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Open Teaching

Research and practices on open, innovative and engaging pedagogies

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PEER REVIEWED PAPERS

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EDITORIAL

Open Teaching: research and practice on open, innovative and engaging pedagogies

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I - When UNESCO introduced the OER concept and a couple of years later the OECD suggested to give knowledge away for free (OECD, 2007), we, as open educators, believed that this was the avalanche which we had been waiting for and which we had been expected to arrive for a long time. Today, at the end of a pandemic year 2020, we know that what we had been thinking of as avalanche, had just merely been a tiny snow drizzle compared to the huge and rapid, and unprecedented tectonic shifts in the landscape of our higher education institutions which had been caused through the near 100% substitutions of what had been the good old presential European university through online modes. We publish this special issue on teaching and learning in the open in this very special time and are aware that nothing safe and secure can be said in terms of uptake and how the next and new normal will look like in higher education. This is true for the use of digital technology at large as well as for the further deepened uptake of open education practice in higher education in particular.

The current developments have hit our higher education institutions and will in due time challenge the nature of their organization, profile and mission as rigidly space and time bound institutions build around the metaphor of space expressing in terms like remote education and distance education. The pandemic avalanche has started already on the top of the mountain and finds its way downward. While we do not see it yet, it is moving faster and faster with great force underneath the surface. If you are experienced with avalanches you know that it will hit but you don't know when, and if you are experienced with higher education you know why: Higher Education institutions had to change their entire mode of operation into an emergency mode from which they will take away stronger impulses of innovation and change than all reform policies within the last 30 years had been possible to evoke.

Thus, this special issue comes timely when the world of learning and teaching is standing in front of a fundamental digital turn which had not been imaginable just a couple of months ago. When we drafted the call for paper for it not even one year ago we never thought that by the end of 2020 all learning in European higher education would be online and digitally supported. We are convinced that this is not just about digital learning. It will as well deepen the integration of open education

practice in higher education in Europe. This will give the movement of the open education community a push long desired, refresh our energies, and open new opportunities and avenues in front of us. The contributions we received show clearly that open education has made progress and convey that on the back of a severe Corona Pandemic we can now go beyond declaring the value propositions of openness into living them in the reality in our institutions.

II - Editing and publishing a special issue is representing also a moment of self-reflection for the community around the topic close to our heart – which in our case is teaching and learning in the open. For the community of open education practitioners and policymakers this is so relevant and valuable since the latest pandemic developments will progressively lead to greater and lasting use of digital – and also of open educational – resources in teaching and learning in all education sectors. However, we know that accessibility and availability of OER do not automatically lead to a well embraced and deep integration of openness into teaching and learning approaches. We hope therefore that this issue and the papers which we received, reviewed and published here serve as a landmark and orientation to support teaching and learning in our institutions in the light of a new paradigm. The positive community response to the call for papers shows the current demand for knowledge and experiences on how to make open work.

III - Following a couple of decades of rather intense advocacy, the Open Education movement obtained one of its most important achievements in 2019, when the UNESCO launched its Recommendation on Open Educational Resources (OER). The recommendation, apart from representing the ultimate recognition of the role that OER can play for more equitable and inclusive education systems, pushes forward the concept of OER-based teaching and learning innovation as well, by stating that

> *"the judicious application of OER, in combination with appropriate pedagogical methodologies, well-designed learning objects and the diversity of learning activities, can provide a broader range of innovative pedagogical options to engage both educators and learners to become more active participants in educational processes and creators of content as members of diverse and inclusive Knowledge Societies" (UNESCO 2019).*

While we regard this to be a major achievement of the education practitioners and policy community around the world we come to realise that at the same it is a huge challenge. This challenge is becoming visible in the fact that the resource-oriented concept when it wants to have a sustainable effect in education really needs to be translated into a pragmatic concept of educational practice – Open Educational Practice (OEP). Open pedagogies pose a great challenge to institutions which really demands for a shift in educational culture. Teaching and learning in the open therefore means much more than bringing OERs into the classroom but rather lead to a change of often long guarded underlying beliefs about education and ultimately demand the shift from teaching to learning which we are talking about since Barr and Tagg suggested it in 1995.

