CALCULATION, VERIFICATION AND ASSESSMENT OF LEARNING OUTCOMES AND WORKLOAD IN DIGITAL ENVIRONMENTS

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OEPASS

Authors

Sood, Ira; Tátrai, Ferenc

Contributors

Ehrenreich, Jochen; Katonal, Dóra; Mázár, Ildikó; Read, Timothy; Szűcs, András; Wiechmann, Svenja

Editors

Sood, Ira; Tátrai, Ferenc

Layout

Tara Drev

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Abbreviations

EAR	European Area of Recognition Project
ECTS	European Credit Transfer System
ECVET	European credit system for vocational education and training
ENIC	European Network of Information Centres in the European Region
ENQA	European Association for Quality Assurance in Higher Education
EQF	European Qualification Framework
ESG	European Standards and Guidelines
GDPR	General Data Protection Regulation
HEI	Higher Education Institution
LM	Learning Management
MOOC	Massive Open Online Course
NARIC	National Academic Recognition Information Centres in the European Union
OEPass	Open Education Passport, Erasmus+ project
OER	Open Education Resources
QA	Quality Assurance

Executive Summary

To give a chance to get the digital certificate recognised by formal education institutions and to accept the learning achievement measured in ECTS (European Credit Transfer System) credits by formal education institutions several criteria should be fulfilled:

a., the fully flexible open learning should seek to comply with the European Standards and Guidelines for Quality Assurance (QA) in Higher Education including course design, delivery, assessment, certification etc. (Inamorato dos Santos, Punie, Castaño Muñoz, 2016).

b., the ECTS is only meaningful if there was a proper assessment of the learning outcomes;

c., the assessment can only be proper, if the learner identity was verified and appropriate anti-cheating methods were applied;

d., and if all the above are fulfilled, the workload in ECTS units has to be calculated properly and should be well documented.

e., If the previous assumptions are all valid, then there remains the problem of matching the learning outcomes achieved with some „modules" of the degree course provided by the Higher Education Institution (HEI) in question.

The report discusses the above subjects with an analysis of use cases of flexible open learning and recommends good practices.

Recognition of Open Education

In spite of the positive momentum that open education resources have gained, the issue of formally recognizing prior-learning that has taken place 'elsewhere' is still a major issue. The difficulties in recognition often stem from many possible sources, e.g.:

- The Open Education course is not described in terms of existing recognition instruments, such as ECTS.
- Recognition is not granted due to lack of trust in the teaching/learning methodologies used in course delivery.
- Recognition is not granted due to difficulties in integrating the content between several courses offered by different bodies.
- The applied assessment method is not commensurate with that of applied in formal education.
- The learner identification and cheating prevention is missing or unreliable.

Open education and open education resources (OERs) in general are in need of established mechanisms that aid their validation and recognition at an EU level. There are considerable issues when it comes to documenting formal/informal learning experiences for recognition purposes, especially when it comes to instruments of formal recognition such as ECTS (European Credit Transfer System). The EC's 'Rethinking Education' communication admits,

“critical elements are not in place to enable digital learning and OER to be mainstreamed across all education and training sectors”. The Erasmus+ project **OEPass** (Open Education Passport) aims at enhancing the recognition of learning experiences that do not fall within the purview of 'traditional university education'.

The project intends to:

• Increase trust in open and innovative practices, by providing valid pathways to recognition.

• Widen the scope of internationalisation and credit-mobility by fully encompassing virtual mobility experiences into Bologna-tools.

• Improve the transparency and recognition of open qualifications.

We do not discuss neither the difficulties of teaching methodologies and course delivery, nor the difficulties in integrating the content between several courses offered by different bodies in this study. The major barriers that we can discuss here, when recognizing flexible learning experiences formally, are:

- Their lack of compatibility with credit frameworks such as ECTS, that have clearly defined requirement of workload helping to standardize the quantity of work needed to achieve the learning outcomes successfully.
- Their various, uneven assessment and evaluation procedures that are not always comparable with those used in formal education in terms of rigour.
- Their manifold and not always reliable learner identification and cheating prevention systems.
- The quality assurance applied to ensure that the ECTS, awarded to acknowledge the learning outcome, be recognisable in formal education.

This report tries to evaluate the use cases collected in Output A1-A5 and suggest policy recommendations to further the application of digital credentials.

1. Workload in ECTS

One of the major barriers when recognizing flexible learning experiences formally is their lack of compatibility with credit frameworks such as ECTS. ECTS has a clearly defined requirement of workload that helps standardize the quantity of work needed to achieve the learning outcomes successfully. This chapter addresses the issue of workload calculation in flexible learning environments and how they can be mapped to ECTS for recognition purposes.

