enhanced education, namely, in digital learning and online courses. By virtue of this complete picture of all potential dimensions and processes, the structure of ISO/IEC 40180 with its 7 dimensions and 38 processes is used in the following framework as the basis for categorising online courses.

In Table 2, we compare the different dimensions and categorisations of online courses used in the standards and the norm ISO/IEC 40180 plus the QRF introduced above to develop the TOC framework below.

4 TOC Framework

It is evident at first glance that there is a major discrepancy between the international norm ISO/IEC 40180 and QRF, on one hand and the practical implementations in online platforms on the other. ISO/IEC 40180 and QRF address all

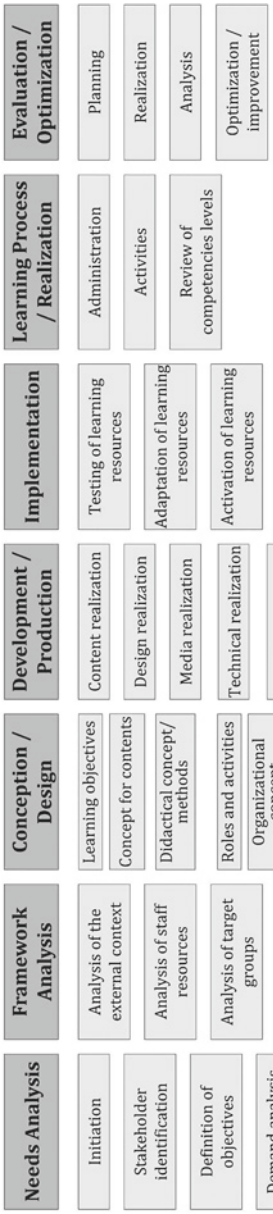

Fig. 5 ISO/IEC 40180: QRF Quality Model (ISO, 2017)

Table 2 Categories of Online Courses Differentiated in Standards and Norms

	ISO/IEC 40180	IMS LD	IEEE LTSA	QRF
Objectives	Definition of objectives Learning objectives	Learning objective		Definition of objectives Learning objectives
Target group	Demand analysis Analysis of target groups	Person Prerequisite	Learner entity	Needs and demand analysis
Pedagogies	Didactical concept/methods Roles and activities Organisational concept Communication concept Organisation of use Activities	Method Play Act Role-part Role Activity Activity structure Learning activity Support activity	Delivery Coach	Organisational concept and roles Didactical concept and methods Concept for learning activities Communication concept Interaction concept Feedback concept Organisation of use Learning activities and related support
Content	Concept for contents Media concept Content realisation Media realisation Testing of learning resources Adaptation of learning resources	Learning object Service	Learning resources	Concept for contents Media design Content realisation Media realisation
Design	Concept for media and interaction design Design realisation			Design realisation
Technologies	Technical concept Concept for maintenance Technical realisation Maintenance Activation of learning resources Technical infrastructure	Environment		Technical concept Technical realisation Testing and activation

(continued)

Table 2 (continued)

	ISO/IEC 40180	IMS LD	IEEE LTSA	QRF
Assessment	Concept for tests and evaluation Review of competencies levels	Outcome	Evaluation Learner records	Concept for tests and assessment Review of competence levels
Context	Initiation Stakeholder identification Analysis of external context Analysis of staff resources Analysis of institutional and organisational context Time and budget planning Environment analysis Administration			Initiation Stakeholder identification Analysis of the external context Analysis of the organisational context Time, resources, and budget planning Administration
Evaluation	Planning Realisation Analysis Optimisation/improvement			Evaluation planning Evaluation realisation Evaluation review Improvements and optimisation

important dimensions and processes with a strong emphasis on pedagogical categories; this is also supported by the scientific literature and studies. However, online platforms largely neglect these aspects and concentrate mainly on formal aspects and categories directly related to content. The standards for online learning and courses take a middle position due to their specific orientations (IEEE 1484.1 on information systems and IMS LD on pedagogical views). Consequently, we propose a future framework for the typologies of online courses that is more concise than ISO/IEC 40180 and QRF but that still addresses all their details. This can be achieved by a reduced and limited set of dimensions enhanced by detailed (sub-)categories that are representative for online courses and that can be used and adapted for their design, quality, and evaluation. Table 3 presents our proposal for a Typologies of Online Courses (TOC) framework derived from our analysis results, as discussed above.

