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A delphi study

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Development of a Maturity Model for Blended Education: A Delphi Study

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Keywords

Maturity model, blended learning, blended teaching, blended education, EMM, higher education

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In order to embed blended learning environments in a strategic and sustainable manner, a multi-actor, multidimensional approach is necessary. This paper reports the results of a 3-round Delphi study involving 28 experts which focuses on the refinement and validation of a layered maturity model that assesses key aspects of blended practices in higher education. The study examines the wording of the proposed assumptions, dimensions and indicators, whether they bear validity and if there are others that are not accounted for. We present the findings of each round, the confirmed maturity model and a series of recommendations for its future usage. As such, it is helpful for lecturers, program coordinators, support services or institutional leaders to decide upon follow-up actions and to achieve up-scaled blended programs and courses in higher education institutions.

Keywords: maturity model; blended teaching; blended education; Delphi study

Introduction

Those investigating or developing blended courses and programs in higher education (HE) need an evidence-based framework which allows them to conceive studies, to develop instruments, to map practices or to initiate planned changes. Previous studies have presented models and principles in order to tackle design and implementation issues of blended learning environments (BLEs) in different educational settings (e.g. Lai, Lam, & Lim, 2016; Van Laer & Elen, 2018). In the field of quality assurance (QA) of online and blended learning, a series of benchmarking instruments are available to different actors in higher education (HE): an institution (e.g. Ubachs, 2009; Marshall, 2012), a program coordinator (e.g. Online Learning Consortium, n.d.) or a lecturer (e.g. McGee & Reis, 2012).

In practice, successful embedding BLEs demands a holistic approach with collaborative leadership and concerted actions. Prevalent in this regard is the (sustainable) equilibrium between outcomes at the course and program level, the instructional strategies and roles of faculty and learners (Garrison & Vaughan, 2013; Mozellius & Hettiarachchi, 2017; Owston, 2013). For the purpose of guiding institutions to better understand and demarcate their practices, as well as to identify opportunities for growth, maturity models are created. Previous

developments include Graham, Woodfield and Harrison's blended learning adoption framework (2012), the Online Course Design Maturity Model (Neuhauser, 2004) and the Maturity Assessment Framework for Open Distance E-Learning (Nsamba, 2019). However, none of these frameworks focus on BLEs specifically, nor include multiple actors or levels of analysis.

Objectives of the study

In this study we aim to create a maturity model for blended teaching and education in HE. It is part of an ongoing Erasmus+ project which was launched in 2017 by six higher education institutions (HEIs) located throughout Europe (cf. <https://embed.eadtu.eu/>). Two research objectives are set forward: (1) to identify valid dimensions and indicators that determine the maturity of blended teaching and education in HE (RO1); and (2) to develop and validate a multilevel maturity model of blended teaching and education in HE (RO2).

The initial maturity model results from desk research that integrates frameworks, models and studies that are considered suitable for analyzing BLEs at the course, program and institutional level in a HE context (RO1). In line with the model, detailed descriptions of blended practices per maturity level are developed. Subsequently, a 3-round Delphi study is set up in order to obtain feedback from experts and to integrate their reviews in a refined version of the initial model (RO2).

1. The initial maturity model

Assumptions

The European Maturity Model or EMM is conceptualized as a multilevel model, consisting of three action levels with different (teams of) key actors: course, program and institution. The first level refers to the core of the educational system, which is involved with the design, development and evaluation of courses. Its stakeholders are instructors and students, eventually instructional designers learning or content developers. At the program level the deans, vice deans, program coordinators and others are engaged with the design and development of program, i.e. a structured series of courses. Among others, the academic leaders

and heads of teaching and learning centers are in charge of decision making processes situated at the institutional level (Authors, 2019).

The EMM is further conceptualized as a ‘staged’ maturity model which assesses systematically capabilities and growth based on predefined dimensions and categories. A more advanced level of practice is reached once capability is demonstrated in a previous, more basic phase. In this regard, the model is comparable to previous publications in other research domains (e.g., Al Mughrabi & Jaeger, 2018; Chen, Preston, & Xia, 2010; Friedrich, 2017; Penicina, 2011; Thong, Yusmadi, Rusli, & Nor Hayati, 2012).

Finally, the EMM assumes that a higher level of maturity indicates a more holistic approach, informed by evidence and framed by mechanisms for continuous quality improvement (CQI). Maturity at the institutional level is deemed to be the result of change processes, as well as deliberate interventions in implementation conditions or policy areas. Therefore, ‘maturity’ relates to the degree of formality, alignment and optimization of design and decision making processes in the initiation, uptake or diffusion phase of blended practices in a HEI. A higher level of maturity is enacted by: (1) a data-driven and comprehensively documented educational mission about blended education, teaching and learning; (2) a vertical (between programs) and horizontal alignment (between programs and courses); (3) a university-wide structure and support for blended teaching and learning; (4) an articulated CQI cycle which involve key actors of the HEI. At the course level a higher level of maturity is reached when an individual or a team has designed blended courses which proved to lead to equivalent or better intended learning outcomes. Such designs are articulated as principles or patterns (e.g., Makri & Kynigos 2014; Van Laer & Elen, 2018), model-driven and/or theory-based (e.g. Laster, 2010; Vaughan, 2010). Prominent CQI mechanisms for blended practices may include design-based research for studying designs and outcomes in a systematic manner or the onset of learning analytics for online activity measurements of participation, progress, tailored interventions or feedback. Therefore it is plausible that a high-quality practice never achieves a higher-level maturity level due to a lack of the above described design-driven approach or CQI mechanisms.