In order to apply the concept of ECTS to the Open Education context we refer to the ECTS Users' Guide (2015) and the European Standards and Guidelines (ESG 2015) as our main sources. The ECTS Users' Guide clearly defines key concepts relevant for OEPass as follows:

- "ECTS is a learner-centred system for credit accumulation and transfer, based on the principle of transparency of the learning, teaching and assessment processes. Its objective is to facilitate the planning, delivery and evaluation of study programmes and student mobility by recognising learning achievements and qualifications and periods of learning." (ECTS Users' Guide 2015, p. 10)
- Student workload in ECTS consists of the time required to complete all planned learning activities such as attending lectures, seminars, independent and private study, placements, preparation of projects, examinations, and so forth. In other words, Workload hours measure the time-on-task hours, defined as the time directly spent on the act of learning (Carroll, 1989; Berliner, 1990; Brodhagen & Gettinger, 2012; Scheerens & Hendriks, 2014).
- 60 credits measure the workload of a full-time student during one academic year. In most cases, one credit stands for 25 to 30 working hours.
- Credits in ECTS can only be obtained after the successful completion of the work required and appropriate assessment of the learning outcomes achieved. Learning outcomes are sets of competences, expressing what the student will know, understand or be able to do after completion of a process of learning, long or short.

ECTS also facilitates student and teacher mobility by providing a common currency and transparency on content and weight of course material and information on assessment methods.

1.1 Workload calculation

Current Research

Much of the actual calculation of the student workload of a course is done by guesswork, intuition or from experience of working on courses rather than in any more rational or scientific

way. Calculation of academic workload in flexible environments is a complex process due to the number of variables involved in an ecosystem that can influence such a process. In the last few years, HEIs have increasingly accepted and recognized courses finished off-campus via online content providers for ECTS purposes. In some cases, HEIs (especially in the United States) have even collaborated with online content providers to collaboratively design and plan courses or even complete degree programs. While in the US the recognition of online and flexible learning as an integral part of a university curriculum is well advanced, the transferability of the learning outcomes into ECTS still remains inconclusive in Europe. Although there are some promising initiatives: e.g., the Technical University of Munich has actively created MOOCs (Massive Open Online Course) in collaboration with EdX and Coursera since 2013. RWTH Aachen, Sorbonne in Paris and EPFL Lausanne have been collaborating with EdX since 2015.

This inconclusiveness is understandable, if we think through the entire process:

Academics that design and develop the curriculum as well as carry out the courses in practice are at the centre of quality determination when it comes to flexible learning environments. There is a heightened need for transparency when it comes to estimating and calculating workload in such an expansive ecosystem. Another important area of concern is the need to map out these learning experiences not just to ECTS but also to make them transferable to other reference framework tools such as ECVET (European Credit System for Vocational Education and Training) and the EQF (European Qualifications Framework). Compatibility with EQF makes any kind of learning readable and understandable across countries and systems, and thereby facilitate student mobility.

The guidelines further suggest that specific details about how the workload is calculated must be noted in the transcript.

Recommendations

According to the practical guidelines developed by the ENIC (European Network of Information Centres in the European Region)-NARIC (National Academic Recognition Information Centres in the European Union) network in the EAR (European Area of Recognition Project) manual (2016), flexible learning paths refers to any situation “in which the graduate has obtained a qualification in a way that is not the standard learning path followed by the mainstream student”.

1.1.1 Setting the Workload

In order to facilitate the process of recognition, it is important to provide enough information in a transparent manner to all the stakeholders involved in decision making.

When setting the workload in flexible learning, the following elements must be considered:

- The learning outcomes (and the level of learning) must be clearly specified and should correspond to the credits being offered.
- All the activities included in the course must be clearly listed and defined in advance.
- The course designers must have a clear and realistic idea about the average time that learners need to not only finish the activities involved in the course, but also consider the time needed for *self-study, self-reflection* and *self-evaluation*.
- As the ECTS system has an already defined equivalence (one credit= 25-30 hours of work), the same mechanism should be applied in order to measure flexible open learning experiences.
- The European Qualifications Framework for Lifelong Learning provides eight levels of reference to facilitate the recognition and validation of non formal and informal learning based on learning outcomes. Although a voluntary frame of reference, the EQF-LL could serve as an effective tool for National Qualification bodies to recognize the diversity in flexible learning pathways.
- Educational activities must take into consideration the **mode of instruction** (*pre-recorded lecture videos, interactive lectures, live chats, forums and discussion boards, google drive or similar collaborative tools*), the **type of assessment** (*automated quizzes, essays, peer grading, manual grading by instructor*) and the **type of activity itself** (*quizzes, learning diaries, numerical exercises, written exams, peer reviews, problem based learning*).

Setting workload can be an iterative process with each round of implementation, taking into account the feedback received from students regarding the appropriateness of the workload. Similar methods are followed in traditional learning environments by employing mandatory course feedback mechanisms. Thus, it is important to educate students about the crucial role they play in course design.

1.1.2 Monitoring and Evaluating Workload

The process of monitoring and evaluating workload once it has been set should ideally be a binary process centred around the two main participants: learners and course providers (or instructors). Consequently, it includes the following tasks:

- **Monitoring and Evaluation of Workload with Students, meaning** *Understanding workload expectations prior to the course from a learner's perspective and jointly interpreting the feedback on workload calculation after the course.*

- **Monitoring and Evaluation Workload with Course Providers, i.e.** *forming learning agreements beforehand with the partners involved in the course and workload measurement during the course.*

1.2 Use cases

All but one of the use cases refer to short courses offered by HEIs, partly as e-learning courses, partly as MOOCs. Two of the 15 cases offer solely ECTS, four others ECTS and/or digital certificates, five offer digital certificates, and six offer some form of digital badges under

different names. This demonstrates the difficulties in awarding ECTS even if the learner can receive digital certificates: the learning outcome is certified, but not related to the workload are ECTS units. Digital badges are just as popular as digital certificates, but they do not count the workload. In some cases ECTS is only awarded to domestic students, foreigners may only get digital certificates[1], showing the barriers of recognition of ECTS credits by HEIs outside the national HEI system. In one case, the digital certificate is only recognized as part of the degree course offered by the same university that provided the course.