IV - Teaching and learning in the open is going beyond using OER and makes visible the need to change from an instructional paradigm to a learning paradigm. That such a restructuring is needed is beyond question: the gap between what we say we want of higher education and what we really provide is - unfortunately - quite large. To use a distinction made by Argyris and Schoen, the difference between our espoused theory and our theory-in-use is becoming distressingly noticeable. An "espoused theory", is the set of principles people offer to explain their behavior. The principles we can perceive from how people or their organizations actually behave is their "theory-in-use". Right now, the Instruction and closed learning resources paradigm is our theory-in-use, yet the espoused theories of most educators more closely resemble a teaching and learning in the open paradigm. And the dreadful problem is that the more we discover about how minds work and how students learn, the greater the perceived disparity becomes between what we say and what we do. The articles in this special issue show closely that teaching and learning in the open also leads to a stronger emphasis of the learning paradigm over the instructional paradigm.

Thanks to the UNESCO Recommendation, and to the work of a number of stakeholders who committed to monitor its actual implementation by governments around the world, at the beginning of 2020 the policy priority assigned to OER and Open Education was clearer than ever, still the risk was that this policy drive would not have been followed by a corresponding wave of systemic innovation, or at least systemic experimentation. The Open Education movement had experienced this slope of disillusion already after the creation of the OER idea in 2002 and had seen the MOOCs, and their promises to democratize education thanks to the internet, transforming into commercial ventures of questionable inclusion value. The COVID-19 pandemic led to the development of an online emergency mode, creating a sort of a global digital education laboratory, where – side by side with those teachers who are trying to keep up and survive the wave of forced innovation – a number of educators is actually experimenting with online teaching tools and approaches, trying to limit the education exclusion dynamics connected to the pandemic.

In this global digital education laboratory, the space for experimenting with OEP is large and mistakes are, to a certain extent, accepted. That is why it is important – now more than ever! – to facilitate the circulation of open teaching practices that work, to take the chance of the all-online mode to position open teaching into mainstream higher education. Also, the moment is propitious to keep on investigating what open teaching means, and how its meaning is changing during COVID-19 times. The feeling is that this wave of experimentation – and hopefully adoption – of open teaching approaches will help us anchoring the very concept of Open Educational Practices, that has been discussed extensively in literature (see Ehlers, 2011; Koseoglu & Bozkurt 2018; Cronin & MacLaren, 2018; Nascimbeni et al. 2018; Huang et al. 2020; Havemann 2020 among others).

V - An editorial piece allows reflection of the progress made – in our case within the *open community*. We believe that the progress is huge although no new paradigms have been introduced since the introduction of the concept of Open Educational Practices (in Ehlers 2011). The relationship between OER and OEP is made clear in one of the most used definitions of OEP, where we defined it as

> *"practices which support the (re)use and production of Open Educational Resources through institutional policies, promote innovative pedagogical models, and respect and empower learners as co-producers on their lifelong learning paths" (Ehlers, 2011, p. 3).*

However, this in itself has provided a big step forward. The concept emphasises the importance to go beyond the resources concept of OER and emphasised the cultural dimension OER are built on - in the sense that they are transporting a learning paradigm rather than perpetuating the instructional (teacher centered) paradigm. The last ten years of work since its instruction have shown its importance and led to a collection of rich cases and a large body of experience. Today we come to realise that since its introduction in 2001 the concept of OER has matured, has emerged and moved into a practice concept through the introduction of OEP and thus resulted into a mature debate on teaching and learning in the open which more and more is also backed through empirical evidence, as this special issue is showing.

The main achievement of the OEP concept is the vision that allows open digital learning technology and open pedagogies to be working in relation and coupled with each other. Since the introduction of the concept in 2011 a number of related concepts have been developed and published which all play along this very relation and conceptualise open education practices as the space in which certain pedagogies, learning methodologies or educational paradigms couple open technologies with open pedagogies. The concept of OEP thus has increasingly been coming to the fore of the open debate (Bali et al., 2020), complementing OER as another fundamental pillar of openness in education (Cronin & MacLaren, 2018; Havemann, 2020).

The often referred to OEP matrix presented below show the interrelation between pedagogies and technologies which is coupled in the concept of open educational practices. Different degrees of openness in the usage and creation of OER are outlined there and thus the dimension of technological innovation is coupled with pedagogical innovation.