Table 3 Dimensions of a Typologies of Online Courses (TOC) Framework

Context	The given context is crucial for the design of an online course. Specific conditions and the given limitations such as available resources have to be identified and considered. Therefore, the design should start with a needs analysis that also reflects the requirements and demands of all the stakeholders involved
Objectives	This dimension covers the organisational objectives related to the expected impact as well as learning objectives associated with the planned learning outcomes
Pedagogy	The dimension pedagogy can be considered to be most important for overall success and requires close attention and addressing several aspects. In online courses, there are several unique opportunities that need to be exploited such as community building, collaborative learning, and automatic self-assessment
Content	Content covers the resources and media that are combined and mixed in the online course
Interaction	Interactions in online courses are enriched by a fourth mode—the interactions among different groups of learners, as explained above. Online learners as well as online designers highly value this feature although the learners and designers have diverse expectations
Technologies	Technologies play a special role in online courses as they have to work, and learners (as well as designers and facilitators) need related digital competences
Support	Support in online courses is crucial for introducing beginners to online learning, giving orientation, and providing feedback
Assessment	The assessment consists of measurement of the learning progress and outcomes achieved by the learners as well as the evaluation of the online course for future improvements

It is important to note that there is no specific sequence of the dimensions. Instead, there are generally iterative definitions and refinements of all dimensions in cycles. This is not finalised during the design but continues during the implementation, realisation, and (formative and summative) evaluation as stated and required in ISO/IEC 40180 and QRF. Our aim is to enhance our framework proposal with detailed categories for the design, quality, and evaluation of online courses. Furthermore, a task for future research will be to add appropriate analysis methodologies and validate them through mixed methods research involving learners, designers, and providers of online courses.

5 Conclusion: (Open) Online Courses and their Contributions to DLE

It has become evident that online learning and courses will play a more important role in the future (Qayyum & Zawacki-Richter, 2019), independent of the continuation of the COVID-19 pandemic. Teachers, students, and their families have been forced into their first experiences with online learning and courses in formal education and some of these experiences have been quite positive. Therefore, we believe that this sudden introduction of online learning and courses or at least their beneficial aspects that teachers, students, and their schools and universities have discovered will stay. Consequently, an in-depth research on the dimensions, conditions, and effects of online learning and courses is required to identify their prerequisites, factors, and impact.

In this chapter, we have presented and discussed the results from our literature review and analysis of standards and current practices as well as online platforms for online learning and courses. We state that there is an great difference between scientific publications and studies, on one hand and current practices and online platforms on the other. By comparing the identified dimensions and categories of online courses, we can derive and propose a TOC framework consisting of eight dimensions: Context, objectives, pedagogy, content, interaction, technologies, support, and assessment.

As an outline for future research and for embedding this chapter into the broader context of this handbook, we will briefly highlight how (open) online courses can support and strengthen digital education and DLE, particularly in the movement towards open education (Kerres & Heinen, 2015; Koseoglu & Bozkurt, 2018). We selected two types of online courses that are currently most prominent in online learning and education: OER and MOOCs.

5.1 Open Educational Resources (OER)

The OER movement is older than MOOCs (Stracke et al., 2019); it is connected to the evolution of the movement towards Open Learning and Open Education (the favoured term has changed over time) that started some thousands of years ago in the philosophies of Confucius, Socrates, and Plato (Nyberg, 1975; Stracke, 2019). The concept of OER is used in two ways: narrowly, for freely and openly

accessible learning materials with an open license, and broadly, for a grassroot movement towards designing, sharing, and re-using open education for all (for diverse definitions, see D'Antoni (2009), Downes (1996, 2007), McAndrew (2010), and Stracke et al. (2019)). The main institutional driver was (and still is) UNESCO (2002), which introduced the term OER in 2002; followed by many OER reports, declarations, and guidelines such as the Cape Town Open Education Declaration (2007), the Dakar Declaration on OER (2009), and the Guidelines on Open Educational Resources in Higher Education (2011) (Atkins et al., 2007; Stracke et al., 2019).