Note, that in some of the investigated cases there is still a way to make it part of a degree programme in an indirect way: The University of Tasmania offers a MOOC with digital certificate with the opportunity to gain a formal university qualification[2]. In another case, the recognition of ECTS is bound to mutual agreement between the host and home university (virtual mobility arrangement).[3]

1.3 Conclusions

The concept of workload as applied in ECTS can be adapted to fully flexible learning experiences provided the mechanisms are regulated in a manner similar to how it takes place in traditional education. ECTS defines workload in terms of hours and learning outcomes achieved which are defined prior to the course. A similar method can be used to define the workload in flexible learning experiences as long as it can be ensured that the outcomes are achieved when assessment is performed.

[1] https://www.cs.helsinki.fi/u/ttonteri/elements/elements_objectives.pdf
[2] https://mooc.utas.edu.au/courses/understanding-dementia-2019-02, http://www.utas.edu.au/wicking/bdc
[3] http://openstudies.eu/sites/default/files/studentguides/vmu/OUVM_module_student_guide_template_INTERCEC.pdf

2. Assessment Methods

2.1 Introduction

A working group of ENQA (European Association for Quality Assurance in Higher Education) is developing a toolkit to ensure the quality of digital learning environments (Huertas, Roca, Ranne, & Gourdin, 2018) aligned with the European Standards and Guidelines (ESG).

From the eight areas covered (see chapter Quality Assurance) in their model, three focus on assessment:

- processes and resources for quality assurance of e-assessment;
- assessment of learning;
- E-assessment system security, capacity and authenticity.

Once the processes and resources for quality assurance in e-assessment are ensured, the question can be reduced to *QA of assessment of learning* and to questions of e-*assessment security, capacity and authenticity*.

2.2 Assessment of learning

Current Research

E-assessment methods are varied, facilitate pedagogical innovation and determine rigorously the level of achievement of learning outcomes. They are consistent with course activities and resources and adapt to the diversity of learners and educational models.

Good practices in the assessment of learning can be identified at online universities as they apply a diversity of assessment methods taking into account a student-centred pedagogical approach with an increased flexibility of learning design and delivery. In most universities taking part in the TeSLA project (2018)[4], diagnostic, continuous, formative and summative e-assessment methods were used. Open Universities mostly use e-assessment methods for both formative and summative assessment.

Note, that collaborative assignments are still a challenge as most of the assessable activities are designed to be performed individually. However, in all cases, chosen assessment methods should align with learning outcomes.

[4] http://tesla-project.eu/ (Accessed: 13 July 2018).

2.2.1 E-assessment system security, capacity and authenticity

The issues of trust, and particularly authentication and authorisation is critical in the context of quality assurance of micro-credentials (Chakroun, B, Keevy, J (2018). Hence the development and implementation of the e-assessment should include protective measures that guarantee learner authentication and work authorship. The e-assessment system should be secure and fit for purpose. HEIs (and formal education institutions in general) are aware of technical and security implications related to the implementation of a new e-assessment system. However, some issues and improvement possibilities can be identified about the security of e-assessment. These corrective actions will contribute to the risk analysis of the further development of a more structured approach to the security of the system. Questions of academic integrity, unethical practices, especially plagiarism should be treated appropriately. Cheating (authentication and authorship issues) should be treated by means of a defined threshold level (what is considered normal vs suspicious behaviour). A big challenge has been observed in the TeSLA project (2018) as students were not confident enough to share personal data requested by the TeSLA system for the proper functioning of the instruments. Even if an e-assessment system complies with the European GDPR (General Data Protection Regulation) regulations and national legislations on data privacy, it is important to provide students with information and guidance on how the system deals with privacy and security.

2.3 Typology of Assessment Methods

The typology draws upon course-descriptions of ongoing open learning courses at 15 different institutions as well as literature in the field, to create a list of assessment methods classified according to

(a) what they test,

(b) format of the assessment,

(c) who does the grading,

(d) work involved in designing and marking the assessment, and

(e) any special issues in applying to open learning.

2.4 Use Cases

The analysis of use cases showed, that the assessment types are varied depending on what they intend to assess.

What they test	Format of the assessment	Who does the grading	Work involved in designing and marking the assessment	Special issues in applying to open learning	Assessment method
● Quiz: Test recall ● Numerical exercises: test analytical skills ● Learning diaries: Test reflection skills ● Written exams: Test knowledge and application of knowledge to theoretical scenarios ● Peer Reviews: Test synthesizing and presentation skills ● Problem based learning: Test practical problem solving skills	● Automatic grading ● Peer grading ● Manual grading by instructor	● Automated ● Peer ● Instructor	● Grading criteria	● Recognition issues ● Compatibility with ECTS	● No Assessment ● Online assessment with ID verification ● Online Assessment without ID verification ● Onsite Assessment with ID verification

Table 1: Assessment types and features of use cases.