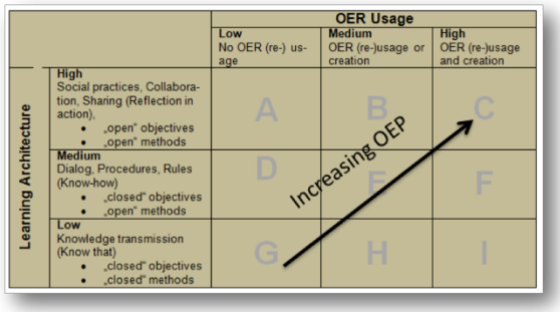

Figure 1 - Open Educational Practice Matrix (Ehlers, 2011, 2014).

Today, ten years after its introduction Huang et al. (2020) evaluated existing OEP concepts and suggest a further differentiation of openness as a central component in the concept. They collect four different dimensions of educational practices, as there are OER, Open Assessment, Open Collaboration and Open Teaching.

VI - It is important to note that the OEP has not yet become a mainstream in higher education or other education sectors. More energy is needed to convince and more organisational approaches to incentivise teaching in the open. The next era of bringing OEP in its various degrees of intensity into the reality of teaching and learning in our institutions will see the development of skill frameworks which help educational practitioners to put openness into practice.

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INVITED PAPER

Towards an Operational Definition of Open Teaching

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The field of open and distance education has transversed many conceptual and pedagogical boundaries to define openness, Open Educational Resources (OER), Open Educational Practices (OEP), open access, open pedagogy, open research and open assessment (Butcher, 2011). And, although there is a tendency to associate all these concepts with open and distance education, we must remember these concepts apply equally to traditional f2f models and pedagogies (Garcia-Holgado et al., 2020).

The macro view of these open concepts has expanded access to content and resources and made these more accessible and usable across education. In the U.S. we have seen massive adoption of OERs to reduce textbook costs for students and in developing countries where content and text book costs can be cost-prohibitive, OERs and open content have been the catalysts for promoting access to higher education in particular (Olcott, 2012a; 2012b; 2013).

Despite this progress, there is a need to bring our conceptual framework for open education back to exactly what we do with all these resources. What we do with these resources is teach. We use them to enhance teaching and improve learning, by promoting high quality interaction, engagement, retention and reduce transactional distance.

Garcia-Holgado et al. (2020) offered a general definition of Open Teaching as a

> *"combination of practices aiming at increasing access and quality of learning where theories about learning, technology, and social justice enter into conversation with each other and inform the development of education practices" (p. 1).*

This opening act on Open Teaching is a good start. The next step is to refine and define this concept operationally.

Open teaching is an instructional framework that draws upon open practices, resources and pedagogical strategies designed to promote access, enhance teaching quality and improve more effective learning in educational environments.

Characteristics of Open Teaching include:

- Use of Open Educational Resources (OER) as the primary content of courses/programmes.
- Use of Open Educational Practices (OEPs) standardised by the institution and or profession.
- Student, student to teacher, and student to student opportunities for creating and revising open content. This process is typically called open pedagogy.
- New and/or revised content created in the course are assigned OER status with the appropriate open licensing.
- Open assessment options for students in collaboration with teachers to contribute/identify some elements of their assessments.

- Engagement of external stakeholders and community to improve the teaching process and to make students' assessment more relevant.

This definition focuses on the teaching process in open educational environments. Garcia-Holgado et al. (2020) discussed the broader open ecosystem which may further include open source, open research, open government, open innovation. These are valuable and certainly may have an indirect role to open teaching but maintaining a clear focus on the open teaching instructional framework avoids unnecessary confusion.

Moreover, any teacher will tell you they do many things that contribute to the overall educative process in their teaching. Most of these can be categorised (see Garcia-Holgado et al., 2020) under OEPs, basic teaching strategies, theoretical concepts, etc. However, for offering a simply definition of Open Teaching we should stay focused on the basic definition of what it is. The "*how*" of open teaching is embedded in the strategies, pedagogies, theoretical frameworks and OEPs we use to teach.

Without question, by operationally defining Open Teaching it raises some interesting questions.

Does a university have to be "open" for its teaching to be considered open? The answer is no. Universities set parameters for admission, tuition and fees and many other regulations and administrative requirements but once in the institution the mode of teaching can be entirely open. Conversely, other institutions may have extensive digital innovation tools whereby other institutions may be very limited in its technology. Digital arsenals can empower open teaching and open in general.