The two World OER congresses organised by UNESCO (2012 in Paris and 2017 in Ljubljana) were milestones for the global OER movement, leading to the global OER Recommendation (UNESCO, 2019), approved by all 194 member states. The recommendation's unique characteristic is the binding requirement for all member countries to deliver annual national reports about their OER status and progress. Research on OER has increased and the latest findings of a comparison of 25 OER projects (Otto, 2019) demonstrate the diverse adoptions and diffusions of OER in education. A survey among designers of online courses from four selected European countries reveals that OER are most used (35%) after PowerPoint slides (85%) and videos (36%) (Meletiou-Mavrotheris et al., 2021), which demonstrates the potential of OER that still needs to be fully exploited.

5.2 Massive Open Online Courses (MOOCs)

Open online courses existed before MOOCs; these courses started with email-based classes in the 1990s (Abdolrasulnia et al., 2004; Hodges, 2008; Smith et al., 1999), followed by self-paced online courses in the late 1990s and early 2000s (Wiley & Gurrell, 2009). MOOCs were born in 2008 with the online course "Connectivism and Connective Knowledge" (CCK08), which later became known as MOOC, a term coined by Dave Cormier (Bozkurt et al., 2018). The debate over whether MOOCs are OER has been clarified and answered by Stracke et al. (2019) in their detailed historical overview and discussion, which pointing out that it depended on the chosen definitions and perspectives.

Since the beginning, the number of MOOCs has been constantly growing (Daniel, 2012; Gaskell & Mills, 2014; Pappano, 2012), and online designers and researchers have discussed and analysed the quality of MOOCs and their educational impact and achievements (Liyanagunawardena et al., 2013; Stracke, 2019; Stracke & Trisolini, 2021; Veletsianos & Shepherdson, 2016; Zawacki-Richter et al., 2018). Consequently, different types of MOOCs have been designed

with specific learning objectives and pedagogical approaches (Davidson, 2013; Stracke, 2017). Today, the numbers of offered and registered MOOCs (16,300 as of 2020), participating learners (180 million), and providers (950+) are continuously increasing, as reported by the MOOC platform and aggregator website Class Central; especially during the COVID-19 pandemic and the resulting lockdowns, the demand and the registrations for MOOCs have grown strongly (Shah, 2020).

5.3 Contributions of OER and MOOCs to Online Courses and DLE

Two main questions remain to be briefly discussed. First, how can OER and MOOCs improve online courses and their design, quality, and evaluation? Second, how can OER and MOOCs strengthen DLE?

The answer to the first question appears to be evident: OER and MOOCs offer open and free concepts, materials, and methods that can be re-used and adapted by online designers using free formats. Moreover, they benefit from open licenses, for example, for situational, cultural, or language modifications. Furthermore, online learners can openly and freely register for and take OER and MOOCs. This open approach benefits both designers and learners, allowing for variety, better comparability, and transparent evaluation, leading ideally to improved design and quality of online courses. Designers can benefit from development experiences (and do not have to start from scratch), while learners can benefit from easier comparisons. However, this direct consequence still needs to be proven by future research on the impact of (open) online courses.

The answer to the second question depends on how OER and MOOCs are designed and used by designers as well as learners. Both designers and learners have to embrace the opportunities of (open) online courses, namely, their potential for equity and collaborative development and learning. In the best approach, through their learning objectives, design, and tasks, OER and MOOCs demand collaborative and networked learning that would directly facilitate DLE. Here, we need an increased understanding about the driving forces and success factors behind DLE in complex and longitudinal research studies. We hope that the coming years can provide such experiences and research results to continuously improve online courses and DLE and the understanding of both.

In summary, digital education and online courses have started to dramatically change learning (especially formal learning), which is an accidental consequence of the COVID-19 pandemic. This chapter provides the first insights into their

dimensions and introduces the TOC framework. OER and MOOCs are strong candidates for the broad implementation of digital education and particularly DLE as they require and support equity and collaborative learning ecosystems—MOOCs aiming to open education to all.

For future research, it would be beneficial to conduct a systematic literature review of the typologies of online courses with a special focus on the characteristics of open online courses and their potential contributions to improving online learning for all. We need additional insights into successful, effective, and efficient online courses and digital learning in general. Further, we believe that open learning and education can strongly contribute to such digital learning and facilitate (open and online) education for all as one of the sustainable development goals (United Nations, 2015).

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