Literature review

Course level

Any blended course requires a deliberate consideration of its instructional design. It is deemed characteristic to more mature approaches that their designs are the outcome of a structured and rational (selection) process, while being continuously improved by evidence from literature or past experiences. This involves monitoring and assessing effectiveness, as well as adapting a course design if necessary. By means of study load measurements, for example, course designers may receive crucial feedback on the extent to which their choices have affected students' experiences in terms of work load (Chen, Vorvoreanu, & Madhyan, 2014; Margolis, Porter, & Pitterle, 2017; Smyth, Houghton, Cooney, & Casey, 2012; Welker & Berardino, 2005).

Learning activities are selected to achieve particular course objectives of the course and curriculum, taking into account the learners' characteristics. The sequencing and proportion of online and offline learning activities in a blended course are rooted in a particular view on how to prompt and support learning, inspired by an educational theory, instructional design model or pedagogical principles (Adams, 2013; El-Mowafy, Kuhn, & Snow, 2013; Author & Fairchild, 2016). Accordingly, to scaffold effectively a blended course the selection of media and tools considers the 'cost' and 'affordances' of media and technological requirements of the context. Some literature discusses systematic approaches in this regard (e.g. Hirumi, Bradford, & Rutherford, 2011; Kerres & De Witt, 2003; Picciano, 2006; Yelon, 2006).

A prominent rationale for combining online and face-to-face instruction is the flexibility for learners (e.g. Chen et al. 2014; Bergamin, Ziska and Groner 2010). It implies that learners have to some or more extent control over time, place, and the order and mode of the learning activities and/or contents. A potential drawback of flexibility is that social interactions become different, which may lead to a 'transactional distance' in the online part of a BLE (Stein, Wanstreet, Calvin, Overtoom, & Wheaton, 2005). Therefore, online interactivity (instructor-learner, learner-learner, learner-content) and learning community building are both key to

student success in blended courses (Miyazoe & Anderson, 2010; Park, Perry, & Edwards, 2011; Vaughan, Cleveland-Innes, & Garrison, 2013). Besides, students' self-regulation competences have been identified as determinant of their persistence and retention in online and blended learning environments (Kim, Olfman, Ryan, & Eryilmaz, 2014). These encompass metacognition, planning, monitoring, evaluation and adjusting one's progress, as well as motivation to learn (Panadero, 2017). Van Laer and Elen (2018), for example, found blended learning to improve when students' self-regulation is facilitated by design. Even so, inclusive course designs ensure that a diversity of learners are accommodated (Douglas, Chapin, & Nolan, 2016), for example by integrating Universal Design for Learning principles (Tobin & Behling, 2018).

Program level

The design of a program takes shape at a different level of decision making and at a different point in time than is the case for the instructional design of a course. In line with Falconer and Littlejohn's view (2007), program design for blended learning is defined as 'the organization, planning and documentation of a structured series of blended courses or units'. A coherent program design links the overall educational aims and main features of a program to the actual blended learning opportunities provided to students. Learning program designs further anticipate (adapted from Porter, Graham, Spring, & Welch, 2014):

1. the instructional approach (based on agreed learning principles and purposes);
2. the support of learners, prior, during or after learning activities by means of learning communities and/or the onset of a learning management system (LMS);
3. the scheduling flexibility, program duration and modularization (in line with learners' demands for personalized trajectories);
4. the evaluation: the program's position in relation to external reference points (benchmarks, qualifications frameworks, requirements of professional and statutory bodies and employers).

Accurate program design considerations and continuous quality improvement of the aforementioned characterize mature practices. They improve outcomes at the course and program level, and are beneficial by virtue of: (1) accurate calculations of costs in terms of time, resources, learner and educator effort; (2) management of learner expectations and streamlined didactical methods and delivery formats; and (3) transparency of practices for learners, scholars and instructional designers.

Blended programs allowing for self-regulated learning (SRL) are built upon flexible, learner-centered trajectories (Steffens & Underwood, 2008) or are organized in modules (Chang, 2005). Adequate program coordination involves establishing a feasible course flow and spread of assignments throughout a semester (Chmiel, Shaha, & Schneider, 2017; Margolis et al., 2017). Appropriate selection of interaction types, means, control schemes, environments or tools will eventually increase program accessibility (Galvis, 2018). Niemiec and Otte (2010), Toth, Foulger and Amrein-Beardsley (2008) point out that allowing learners to choose about the *what*, *when* and *how* of learning and assessment, i.e. the sequencing or scheduling depending on their private and professional circumstances, is beneficial to persistence.

HEIs can save considerable resources by using a uniform, multifunctional LMS (Lothridge, Fox, & Fynan, 2013) or by reusing courses and tools over a period of years (Maloney, Nicklen, Rivers, Foo, Ooi, Reeves, Walsh, & Ilic, 2015). They allow for immediate feedback and automated actions for early warning and reporting, which is beneficial to learners' self-regulation and persistence (Daradoumis, Juan, Lera-López, & Faulin, 2010; Paechter, Maier, & Macher, 2010). Additional to the usage of a LMS and its tools, the deployment and appropriation of open educational resources (OER) and massive open online courses (MOOCs) have been endorsed as a cost-effective approach to program development. The '5R concept' of Wiley and Hilton (2018), for example, enables course and program designers to reuse, adapt, incorporate and publish course materials. These may become learning units made available to a lifelong learning population outside a formal program or institution (Band et al. 2016).