Does the creative open pedagogy of Open Teaching mean students should be able to create anything and everything they want? Again, the answer is no. There are boundaries and negotiating points by which open teaching meets the minimum "openness" on the definitional characteristics listed above so that we can comfortably and genuinely consider this open teaching. Open pedagogy is not turning the entire content continuum over to students. Most of this is plain common sense.

The Open Championship is held each summer in the UK or Scotland. It is publicised as Open – does this mean every golfer on the planet can come and play? No. It means every golfer who can play great golf and qualify via various systems can enter The Open Championship. Open universities advocate students can come and study anything they want no matter what their previous background and experience. Does this mean if I have no background in medicine I have open access to Med School? No. It simply means the open university will admit you to the university but you will still have to meet all requirements set by the School of Medicine – this could mean taking three years of prerequisite coursework before you would even start medical studies. Similarly, open teaching doesn't mean open everything for the teacher nor the student. There are boundaries, rules, and everyone agrees on these. The teacher might use a non-OER resource if she/he believes it is relevant and important enough to student learning. Does every open teaching course have to personify all OEPs of the institution? No. Autonomy, open dialogue and responsibility still remain key to open teaching but it does not mean anything goes. The key point here is you can employ an open teaching instructional framework and still retain locus of control for decision making and core course values and norms.

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Open pedagogy practices: a case study in undergraduate education

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Abstract

The study reports about an open education practice in undergraduate education, by analysing the openness of a course in which the teacher was not a *self-declared* open educator. It explores data from involved educators, students and entrepreneurs, who participated in a project-based learning pathway carried out online. Data collection included observation of the process by an external researcher, final questionnaires and interviews to participants. Conclusions argue that open education practices (OEPs) can also be found in courses which have not been designed purposely as *open*, and that further work is needed to understand students' perceptions in open practices.

KEYWORDS: Open Teaching; Open Educator; Project-based Learning; Inclusion.

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1. Introduction

One of the most acknowledged definitions of Open Educational Practices (OEPs) derives from the work of the Open Educational Quality Initiative (OPAL) project, as "the range of practices around the creation, use, and management of open educational resources (OERs) with the intent to improve quality and innovate education" (OPAL, 2011). Further, Elhers (2011) considered that the use of OERs does not guarantee itself the openness of the practice: by analysing the use of OERs in context, argued that learning architecture plays a remarkable role in the openness of the practice. The author provided a model in which the degree of openness relates "to openness in resource usage and creation versus openness in pedagogical models" (p. 5), concluding that OERs should "be accompanied by changed learning models to encourage the uptake of open educational practices" (Ehlers, 2011, p. 8). Additional work includes the definition other OEPs-related concepts (Cronin & MacLaren, 2018), such as open scholarship (Burton, 2009; Garnett & Ecclesfield, 2011; McKiernan, 2017), networked participatory scholarship (Veletsianos & Kimmons, 2012), and open pedagogies and open teaching.

Open pedagogies have been often referred to as the use of open educational resources in teaching and learning (Wiley, 2013, 2017). Other authors, however, have shifted toward a more comprehensive concept of open pedagogies and generally openness (Conole, 2013), which can be broadly defined as "the natural progression of integrating socially just principles of human relations and the potential of current technology into the educational system" (Green, 2017). Hegarty, starting from the five principles of openness as defined by Conole (2013), identifies eight attributes to open pedagogies (Hegarty, 2015), namely:

1. Participatory technology;
2. People openness and trust;
3. Innovation and creativity;
4. Sharing ideas and resources;
5. Connected community;
6. Learner generated;
7. Reflective practice;
8. Peer review.

These interlocked attributes are able to generate, according to the author, "a seamless process that occurs throughout life when participants engage in open and

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collaborative networks, communities, and openly shared repositories of information in a structured way to create their own culture of learning" (Hegarty, 2015).

Even if a shared understanding of open pedagogies, which are constantly expanded by technologies (Hilton III et al., 2019), has not been agreed yet, it can be argued that open pedagogies include the adoption of learning designs and approaches to teaching and learning that consider sharing, networking, and co-creation of knowledge at least. With reference to teaching, Nascimbeni and Burgos (2016) proposed four dimensions to analyse the *open educator*, namely:

1. *Open design*, which implies sharing ideas and plan and including insights with colleagues, potential students;
2. *Open content*, by releasing own resources through open licenses and distribute them in OERs repositories, as well as use others' resources;
3. *Open teaching*, by adopting teaching methods promoting co-creation of knowledge;
4. *Open assessment*, by supporting "peer and collaborative evaluation, open badges, and e-portfolios, engaging students as well as external stakeholders in learning assessment" (p. 4).