Quiz type assessment was the most popular (in about half of the cases), followed by instructor led and peer grading.

Note, that these features of the assessment method are sometimes interdependent: automatic grading is mostly used in multiple choice quizzes and numerical exercises, peer grading in exercises with written answers, manual grading by instructor in evaluating essays, the learning diaries and practical application assignments, self-reflection skills, essays and in exception cases to test certain skills. In most cases, different assessment methods were combined depending on the task they assessed. Although all cases stem from some kind of online learning, about 25% of them ended by onsite examination.

Recommendations

- use the assessment method most appropriate to the task they intend to assess, and combine them to assess each element of the learning outcome;
- automatic grading (machine grading) is popular because of its simplicity, but should be carefully designed. It might be less appropriate to assess creative tasks;
- assessing learning diaries, practical application assignments, essays require interference of instructor;
- all assessment should be quality assured and documented to help future recognition of the digital certificate;
- in order to ease recognition, the assessment in flexible open online learning should follow the same standards (adapted to the feature of open online learning) as the assessment in formal education.

3. Identity Verification & Cheating Prevention

Learner identification and cheating prevention are vital to ensuring the potential recognition of ECTS credits by formal education providers.

This chapter gives an overview of methods used for verifying learner identities and preventing common cheating practices in open education. The task analysed 15 ongoing open learning courses from different institutions. Additionally ten use cases were selected from the private sector (MOOC providers) to have an extended advantage point on the current trends in this area.

3.1 Identity Verification

Current Research

Online course offerings have increasingly become a common addition to traditional classroom education in HEIs either as a supplemental or as a standalone form of education (Wilson & Moore, 2004). Although technology has been one of the driving factors in enabling the adoption of flexible study options, it has been challenging to establish regulated and controlled study environments and assessment (Heberling, 2002). Standardised verification mechanisms to establish learner identity has been one of the major obstacles in preventing the large scale adoption of flexible study options (Bailie & Jortberg, 2009). Vetting of identity is usually achieved by following standardised practices as defined either by a Higher Education Institution or dictated by Federal regulations defined within a state via accreditation agencies (Termini & Hayes, 2014). However, it is also important to ensure student's right to privacy[5] under data protection regulations such as GDPR (EU's General Data Protection Regulation).

Student ID verification: Verification of identity can be in person or remote (meaning from a computer or portable device). Identification is usually accomplished by the use of credentials including: something you HAVE – a physical document/transcript/card. Something you KNOW – information only the real person should know, and something you ARE – always a biometric identifier whether physical or behavioural. A typical example is the *method of Coursera* that in the past offered a service called Signature Track wherein learners could verify their identity by taking a photo, upload a photo of a government issued ID and have their typing patterns recorded. The latter of which was done using Keystroke Dynamics.

[5] https://swgfl.org.uk/resources/gdpr-guidance-for-schools-and-colleges/part-4/

Note these credentials are used/combined differently depending on whether the identification is in person or remote. Authentication of identity is always biometric. Verification and authentication are used by most interchangeably although they are different. Authentication is not a single point in time but a continuous process. Many MOOC providers make sure that the identity verification process is regularly repeated to ensure that the credentials are being awarded to the person who has taken the test.

When we add the dimensions of time, location, and history to a biometric we achieve best practices and the highest confidence levels the person is who they say they are.

The TeSLA project (2018) developed an adaptive trust-based system for assuring e-assessment processes in online and blended learning to guaranty student authentication and to prevent cheating.

With the use of different technologies based on biometric data and documentary analysis, the TeSLA recommended system aim at providing effective proof of student identity (authentication) and authorship. The technological instruments integrated into one single service to support e-assessment are divided into three main groups depending on their functionality and specific task:

1. Biometric instruments are based on the use of mathematical and statistical techniques to guarantee the learner's authentication – in other words identity verification:

    a. Facial verification and recognition
    b. Voice recognition
    c. Keystroke dynamics

2. Cheating prevention: Document Analysis instruments use a qualitative analysis package on written material such as essays, descriptions, the outputs of learning activities, etc.:

    a. Plagiarism tools
    b. Forensic analysis (also supports authentication)

3. Security Techniques deploy a security service provided by a layer of communicating systems:

    a. Digital signature / Timestamp
    b. Anti-spoofing

3.2 Cheating Prevention

Current Research

In traditional education, evaluation or assessment is usually done based on standardized testing, which takes place in a controlled environment (Rovai, 2000; Jones et al., 2006). However, in the last decade the adoption of online assessment has been more commonly viewed as a part of institutional strategy (Allen & Seaman, 2004). In flexible learning environments, online learning and assessment become almost integral. A quick literature review reflects the role played by technology in facilitating cheating in such environments which has been referred to as e-cheating (Renard, 2000; Bracey, 2005; Goode, 2007). Additionally, use of non-technology based means has also been recorded to 'game' the system (Tippins, 2009; Cavanagh, 2014).