An inclusive approach signifies that HEIs establish pedagogical and technical conditions that consider the demands of students with varied (cultural) backgrounds and special

needs (Peck, Bouilheres, Brown, & Witney, 2018; Stentiford & Koutsouris, 2020). Instead of attributing such responsibility solely to individual lecturers, program-wide initiatives and coordination may reinforce inclusiveness across courses, hence, guarantee accessibility to different types of students. Such rollout may include student guidance documentation, general principles for inclusive design, specific technology testing and assessment of tools for accessibility, professional development and support (Pearson, Lister, McPherson, Gallen, Davies, Colwell, ... Collins, 2019).

Institution level

As extensively described by Porter et al. (2014), a mature implementation depends upon ‘well-established BL strategies, structure, and support that are integral to university operations’ (p. 186). A strategically strong approach ensures that policies, rules, regulations, action plans and guidelines related to blended teaching and learning are embedded in the standard governance structure of the institution. BE is strengthened by a shared vision on the actual and future purpose(s) of blended courses and programs, as well as by a close fit with the organizational culture, teaching and learning facilities and infrastructure. If governance is restricted to *ad hoc* decision making, practices will remain predominately limited to individual faculty exploring blended teaching techniques.

On a further note, an elicited strategy and supportive policy regarding OER sustained by a culture of sharing at the HEI may be beneficial for enrollment numbers and international recognition, while improving cost-efficiency (Jansen, Schuwer, Teixeira, & Aydin, 2015). HEIs need to formalize such commitment in their educational vision and mission (Dos Santos & Punie, 2019). In this regard, HEI staff and students’ needs and feedback are to be integrated for decision making and further developments. Firm institutional governance implies that faculty are provided with standardized models for blended courses and programs are provided, while given opportunities for guided professional development – they need to acquire competences and instructional methods unique to blended teaching (Korr, Derwim, Greene, & Sokoloff, 2012; Owens, 2012). Financial support, project funding, incentives or other rewarding

initiatives incite academic lecturers and course designers to initiate projects, do pilots, to hire staff, and so forth (Graham et al., 2012; Oh & Park, 2009).

Dimensions, indicators and maturity measures

The initial model consisted of sixteen dimensions, 10 sub dimensions and 66 indicators along three maturity levels, considered crucial for discerning maturity of course and program practices, next to institutional conditions. The maturity levels move from level 1 to level 3, labeled in different ways, in accordance with the label of the (sub) dimension. Each level is built up on the prior one, each level is characterized by a set of common aspects deemed to indicate maturity of courses, programs or institutional conditions. A higher level of maturity does not equal per se a practice of better quality, but as being 'more comprehensive' (see Assumptions).

The maturity measures for the initial model were deducted from literature as previously described and two prior, independent expert reviews. The first was organized during an international conference in December 2018 where an international expert panel generated feedback on the interim model. The input led to an enhanced version of the EMM which was again assessed mid-January 2019. In this pre-Delphi study, participants were first presented the model's assumptions. Using an open-ended question, the experts could note their remarks. Next, participants were asked to indicate on a 4-point Likert scale from 'strongly disagree' to 'strongly agree' to what extent they agreed with the inclusion of the dimension(s) and their description. Afterwards, a text field allowed respondents to elaborate their answers. Two more open-ended questions finalized the pre-Delphi survey: 'Are there any dimensions or topics missing at the course and program level?', and 'Do you have any other remarks regarding the course and program level?'. On the basis of the pre-Delphi results the model was adjusted, and some items of the questionnaire and the answer categories were altered for Delphi round 1. Furthermore, 8-point Likert scale questions were introduced for assessing: (1) the importance of the (sub)dimensions in the model; (2) the validity of the (sub)dimension for assessing practices; and (3) the validity of the indicators for discerning maturity levels.

The expert review

Method

This study employs the Delphi approach, a method often applied in (para)medical research (e.g. Keeney, Hasson, & McKenna 2006). It allows us to collect and interpret a collective point of view of expert-participants from geographically dispersed regions who are not selected randomly in order to generate empirical validation. It is selected and considered the most suited method due to its distinct characteristics: anonymity, iterated approach, controlled feedback and statistical group response (von der Gracht, 2012). In the educational technology field, the Delphi technique was previously applied in to identify and rank critical success factors for e-learning (e.g. Bhuasiri, Xaymoungkhoun, Zo, Rho, & Ciganek, 2012), to identify and predict the roles of blended learning approaches in computer-supported collaborative learning environments (So & Bonk, 2010) or to develop a QA model for blended adult education (Blicck, Ooghe, Zhu, Depryck, Struyven, Pynoo, & Van Laer, 2019). In this study, the model is validated following the particular guidelines of Jünger, Payne, Brine, Radbruch and Brearley (2017).

This Delphi study is consensus-oriented (von der Gracht, 2012; Hsu & Sandford, 2007). More specifically, it focuses on reaching consensus about:

- the completeness of the EMM: the degree to which the model accounts for all crucial dimensions, indicators and maturity measures;
- the wording of each of the EMM components;
- the validity of the EMM: the appropriateness of its (sub)dimensions and indicators, as well as of its assumptions, definitions and demarcations.