These dimensions have been applied to explore the degree of openness among teachers of an Italian university, to map the overall OEP capacity of the institution (Nascimbeni et al., 2018). The authors proposed four activity's areas to explore the openness of the educators, each of them having three levels, from low to higher degree, as in Table 1.

Nevertheless, the adoption of open pedagogies by teachers is not enough, since positive outcomes of learning require an aware and active involvement of students. Research on students' perceptions and beliefs about open pedagogy is still underdeveloped. Hilton III et al. (2019) explored the perceptions of 173 students of implementations of approaches to open pedagogy in post-secondary institutions in New Hampshire, by comparing *traditional* and *open* pedagogies. They found that 53% of students value open approaches more than traditional approaches, 31% considered them as equal in terms of educational value, and 16% that open pedagogy approaches had less educational value than traditional approaches. Also, 20% of the overall sample would have preferred traditional methods compared to *open* methods. Scholars seem to agree on the added value of active pedagogies for learning (Hassanien, 2006; Hyun et al., 2017). However, the engagement of students, and their perceptions about this type of teaching, cannot be given for granted: students can be resistant to group work (Allan, 2016; Payne et al., 2006; Piezon & Donald, 2005), flipped teaching (McNally et al., 2017), and generally active pedagogies (Smith & Cardaciotto, 2011).

2. Materials and Methods

This study seeks to analyse the degree of openness of education in the frame of the course "Economics and Marketing of Agri-food" carried out at the University of Macerata during the Academic Year 2019-2020, by using as reference the Open Education Factory (OEF) framework proposed by Nascimbeni et al. (2018).

The course, which is mandatory for the undergraduate program degree "Cultural Heritage and Tourism", is usually delivered face-to-face. It includes a range of teaching methods, including lecturing, participation to seminars and workshops, field visits, and a project-based learning pathway (Blumenfeld et al., 1991; Bell, 2010; Blackwell et al., 2014), which is the core students' activity during the semester. The project-based exercise is designed as a consultancy project of groups of students to entrepreneurs of the agri-food field. Since years, it has included the use of open educational resources as reference readings and open assessment practices by the involved external stakeholders. During the academic year under analysis, due to the COVID-19 pandemic, learning activities have been implemented entirely online.

The course enrolled 58 students, of which 54 participated in the project-based learning (PBL) exercise. One of the participants to PBL was a student with a disability: a personalised learning pathway was designed in this case and did not include teamwork. Involved tutors, post-doc researchers or PhD candidates, were 7; involved companies/associations were 7.

Feedback was collected by a researcher external to the teaching group, appointed as observer/evaluator.

Evaluation data included:

- Observation (and participant observation for open assessment);
- Analysis of online content in the course's virtual learning environment (VLE) space;
- Questionnaire to students;
- Semi-structured interviews with tutors and the teacher;

Design	Content	Teaching	Assessment
A3. Open designer	B3. Expert OER user	C3. Open teacher	D3. Open evaluator
A2. Collaborative designer	B2. Familiar with OER	C2. Engaging teaching	D2. Innovative evaluator
A1. Individual designer	B1. New to OER	C1. Traditional teacher	D1. Traditional evaluator

Table 1 - OEF (Open Education Factory) framework. Source: Nascimbeni et al. (2018, p. 514).

- Feedback collection with entrepreneurs (unstructured interviews).

The dimensions under evaluation are listed for each target group here below.

Students (questionnaire):

- Online course as learning experience (includes technological user acceptance items)
- Quality of the online materials
- Quality of the project-based learning exercise
- Added-value of working a) in a team; b) with entrepreneurs.

Each dimension required rating of items on Likert-scale 5 and compulsory open questions, asking to comment their rating on technology and online educational resources, and a reflection on skills development for learning and employability purposes. Assessment of the project-based process and on the tutors' support was also part of the questionnaire, as items to be rated on Likert-scale 5. The questionnaire was based on the work of Petasakis et al. (2015) and Palmer and Hall (2011) and adapted to the case. It was administered online during the second half of June 2020, after the ending of the classroom and exam activities.