3.2.1 Technology based cheating (or digital cheating)

Technology based cheating employs technology in one form or another to perpetrate acts of academic dishonesty. Baker & Papp (2003) state that digital cheating can consist of:

- test takers being able to access other websites,
- test takers being able to communicate with others via instant messaging tools and email during the exam,
- test takers being able to seed test computers with answers, and
- test takers being able to bring in non-exam disks (or other data storage devices) containing solutions to the exam.

3.2.2 Non-Technology based cheating

A myriad of methods have been uncovered as means of cheating committed solely without the interference of technology. Some of these are:

Cheating based on surrogates or proxies where a person other than the test taker takes their position to take the test (Beaty et al., 2011; Lievens & Burke, 2011). The recent students' admission scandal in USA is an example of this.
Having access to questions beforehand via bribery to officials involved in creating tests, is another commonly employed tactic (Drasgow et al., 2009; Naglieri et al., 2004).

Dick et al. (2003) and Mott (2010) have suggested three ways of handling cheating prevention: pre-empting it (prior to assessment), detecting it (examining and monitoring tests), and responding to it (response after detecting cheating). Although there is no full proof method to eliminate cheating, a holistic approach towards prevention of cheating should ideally be built around three main pillars: *Methodological, Technological* and *Environmental*.

Cheating prevention based on the methodological pillar

It is essential to understand the source and motivation behind cheating. Dick et al. (2003) came up with a four-component model (Based on Rest, 1994; Passow, 2002) to analyse the intrinsic and extrinsic factors that may prompt students to cheat.

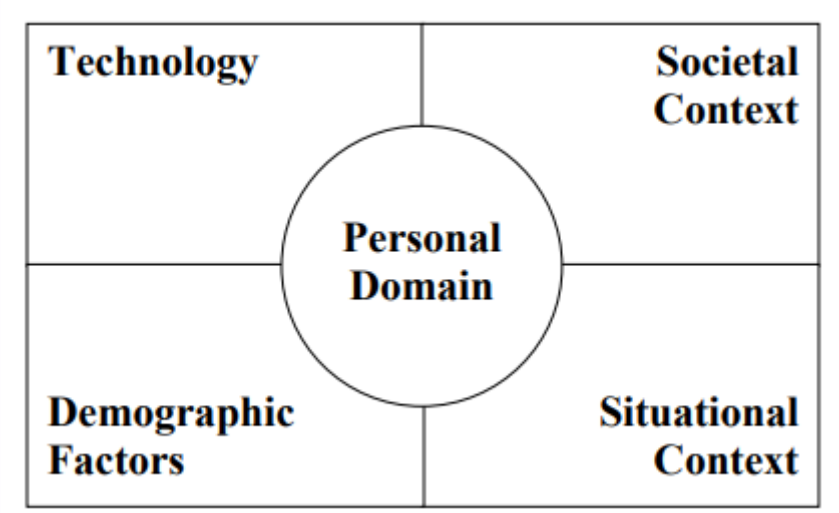

Fig 1. Model of individual student's decision to cheat based on intrinsic and extrinsic factors (Dick et al., 2003).

The personal domain refers to the intrinsic factors wherein students may end up failing moral decision making due to *sensitivity* (ability to interpret a moral situation), *judgement* (ability to differentiate between wrong and right), *motivation* (influence of internal values) or *character* (ability to resist an act of dishonesty). Four external factors namely *technology (*ease of access to information via technology*)*, *demographic* [6](age, gender, socioeconomic standing, grades, religiosity, ethnicity), *societal context* (influence of peer group, family, media) and *situational context* (immediate factor before the act of cheating such as heavy workload, inadequate teaching etc.) have been identified. They concluded that the decision to cheat is made by weighing internal values against a combination of extrinsic factors.

Define clearly for students what is 'cheating' (academic integrity) and set expectations. Students do not often realize what they are risking (e.g., suspension, blacklisting, financial damage), so present these details in a matter-of-fact way. For e.g. something like Coursera does by encouraging students to sign and abide by its 'honour code'.

Establish a culture of honesty. For example, if students become aware that classmates are getting away with cheating (e.g., using Google to look up answers during an online test), this behaviour will spread to other members of the class very quickly. A culture of dishonesty will then emerge where students feel they must cheat to be competitive. Ongoing continuous reminders throughout the course should be given to students about the consequences of cheating.

Methods surrounding the design of tests could be altered regularly to avoid patterns. For e.g. using a mix of multiple choice questions and short essay type questions or randomizing the order of questions every time. Employing case studies, which may have multiple solutions and group assignments, are also ideal.

Technology based cheating prevention

[6] Highly contested in literature due to ethical considerations.

Technological methods can be constructed using innovative techniques that prevent students from cheating during the course and in preventing identity fraud. These methods have been identified in the analysis of data collected from the HEIs and private course providers.

Online Proctoring **(Pearson VUE, SMOWL, ProctorU, Examity, Remote Proctor)**

Proctored testing at predetermined locations is one of the most commonly identified methods of conducting online assessments in a secure way (Kim et al., 2008; Kaczmarczyk, 2001).

Live proctoring employs a qualified proctor that monitors the test takers' audio and video via screen sharing in real time. It is possible to proctor up to 16/32 candidates at a time depending on the provider.