A priori, consensus in reference to each proposed model component (assumption, definition, (sub)dimension and indicator) is defined as follows: at least 75% of the experts (strongly) agree (score 5, 6 or 7 on a Likert scale from 0 to 7). This is an appropriate cutoff point for agreement or disagreement when selecting indicators (Boulkedid, Abdoul, Loustau,

Sibony, & Alberti, 2011). The model components that do not reach consensus, are revised and altered based on the free comments of the expert participants. These are collected by means of open-ended questions after each cluster of Likert-scale questions, in order to lower potential bias (Bhuasiri et al., 2012). The responses are tabulated, synthesized and independently interpreted by two researchers. All disagreements are discussed in follow-up rounds until consensus is achieved. New or altered dimensions and indicators are reported back to the experts, in line with Jünger and others (2017). The reporting between the different Delphi rounds is further guided by the indications of Hasson and colleagues (2000).

Participants

A purposive sampling method was applied to compose a heterogeneous international panel of experts. These were selected on the basis of their current job, their position and years of experience in the field of blended teaching and education. Each of the six partners of the Erasmus+ project suggested a number of experts, which resulted in a pool of 40 recognized experts from different countries. They were invited individually by email, and an initial response rate of 82% was achieved (pre-Delphi). Subsequently, response rates of 55% (round 1), 52.5% (round 2) and 47.5% (round 3) were attained. The experts were informed prior to their participation in the study and they all gave their consent. They could withdraw from the study at any given moment. Their coordinates are kept confidential, the results and feedback are anonymized. Not all experts participated in each round. An overview of response and participation rates are listed in Table 1. In total 28 experts from eight different European countries (Belgium, Denmark, Finland, Greece, Italy, the Netherlands, United Kingdom), Ukraine and the US participated in this Delphi study. Table 2 presents their demographic profile.

Table 1. Number and percentage of participating experts, per round and overall

Participation of experts	N	%
Round*		
1	22	55.0
2	21	52.5
3	19	47.5
Number of rounds experts participated		
1 round	7	25.0
2 rounds	8	28.6
3 rounds	13	46.4
Total	28	100

Note. * For each round 40 experts were invited

Table 2. Demographics of the Delphi study participants

Demographic Item	N	%
Country of Residence		
Belgium	5	18
Denmark	3	11
Finland	1	4
Greece	1	4
Italy	1	4
Netherlands	10	36
Ukraine	1	4
United Kingdom	3	11
USA	1	4
Unknown	2	7

Institution		
University	17	61
University of applied sciences	5	18
Other	3	14
Unknown	2	7
Professional position		
Director	1	4
Educational advisor	8	29
Management	7	25
Policy officer	2	7
Researcher	4	14
Teacher	4	14
Unknow	2	7
Years of experience		
0-4	1	4
5-9	5	18
10-14	5	18
15-19	4	14
20-24	9	32
25+	2	7
Unknown	2	7

Instrument, materials and procedure

The full study was launched in March 2019 and ended in July of the same year. The researchers asked the panel of experts to review each component and their specifications by means of a web-based survey, created using Qualtrics software. Such e-Delphi study was

preferred over a traditional approach because of its reported advantages concerning data collection, communication with and feedback to the expert panel (Gill et al. 2013). The completion times of the different rounds were: 60' (round 1), 60' (round 2) and 10' (round 3).

Two questions in the introductory section of the survey focused on the assumptions of the EMM: 'To what extent are the preliminaries important for a correct mapping of BL practices, conditions, strategies and policies?' and 'To what extent are the preliminaries appropriate?'. In order to assess these, participants were asked to indicate their position on a Likert scale from 'not important' or 'not appropriate' (coded as '0') to 'very important' or 'very appropriate' (coded as '7'). Afterwards, a text field allowed respondents to elaborate their answers. This process was repeated throughout the Delphi rounds in order to validate each of the model components at the course, program and institutional level.

The expert feedback was analysed statistically using Microsoft Excel and incorporated after each round (between round 1 and 2, between round 2 and 3). Two researchers analysed the qualitative feedback from participants. If necessary, an assumption, a dimension, an indicator or a maturity level was rephrased or relabeled. To this end, like Hannes, Heyvaert, Slegers, Vandenbrande, and Van Nuland (2015), we applied an adaptation strategy, 'rephrasing particular statements for clarity due to the complexity of understanding, the use of jargon, multiple layers of meaning in one statement, or style issues' (4). The results gave impetus to shape the questionnaire in the subsequent round.

Prior to each round a team of 4 researchers made judgments about the retained model components, and reviewed all sections of the web survey. A short report with the results of the previous round(s) introduced each follow-up questionnaire. It contained the previous operationalization and corresponding expert comments, anonymized details about participants' views and simple statistical analyses. Both convergent and divergent views are reported. This allowed participants to review possible interesting views, besides knowing the majority's opinions.

Adaptations

The outcomes of each round led to different adaptations. Table 3 shows more details regarding the Delphi process followed in order to obtain the final version of the model. We list per round all included, excluded and altered components of the EMM.

Delphi Round 1

After round 1 (between 11th and 27th March 2019), sufficient levels of agreement were obtained regarding the importance and appropriateness of the preliminaries. Furthermore, the following (sub)dimensions are accepted: selection of blended learning activities and their sequence, selection of blended learning tools, course interaction, student learning (both at course and program level), coherence and study load (both at program level). At the institutional level, support, strategy, professional development, finances and quality assurance were immediately included in the final model.