Tutors (semi-structured interviews):

- Perceived quality of online tools and processes
- Strengths/weaknesses of the online working groups
- Awareness about open education

Teacher (semi-structured interview):

- Awareness about open education
- Design process and reasons for the chosen approach and methods
- Reasons for using OERs

Entrepreneurs (unstructured interviews):

- Reasons for undertaking the online learning activity
- Perceived strengths and weaknesses of the process

The interviews were carried out in the second half of June 2020 over Skype and Microsoft Teams.

3. Results

Results, which include data from different sources as above described, are organised according to dimensions/activities of the open educator model. They include analysis of 24 valid questionnaires (students), 5 interviews (1 teacher, 4 tutors), and 4 not structured interviews to collect feedback from stakeholders.

Design

The re-design was carried out before the beginning of the course when the university courses went online following the COVID-19 lockdown. The design was driven by the teacher's pedagogical approach, based on promoting co-creation of knowledge among learners and between learners and the stakeholders in the field. As a researcher, the teacher applies action-based research and participative approaches to local development. For course design purposes, meetings have been organised with tutors and entrepreneurs to define the possible options to implement the project-based learning online, and maintaining the key features in terms of learning outcomes (marketing in agri-food), pedagogical objectives (cooperation and co-creation), and activities (desk and field research). Furthermore, other pedagogical choices were kept, such as the choice of participating the project-based learning pathway or choosing autonomous learning (additional readings were assigned in this case); the self-organisation of students in groups and the appointment of a coordinator within the group; the appointment of a reference tutor for each student groups and the function of the tutors (support to finding information; guidance in using the adopted tool for designing the project, the Business Model Canvas; feedback to project presentation).

Modifications from the original design were: field visits replaced by presentations by companies and associations; interviews with stakeholders carried out online (with different channels, either Skype or WhatsApp); online tutoring.

Importantly, the course has not been designed or planned as based on the *open* concept, as defined in literature: instead, it has been designed on the basis of participative and co-creation approaches, according to the teacher's statements. In fact, also across tutors, "open educational resources" were described as "accessible to all for free" (1), "open source" (2), and "online resources" (1). Likewise, "open education" and "open course" were referred to the concepts of "open source" and online access. One of the tutors noticed that the course could not be defined as *open* as it required enrolment at the university and login to the platform and other tools.

The evaluation of course design, or better its implementation through project-based learning, was in general positive among students, as reported in Table 2.

The most appreciated characteristic of design for stakeholders was the attempt of the university to keep open and active relations with the territory, which was also the main reason for them to be involved in the course. Getting in direct touch with stakeholders (either companies or associations) has also been considered an added value by the all the respondents to the questionnaire, in particular for meaning-making relevance: increased understanding on how the theory works in practice (11), and the added value of sharing and networking for learning purposes (6); increased awareness and of the labour market (4) and acquisition of employability skills (2).

Content

Readings of the course were only open educational resources: the first, the online learning "FARM INC – The farm is my business"; the second, the MOOC "Sustainable food systems: A Mediterranean perspective". Both resources were based on individual learning, with an available online test to self-assess progress, and were subject to formal assessment during the intermediate and final exams.

The FARM-INC course has been produced in the frame of a European-funded project, and at today is hosted by the University of Macerata's server. It is composed of 10 modules, divided into units. Each of the modules provides final tests to self-assess learning progress; some units also provide intermediate tests. The resource is mostly based on text and graphics, with some embedded video from YouTube. Although the teacher stated that this is an open educational resource, there is no indication of the adopted license on the website: however, it is freely accessible from the website and does not require registration. The teacher asked about the licence of the material, answered that:

> *Honestly, when it has been produced, we didn't think about the declaration of the license… we should probably add the license to complete it, as we did for other materials delivered in the frame of other projects afterwards… but I have always conceived this work as shared work. I have promoted its use across colleagues in my subject field. It is also labelled as good practice by the Erasmus national agency of Italy, and also promoted through that channel, so everyone interested can simply use it. [Teacher]*

The MOOC, hosted on the edX platform, was an xMOOC type (Ross et al., 2014). Composed of 10 modules, each of them taught by a different expert, it provides video chapters with transcripts, supplementary learning resources, and a final test. The MOOC is available on the platform for free, upon registration.