Recorded Proctoring involves recording the test taker's audio and video during the test to be evaluated later. Examity, ProctorCam (Pearson), Proctorio, Respondus, ProctorFree are some active players in this area.

Advanced Automated Proctoring uses advanced video (facial recognition) and audio analytics to detect any suspicious activity. Additional options include limiting test taker's logins only to specific IP addresses and blocking copy paste. This method does not require any human intervention. Talview and Mettl ProctorPlus are working in this space.

Another common method is used for the test taker to prove identity via webcam and using laptop/smartphone camera to capture a 360-degree view of the test taker's surroundings.

URKUND *Plagiarism Moodle plugin*

Moodle is a commonly used open source LMS (Learning Management System). Plugins such as URKUND prevent plagiarism in student assignments by integrating it within Moodle.

Using lockdown browsers

Lockdown browsers, which are integrated with existing LMS that prevent internet searches, are effective and commonly used during online assessments in open learning. ***Respondus*** is one of the majorly used lockdown browser plugin.

Adjusting the environment to prevent cheating

This pillar deals with stimulating the external environment to prevent cheating. It could be a mixture of the two pillars and can be described as the identification of the "solitude" so that independence is insured.

Firstly an "accredited" place to do the exam (Open University used British Council places all over the word to send their students to a "safe space", Pearson VUE test centres).

Secondly, a camera setting showing the learner's individual work, with noise ambiance. That should be combined methodologically with questions that are different for all students, and contain elements of contextual personal knowledge.

3.3 Use cases

The analysis of use cases showed that online assessment (with some special exceptions, when recognition by formal education institutions were not intended) always go with some form of learner identification, just like all onsite examinations. We might conclude that learner identification is vital from the point of views of any type of future recognition. However, learner identification methods vary depending on the learning environment.

Recommendations

A process of student ID verification that can establish whether the registered student is the same student taking the classes and doing the work. Pins and passwords are not enough, proctoring is for academic integrity only and is not a solution for ongoing student ID verification.

- Begin student ID verification processes as early on as possible with first contact with the student and then throughput the course at any/every gradable event not just exams. In an eight-week session for example, if you only assess a student at the final exam, who has been doing all the tests, quizzes and participation for the last seven weeks?
- Combine verification of identity before you provide the student their access pin/password to their learning management system and then add time, location, and history to a biometric to verify that the person is who they say they are before they can access any graded event.
- Manage the collection of student credentials and look for fraud patterns using IP addresses, Death master files and other information *OR* use a third party to collect and review this work.
- Choose a system that integrates with the LM (Learning Management) system and gradebook.
- Choose a system that is flexible enough to also be used as a single sign on for any transaction between the student and the institution.
- Choose a system that is flexible enough to be used as an identity authentication to reduce academic dishonesty *AND* financial aid fraud due to identity fraud.
- Choose a system that can provide both real time and historical reporting that has an audit trail report, tracking and suspicious activity tool.
- Use periodic identity verification if available.

The most common forms of personal identification in e-assessment are:

- Secure login and password through learning management systems
- Third party verification tools (e.g. Jumio Netverify, Accredible)
- Audio & Visual Identification
- Verification against national identification databases
- Biometric Verification (e.g. BioSig)
- Predictive Analysis

Cheating prevention is a complex issue. A recommendable good practice is to use a combination of the different tools available: use the possibilities of the methodological pillar, the methods offered by technology and adapt the environment to prevent cheating:

- Define clearly for students what is ‘cheating’ (academic integrity) and set expectations.
- Establish a culture of honesty.
- Alter regularly the methods surrounding the test design to avoid patterns.
- Use Proctoring tools (Pearson VUE, SMOWL, ProctorU, Examity, Remote Proctor), including live, recorded or advanced automated proctoring tools.
- To ensure academic integrity, use Plagiarism tools or lockdown browsers.

4. Quality Assurance

Different forms of online education provision are growing in popularity and were being applied both in formal education and in non-formal education. Non-formal open education is frequently delivered in digital form: A good example is the MOOCs provision that is present in both the non-formal and informal sphere. Online universities are expressing their will to offer fully comprehensive online education and traditional universities are increasingly adopting online methods to their habitual procedures. Consequently, quality assurance (QA) should also develop new processes in order to guarantee the confidence in these new forms of learning and assessing (Huertas, Roca, Ranne, & Gourdin, 2018).

Based on the findings of Witthaus at al. (2016) related to MOOC provision, one of the six vital elements of open non-formal learning provision facilitating future recognition by other formal education institutions or employers is ***Quality Assurance (QA)***.

Goal of quality assurance:

- To enable equivalence of non-formal curricula with traditional quality-assured programmes.
- The term quality assurance means all activities within the continuous improvement cycle (e.g. assurance and enhancement activities) (ESG, 2015).
- Quality assurance should follow quality standards.
- QA methodologies applied to digital learning provision should pay special attention to e-learning characteristics.

4.1 Quality standards

Current Research

If we measure the workload in ECTS credits, the question is how can ECTS credits earned in non-formal education be credited in formal education and be recognised by grade awarding institutions.

To enable recognition of credits, grade awarding institutions (like HEIs) need proof of quality assurance (QA) procedures and the assurance that internationally accepted quality criteria have been applied.