On the contrary, due to a lack of agreement regarding their validity, course flexibility, study load, inclusiveness (at course and program level), alignment, design, flexibility and reusability (all at program level) were adapted. By mistake, ‘facilities’ was not incorporated in the first survey, so added for the next Delphi round. Based on the qualitative expert feedback, new descriptions, additional examples, new labels for one or more maturity levels and/or new indicators were proposed for the following round (see Table 3).

Delphi Round 2

For round 2 (between 16th May and 5th June 2019), nine dimensions and four sub dimensions were presented anew to the experts: flexibility and experience (course level), design, flexibility, modularity and experience (program level), sharing and openness, governance and facilities (institution level). Of these, consensus was achieved during the second round for all (sub) dimensions, except for two, namely program reusability and inclusiveness (see Table 3).

Delphi Round 3

In the final round (between 2nd and 20th July 2019), two out of nineteen proposed model components at the program level required further consultation of the experts: 'modularity' and 'program experience: inclusiveness'.

In the previous two rounds, no consensus was reached regarding the importance nor the validity of the dimension 'program modularity'. Therefore, the experts were asked in round 3 to consider whether this dimension should be included in the EMM (or not). Also, they could opt for one out of three descriptions: (1) a new definition, (2) definition from round 2, (3) definition from round 1. Due to a sustained lack of consensus - only 55% of the experts agreed it should be incorporated - 'program modularity' was omitted from the final version of the EMM.

In the first round, there was sufficient agreement (0.83) among the experts regarding the importance of the sub dimension 'program inclusiveness'. In the second round, consensus was found regarding the validity of its indicators to discern maturity levels (0.80). However, reconsideration of its description was necessary.

Table 3. The Process of the Delphi Study - included, excluded and altered model components

	Model components – dimensions (numbered) and sub dimensions (italic)	Adaptations for the next Delphi round
Round 1	<ol style="list-style-type: none"> 1. Course design process <ul style="list-style-type: none"> <i>Selection of blended learning activities and their sequence (A)</i> <i>Selection of blended learning tools (A)</i> 2. Course flexibility (N) 3. Course interaction (A) 4. Course experience <ul style="list-style-type: none"> <i>Student learning (A)</i> <i>Study load (N)</i> <i>Inclusiveness (N)</i> 5. Program design process <ul style="list-style-type: none"> <i>Program coherence (A)</i> <i>Alignment of blended learning tools (N)</i> 6. Program flexibility (N) 7. Program reusability (N) 8. Program experience <ul style="list-style-type: none"> <i>Student learning (A)</i> <i>Study load (A)</i> <i>Inclusiveness (N)</i> 9. Institutional support (A) 10. Institutional strategy (A) 11. Sharing and communities (N) 12. Professional development (A) 	<ul style="list-style-type: none"> • Course flexibility: new description of the dimension (examples of flexibility where added), new label for maturity level 1 (inflexible > no flexibility), new indicators • Course experience – study load: new indicators (more elaborated) • Course experience – inclusiveness: new description of the sub dimension (more elaborated), new indicators. • Program design – alignment of blended learning tools: new description of the sub dimension, new indicators (more emphasis on alignment of tools) • Program flexibility: new description of the dimension (examples of flexibility where added), new label for maturity level 1 (inflexible > no flexibility), new indicators (more emphasis on deliberate choices) • Program reusability: new name (Program modularity), new description of the dimension, new labels for all 3 maturity levels, new indicators • Program experience - inclusiveness: new description of the sub dimension, new indicators (more elaborated) • Sharing and communities: new name (Sharing and openness), new indicator for maturity level 3 (removal of the description for policy for sharing and openness). • Governance – new description of the dimension, new indicators for all 3 maturity levels

	13. Quality assurance (A) 14. Governance (N) 15. Finances (A)	<ul style="list-style-type: none"> Facilities – this dimension was not incorporated in round 1, so added in round 2
Round 2	2. Course flexibility (A) 4. Course experience <i>Study load (A)</i> <i>Inclusiveness (A)</i> 5. Program design process <i>Alignment of blended learning tools (A)</i> 6. Program flexibility (A) 7. Program modularity (N) 8. Program experience <i>Inclusiveness (N)</i> 11. Sharing and openness (A) 14. Governance (A) 16. Facilities (A)	<ul style="list-style-type: none"> Program modularity - new assessment, regarding (1) inclusion in the model (yes/no question) and (2) description of the dimension (choice between three versions) Program inclusiveness - new assessment regarding description of the sub dimension (choice between three versions)
Round 3	7. Program modularity (E) 8. Program experience <i>Inclusiveness (A)</i>	

Note. (A) = accepted in the corresponding round, (N) = included in the next round, (E) = excluded from the maturity model.