The standards that exist for formal recognition and quality assurance in higher education can and should be applicable to any new forms of (open) learning, certification and credentialing. This means, that when assessing credentials as a proof of the quality of (open) learning, key elements of a qualification should always be considered, with learning outcomes being the most important criterion (Nuffic, 2016).

As stated by Inamorato dos Santos, Punie**,** Castaño Muñoz (2016)**,** quality standards in open education should seek to comply with the European Standards and Guidelines for Quality Assurance in Higher Education, which have been divided in three parts: internal quality assurance, external quality assurance and quality assurance agencies. The term quality assurance means all activities within the continuous improvement cycle (e.g. assurance and enhancement activities) (ESG, 2015, p. 34).

Definition Quality: Quality in open education refers to the convergence of the five concepts of quality (efficacy, impact, availability, accuracy and excellence) with an institution's open education offer and opportunities.

In relation to an institution's open education offer, the higher the confluence of these five concepts of quality (efficacy, impact, availability, accuracy and excellence) the more reliable and trustworthy this offer will be for open learners:

- Efficacy: fitness for purpose of the object, concept being assessed.
- Impact: is a measure of the extent to which an object or concept proves effective. It is dependent on the nature of the object /concept itself, the context in which it is applied and the use to which it is put by the user.
- Availability: this is a pre-condition for efficacy and impact to be achieved, and thus forms part of the element of quality. In this sense, availability includes concepts such as transparency and ease-of-access.
- Accuracy: is a measure of precision and absence of errors, of a particular process or object.
- Excellence: it compares the quality of an object or concept to its peers, and to its quality-potential (e.g. the maximum theoretical quality potential it can reach) (Inamorato dos Santos, Punie, Castaño Muñoz (2016).

However, *standards for digital technologies used for teaching, learning and recognition have not yet sufficiently been considered in existing QA mechanisms* (Camilleri, Rampelt, 2018). Existing criteria and measures for quality assurance must be renewed and supplemented accordingly, to take appropriate account of digitalisation in teaching and learning and to ensure security and transparency for all student groups.

Limiting the scope of the discussion on higher education, the challenge is to review how existing (external) quality assurance can also be applied to digital learning (e.g. MOOCs) provision for higher education studies, which are outside of the normal higher education system.

QA methodologies applied to digital learning provision should pay special attention to e-learning characteristics. Consequently, quality assurance should also develop new processes in order to guarantee the confidence in these new forms of learning and assessing.

4.2 Methods and models of QA in non-formal open learning

Current Research

The ENQA (European Network for Quality Assurance in Higher Education) toolkit (Huertas, Roca, Ranne, & Gourdin, 2018) for ensuring the quality of digital learning environments covers eight areas, which are aligned with the European Standards and Guidelines (ESG), but have been further specified for digital learning, with **a focus on e-assessment:**

- Policies, structures,
- processes and resources for quality assurance of e-assessment;
- assessment of learning;
- e-assessment system security, capacity and authenticity;
- infrastructure and resources;
- student support; teaching staff;
- learning analytics;
- and public information.

Quality assurance model of Kiron (Kiron, 2017)

MOOC-based workload can be credited by HEIs, however, requires a quality assurance that provides the grade awarding institutions security in dealing with Kiron's learning offers.

To enable recognition of credits, HEIs need proof of QA procedures and the assurance that internationally accepted quality criteria have been applied. Kiron believes that a strong network of institutions combining their quality processes can enable equivalence of non-formal curricula with traditional quality-assured programmes.

To meet these challenges, Kiron created and developed its own quality assurance principles in alignment with international standards. They draw on current scientific discussions about recognition of prior learning, online learning, MOOC quality, and developments in open education (e.g., Huertas et al., 2018; Stracke, 2018; Stracke, 2017; Hood & Littlejohn, 2016; Ossiannilsson et al., 2015).

Figure 2: Four Pillars of Kiron's Quality Assurance (Kiron Quality Handbook Curriculum 2017)..

In summary, it can be said that Kiron does not carry out the sole quality assurance of the selected courses, but rather perceives itself as a building block in a layered QA process that brings together the competencies and qualities of different institutions.

The confirmation of this QA process is eventually given by the potential crediting of MOOC-based modules (see Figure 2).

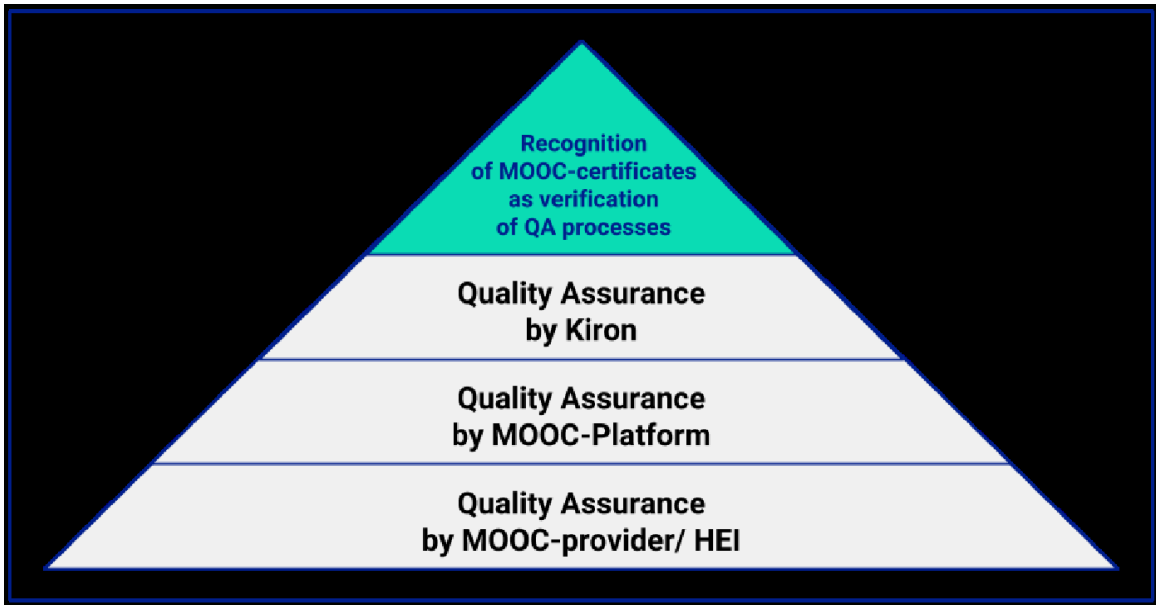

Figure 3: Layered QA process of Kiron (Kiron Quality Handbook Curriculum 2017).

4.3 Use cases and good practices

Fully online universities were established to offer online learning from the very beginning. Policies are adequate and clearly focused through the lens of e-learning. Good practices are observed in these specific HEIs due to the alignment of e-assessment and their pedagogical models.

Good practices (Witthaus at al, 2016):

Open learning provision can be subjected to existing quality mechanisms for course provision at a higher education institution (e.g. review by a faculty committee). For example, *all* **MOOCs of the University of Edinburgh** that are offered through **Coursera** have undergone **institutional quality assurance**.
Peer reviewing by instructional and content matter experts and obtaining a quality label for educational provision, e-learning or MOOC provision in particular is also a recommendable good practice. The MOOC-specific **OpenupEd label** serves as an entry/review procedure for becoming a partner in this European initiative.
Partnerships and collaboration with potentially "recognizing" institutions or bodies can also contribute to the establishment of an appropriate quality assurance system.

Recommendations

- Prepare a QA strategy open learning provision.
- Apply QA principles in all elements of flexible open learning provision:
  - design
  - delivery
  - platform
  - assessment
- Establish cooperation and partnership with potentially "recognizing" institutions or bodies.

5. Conclusions

To augment a learning passport, or other system of documenting online learning we propose the following classifications for the concepts discussed in this paper:

Workload / ECTS

ECTS is a regulated system, which can only be used within certain contexts within Higher Education, however, the concepts used by ECTS can nevertheless be used for any open learning experience. We therefore recommend that this is documented via:

- Number of Hours of Learning
- Learning Outcomes

Quality Assurance

○ Institutional Quality Assurance	A quality assurance procedure applied at the level of an organisation. Institutional Quality Assurance leads to a QA Decision, but does not have any legal implications. Institutional Quality Assurance may be provided within the context of private QA labels.
○ Institutional License	A licencing procedure applied at the level of an organisation. Institutional Licencing implies permission for the institution to operate, and is awarded by Public Authorities or delegates thereof.
○ Program Quality Assurance	A quality assurance procedure applied at the level of one or several programmes. Programme Quality Assurance leads to a QA Decision, but does not have any legal implications. Programme Quality Assurance may be given within the context of private QA labels.
○ Program License	A licencing procedure applied at the level of one or several programmes. Institutional Licencing implies permission for an institution to provide a specific programme, and is awarded by Public Authorities or delegates thereof.

ID Verification

We propose classification of methods of ID Verification and Assessment:

- ID Verification
- No ID Verification
- Supervised with ID Verification
- Unsupervised with ID Verification

Assessment

We propose the following initial classification of Assessment Types:

- written examination
- oral examination
- marked assignment
- continuous evaluation
- peer assessment
- portfolio
- level of attendance
- project work
- group performance
- practical assessment
- artefact assessment
- quiz
- peer review
- problem based learning

We also propose the following modes of assessment:

- Online
- Presential
- Blended
- Workbased
- Project based
- Research-Lab based

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In spite of the positive momentum that open education resources have gained, the issue of formally recognizing prior-learning that has taken place 'elsewhere' is still a major issue. The difficulties in recognition stem from the several possible sources, among others from

- Their lack of compatibility with credit frameworks such as ECTS that have clearly defined requirement of workload helping to standardize the quantity of work needed to achieve the learning outcomes successfully;
- Their various, uneven assessment and evaluation procedures that are not always comparable with that used in formal education in terms of rigour;
- Their manifold and not always reliable learner identification and cheating prevention systems;
- The quality assurance applied to ensure that the ECTS awarded to acknowledge the learning outcome be recognisable in formal education.

This report tries to suggest policy recommendations to further the application of digital credentials by overcoming the above difficulties, based on literature survey and on evaluation of collected use cases.

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