Table 4. The Process of the Delphi Study – Uptake of (sub) dimensions and indicators

		Level of agreement		
	Uptake in model	Importance (sub)dimension	Validity (sub)dimension	Validity indicator for maturity
Course level				
Course design process				
Selection of activities and sequencing	Round 1	1.00	0.89	0.83
Selection of tools	Round 1	0.83	0.78	0.78
Course flexibility	Round 2	0.85	0.85	0.85
Course interaction	Round 1	0.89	0.89	0.94
Course experience				
Student learning	Round 1	0.89	0.89	0.78
Study load	Round 2	0.89	0.83	0.85
Inclusiveness	Round 2	0.79	0.80	0.85
Program level				
Program design principles				
Coherence	Round 1	0.94	0.89	0.94
Alignment of tools	Round 2	0.89	0.95	0,85
Program flexibility	Round 2	0.80	0.80	0,80

Program modularity	Excluded	0.60	0.55	0.55
Program experience				
Student learning	Round 1	0.94	0.79	0.78
Study load	Round 1	0.83	0.78	0.78
Inclusiveness	Round 3	0.83	0.80	0.80
Institution level				
Institutional support	Round 1	0.89	0.89	0.78
Institutional strategy	Round 1	0.89	0.83	0.89
Sharing and openness	Round 2	0.83	0.80	0.80
Professional development	Round 1	0.89	0.89	0.78
Quality assurance	Round 1	0.89	0.89	0.89
Governance	Round 2	0.83	0.95	0.90
Finances	Round 1	0.89	0.78	0.83
Facilities	Round 2	1.00	0.95	0.95

In round 3, therefore, ‘program inclusiveness’ was re-conceptualized on the basis of the expert comments, and once again presented to the experts as a list of three options, consisting of the initial, the first and second revised definition. They were asked to select their preferred specification. The new definition of ‘program experience: inclusiveness’ was accepted by a sufficient number of experts to be included in the final version of the EMM (see Table 3).

The confirmed maturity model

After three Delphi study rounds, the participants agreed (average consensus = 0.9) on three action levels (course, program and institution), 21 dimensions and 63 indicators (Table 4).

The final result shows how the maturity of blended courses, programs and institutional conditions may be assessed on the basis of a multilevel, multidimensional model. The related definitions and demarcations are presented in Table 5 in appendix.

Conclusion and recommendations

The outcomes of this study provide directions for improving measurement and understanding of blended practices, and aims to guide practitioners, scholars and decision makers. The initial maturity model was based on literature and has been modified and validated via the Delphi method by experts, yet its sustainability is to be proven by its future use in HE contexts. In order to facilitate the application of the model, the research team has prepared materials for a workshop. These allow HEIs to assess current practices, and design and implement more mature blended practices.

For this study’s main objective, the Delphi method has proven to be an effective way to gain and to measure group consensus among international experts in the field of blended learning, not only in (para)medical research (Holey, Feeley, Dixon, & Whittaker, 2007). The research team received in a limited time span dedicated and critical feedback regarding all proposed maturity model components. Nevertheless, as with any methodology, the Delphi approach is subject to potential bias due to the sampling technique and limited sample size, or the questionnaire design. Future studies could opt for other participatory (Delphi) methods, in order to further close the ‘gap’ between practice and research (Kezar & Maxey, 2016).

During the model development process and conversations with the stakeholders that the model adds to our understanding. In contrast to existing frameworks, the EMM connects the different action levels and focuses on maturity as a result of a design process view, rather than merely assessing quality by ticking boxes. The EMM is also considered as being an easy-to-use instrument that facilitates discussions within a HEI. By means of the model the stakeholders can share experiences and assess the maturity of current blended learning practices. Moreover, they are equipped to advance and transform blended practices within a holistic approach.

The research team has developed implementation guidelines and will continue to present analyses of users' experiences with the EMM. These will be disseminated in diverse ways, both locally and internationally. The past and scheduled activities include: multi-day international training, multiplier events, webinars, workshops, presentations at international conferences and 'Making Blended Learning Work', a self-paced cMOOC. Last mentioned intends to professionalize staff of HEIs by immersing them in scholarly debates and by sharing practices and experiences.

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Appendix

Table 5. Final version of the EMM – Agreed (sub) dimensions, their definitions and levels of maturity

(Sub) dimension and definition	Maturity level 1	Maturity level 2	Maturity level 3
Course design process: The process of planning, designing, developing and evaluating a blended learning course.			
Selection of blended learning activities and their sequencing: The rationale for the deliberate selection and integration of face-to-face and online learning activities.	Explorative: No deliberate selection and integration of face-to-face and online learning activities.	Design-based: Learning activities (both face-to-face and online) are deliberately selected, integrated, and sequenced based on a design method or design principles	Course cycle: Learning activities (both face-to-face and online) are deliberately selected, integrated, and sequenced based on a design method or design principles. Quality assurance processes are deliberately embedded in order to continuously improve a course in an iterative manner
Selection of blended learning tools: The rationale for selecting tools for the delivery and organisation of blended learning activities.	Tool based: The selection of particular tools is based on their availability at the institution.	Design based: The selection of particular tools is based on learning activities, informed by	Course cycle: The selection of particular tools is based on learning activities, informed by evidence or experience. This

		evidence or experience.	process is monitored, evaluated and changed based on quantitative and qualitative data.
<p>Course flexibility: Opportunities for learners to adjust particular features of the blended learning course, based on their needs and preferences. This includes features such as the selection of learning activities, the selection of resources, the mode of delivery (online/face-to-face activities), pace (educator-paced/self-paced).</p>	<p>No flexibility: No deliberate course flexibility.</p>	<p>Flexible: The course's flexibility is deliberately designed. Its design is based on evidence or experience.</p>	<p>Adaptive flexible: The course's flexibility is deliberately designed. Its design is based on evidence or experience. Continuous quality improvement is deliberately embedded in order to enhance course flexibility.</p>
<p>Course experience: The extent to which a course enhances students' learning and eliminates any obstacles that stand in the way of learning.</p>			
<p>Student learning: The use of blended course features which facilitate students' self-regulated learning (orienting and planning, monitoring, adjusting and evaluating).</p>	<p>Standard: No deliberate consideration for student learning.</p>	<p>Advanced: Blended course features are used in order to facilitate student learning, informed by evidence or</p>	<p>Comprehensive: Blended course features are used in order to facilitate student learning, informed by evidence or experience, and continuous quality</p>

		experience.	improvement is deliberately embedded in order to enhance student learning.
Study load: The match between the intended and achieved study load of a course (distribution and- correctness).	Standard: The calculation of the study load of a course is based on a guess.	Advanced: The study load of a course is calculated based on experience. Different course elements (e.g. online learning activities, face-to-face learning activities, exam preparations) are taken into consideration for the calculation of the study load.	Comprehensive: The study load of a course is calculated based on data and experience. All course elements (e.g. online learning activities, face-to-face learning activities, exam preparations) are taken into consideration for the calculation of the study load. The study load is monitored, evaluated and changed based on quantitative and qualitative data.
Inclusiveness: The consideration for the diverse needs (including accessibility aspects) and backgrounds of all students to create an online and face-to-face course experience where all students feel valued, safe, have a sense of belonging, and where all students have equal access to learn.	Standard: No deliberate consideration for inclusiveness.	Advanced: Initial attempts to facilitate and include the different needs and backgrounds of all learners. Special attention is paid to the social belonging and identity in the online course environment. This process is	Comprehensive: The different needs and backgrounds of all learners are included and facilitated. Students feel valued, safe, and have a feeling of belonging. The realization of inclusiveness is based on evidence or experience. Continuous quality improvement is deliberately embedded in

		informed by evidence or experience.	order to improve inclusiveness in the course.
Program design process: The rationale for the alignment and coherence of educational tools in blended learning programs.			
Program coherence: The vertical (course-program) and horizontal alignment (between courses) of a blended program.	Ad hoc: No deliberate consideration for the horizontal and vertical alignment in a blended program design.	Design-based: Deliberate consideration for the horizontal and vertical alignment in the blended program design, based on a shared vision, and a design method or principles.	Program cycle: Deliberate consideration for the horizontal and vertical alignment in the blended program design, based on a shared vision on blended learning, and a design method or principles. Continuous quality improvement is implemented in order to enhance a program in an iterative manner.
Alignment and coherence of blended learning tools: The rationale for the alignment and coherence of educational tools in blended learning programs.	Ad hoc: No deliberate alignment and coherence of tools used in a program.	Design-based: The alignment and coherence of the tools used in a program are based on learning activities in courses, coordinated by the educators in the program,	Program cycle: The alignment and coherence of the tools used in a program are based on learning activities in courses, coordinated by the educators in the program, and informed by evidence or

		and informed by evidence or experience.	experience. This process is monitored, evaluated and changed based on quantitative and qualitative data.
Program flexibility: Opportunities for learners to adapt particular features of the blended learning program. This includes features like the selection of courses/tracks, the mode of delivery (blended course, online course, traditional course), workload (full time/part time), pace (institution paced/self-paced), progress in a program, possibility to follow courses on other institutions.	No flexibility: No deliberate program flexibility.	Flexible: The flexibility in a program is deliberately designed. Learners have some opportunities to adapt particular features of the blended learning program. This process is informed by evidence or experience.	Adaptive flexible: The flexibility in a program is deliberately designed. Learners have many opportunities to adapt particular features of the blended learning program and receive advice on their options. The offering of flexibility is based on evidence or experience. Flexibility is monitored, evaluated and changed based on quantitative and qualitative data.
Program experience: The extent to which a program enhances students' learning and eliminates any obstacles that stand in the way of learning.			
Student learning: The use of blended program features which facilitate students' self-regulated	Standard: No deliberate consideration for student	Advanced: Students are guided and supported throughout the	Comprehensive: Students are guided and supported throughout the blended program

<p>learning (orienting and planning, monitoring, adjusting and evaluating).</p>	<p>learning at the program level.</p>	<p>blended program on self-regulating their learning. Students and teaching staff are made aware of the blended nature of the program, and what this means for both learning and teaching.</p>	<p>on self-regulating their learning. The blended aspect of the program is internalized in all processes for the students and teaching staff. These processes are monitored, evaluated and adjusted based on quantitative and qualitative data.</p>
<p>Study load: The match between the intended and achieved study load of a program (distribution across courses and correctness).</p>	<p>Standard: No deliberate alignment of study load between courses in a blended program.</p>	<p>Advanced: The study load, including deadlines, of a course is aligned to that of other courses in a blended program.</p>	<p>Comprehensive: The study load, including deadlines, of different courses in a blended program are aligned, monitored, evaluated and adjusted.</p>
<p>Inclusiveness: The consideration of the diverse needs and backgrounds of students in order to create a program where all students feel valued, safe, have a sense of belonging, and where all students have equal access to the online and face-to-face environments of the blended learning program.</p>	<p>Standard: No deliberate consideration for inclusiveness between courses.</p>	<p>Advanced: Initial attempts to align inclusiveness in a collection of courses. Special attention is paid to social belonging and identity in the online environment of the program. This process is informed by evidence or</p>	<p>Comprehensive: Inclusiveness is aligned in all of a program's courses. Students feel valued, safe, and have a sense of belonging. The realization of inclusiveness is based on evidence or experience. Continuous quality improvement is deliberately embedded in order to improve</p>

		experience.	inclusiveness in the program.
Institutional support: The manner in which an institution supports teachers and students' blended learning activities.	Ad hoc: Limited support for blended learning and teaching aimed at individual teaching staff and students.	Consolidated: Dedicated support for blended learning and teaching is available for all teachers, students and departments.	Strategic: Support for blended learning and teaching is part of the standard support services of the institution. Continuous quality improvement is deliberately embedded in order to improve the support for blended learning.
Institutional strategy: The extent to which blended learning, teaching and education are embedded in the vision, educational model and goals of an institution.	Ad hoc: No uniform blended learning strategy is in place.	Consolidated: A dedicated blended learning strategy is consolidated within the institution. University administrators recognize and advocate the importance of blended learning, teaching and education.	Strategic: Blended learning is an integral part of the institutional strategy. The strategy is embedded in the whole institution (throughout faculties and departments), well documented, and evaluated and adjusted on a regular basis. University administrators and departments recognize and advocate for the importance of blended learning, teaching and education.
Sharing and openness: The degree to which an	Ad hoc: Individual teachers or	Consolidated: Communities for	Strategic: Communities for sharing

<p>institution facilitates communities for sharing blended practices, materials and courses.</p>	<p>departments share 'blended' best practices with colleagues.</p>	<p>sharing 'blended' best practices are facilitated. Processes and/or platforms are in place for sharing good practices and/or materials.</p>	<p>'blended' best practices are facilitated, actively built and maintained. Processes and platforms are in place for sharing good practices and materials. Processes are in place for quality assurance of the shared materials.</p>
<p>Professional development: The extent to which teaching staff are able to develop their blended teaching skills.</p>	<p>Ad hoc: A few different workshops or courses related to blended learning and teaching are offered.</p>	<p>Consolidated: Solid efforts to organise workshops and/or courses related to blended learning and teaching are offered for the teaching staff. The blended teaching activities of staff are incidentally recognized.</p>	<p>Strategic: All teaching staff is trained in blended learning and teaching. The institution offers a well aligned portfolio of workshops and/or courses (related to blended learning and teaching) for the continuous professional development of their staff. The blended teaching activities of staff are recognized and valued by the institution.</p>
<p>Quality assurance: The process where blended courses, programs, strategy, rules and</p>	<p>Ad hoc: No deliberate quality assurance for blended courses,</p>	<p>Consolidated: Special processes for evaluation of blended courses,</p>	<p>Strategic: Quality assurance for blended courses is part of the standard quality</p>

<p>regulations are evaluated and revised on a regular basis.</p>	<p>programs, strategy and policies.</p>	<p>programs, strategy and policies are developed and implemented. Some research is conducted on blended courses and/or programs.</p>	<p>assurance processes of the institution. The evaluation and improvement are based on clear criteria and multiple data sources. The institution has a research agenda for researching its own courses, programs and education.</p>
<p>Governance: The way in which the vision and policies are translated to rules, regulations and actions that facilitate blended education</p>	<p>Ad hoc: Some informal policies, rules, regulations, action plans and guidelines (e.g. legal, ethical, privacy, data) related to blended learning are used in the institution. The institution does not have standardized models for blended course and program design.</p>	<p>Consolidated: Policies, rules, regulations, action plans and guidelines (e.g. legal, ethical, privacy & data) related to blended learning are developed and implemented in the institution. Some key actors in the institution are involved in the process of developing new and existing policies, rules, regulations and action plans. Models for blended</p>	<p>Strategic: Policies, rules, regulations, action plans and guidelines (e.g. legal, ethical, privacy & data) related to blended learning are embedded in the standard governance structure of the institution. The governance of the institution is systematically reviewed and adjusted. Key actors, at different levels in the institution, are involved in the process of reviewing, adjusting and developing new and existing policies, rules, regulations and action</p>

		course and program design are shared in the institution.	plans. Standardized models for blended course and program development are provided.
Finances: The extent to which financial resources are allocated to develop, support, and stimulate blended learning.	Ad hoc: No allocation of financial resources specifically for blended learning purposes.	Consolidated: Financial resources are incidentally allocated (e.g. projects, pilots) to develop, support, stimulate and improve blended learning and teaching. The allocation of the resources is evaluated.	Strategic: Financial resources are structurally allocated to develop, support, stimulate and improve blended learning, teaching and blended education. The allocation of the resources is systematically evaluated and adjusted, based on clear criteria and qualitative and quantitative data.
Facilities: The extent to which institutions are equipped to facilitate blended learning and teaching.	Ad hoc: Limited availability of blended learning and teaching facilities.	Consolidated: A wide variety of facilities is available. This includes both digital (e.g. digital learning environment, educational tools) and physical (e.g. video	Strategic: A wide variety of facilities is available. This includes both digital (e.g. digital learning environment, educational tools) and physical (e.g. the availability of different classroom set-ups, video

		<p>recording studios, the availability of different classroom set-ups) facilities.</p>	<p>recording studios) facilities. Teachers have influence on the scheduling of the facilities. The development of facilities is aligned with the institutional strategy. The quality, quantity and assortment of facilities is systematically evaluated and adjusted, based on clear criteria and multiple data sources.</p>
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