According to the teacher, the first was aimed at providing the theoretical ground of the field subject, the second at enlarging horizons, by giving an international perspective about the implications of food production and food chains in global terms.

The results of students' evaluation of the two resources, is reported in Table 3.

Open questions further define pros and cons of the learning materials, particularly in relation with the update or the type of access (videos within the MOOC were considered highly useful for learning from 5 out of 24 respondents); many about the translations (the

Item	Average	St. Dev.
Did you enjoy working in teams?	4,17	0,87
Did you enjoy giving oral presentations?	3,42	1,10
Did you understand what you needed to do for the design project assignment?	4,38	0,71
Were you able to find the information you needed to complete the design project?	4,38	1,01
Did your group work well together on all design project assignment?	4,33	0,92
Was your group presentation successful?	4,63	0,65
Were you satisfied with the design produced by your group?	4,50	0,78
Overall, were the project-based activities an enjoyable learning experience?	4,08	1,14
Did the project-based activities increase your knowledge of the field of economy and marketing of agri-food?	4,29	1,08

Table 2 - Results evaluation from the questionnaire (Likert scale 1-5, where 1 = not at all; 5 = a lot) – project-based learning.

Item	MOOC		FARM INC	
	Average	*St. Dev.*	Average	*St. Dev.*
The online content was sufficient and accurate	3,62	*1,18*	4,08	*0,93*
The online content was clear and understandable	3,54	*1,05*	4,25	*0,94*
Information provided were adequate	3,62	*1,06*	4,17	*0,87*
The online content satisfied me	3,31	*1,28*	3,92	*0,93*
The online content was appropriate to the course	3,73	*1,00*	4,08	*1,02*
The educational content was updated	3,50	*0,93*	3,83	*1,01*
There was enough online content for the specific course	3,69	*0,83*	4,04	*1,04*
The online content offered too many information	2,58	*1,02*	2,88	*1,26*
The link between the learning materials and the course was clear	3,58	*1,08*	4,08	*0,97*
I could identify the link between the content of the learning materials and the local context (of the region where I study/where I live)	3,38	*1,09*	4,04	*0,95*

Table 3 - Results evaluation from the questionnaire (Likert scale 1-5, where 1 = not at all; 5 = a lot) – online content.

MOOC was available in English with Italian translations). Only one respondent stressed (or noticed) the fact that the learning materials were available for free:

> *As online and for free, the learning materials support those students who have a little financial capacity, or difficulties in finding the books [Respondent 14]*

One respondent pointed out the preference for paper-based learning materials.

The Business Model Canvas (BMC) template, produced by Strategyzer and licensed under an open licence (CC-BY-SA 1.0), was used to guide the process toward the production of the project. The students' projects were shared within the group, but neither made public nor published under open licenses.

Teaching

The overall course, except for introductory lectures, which were recorded and made available on the platform, was mostly self-managed by students, with the support of tutors. Students were asked to self-organise groups, identify the company case as the subject of their project, appoint a group leader, and freely organise their work. The only compulsory requirement was the use of the BMC as reference for the project development; however, the final presentation could be produced in any form (video, or presentation file, etc.) as long as it contained all the elements of the BMC. Tutors did not intervene in group management, and a little in groups' self-organisation: they were appointed to support the group according to the need, and in particular to facilitate the links with the stakeholders. The role of the teacher was to facilitate relations during online presentations with entrepreneurs, to provide further insights to interpret data, and to motivate active discussions during lessons about topics related to the task (e.g. case studies on agri-food in tourism with invited experts, tools' analysis, apps, etc.).

Discussion took place mostly through synchronous communication; therefore, data on the online forum are limited. The analysis of posts shows that the self-organisation of students in groups was carried out mainly outside the online platform, and all groups coordinators posted the names of participants by the given deadline. Student teams could choose the subject for their consultancy project according to their interest after the presentation of the stakeholders' cases. Tutors were appointed according to the selected case.

According to tutors, there were no major detected problems in the groups' work and self-organisation during the process, even if some doubts on the task were pointed out at the beginning and teamwork has been challenging for some of them:

> *In both groups that I have supported, I noticed a certain initial "disorientation" in understanding the necessary work, despite the clarification meetings with the teacher and tutor(s). [Tutor 1]*
> *I didn't perceive the willingness of anyone to work individually. Instead, I found little interest in some of them; difficulty in reaching an agreement within a group. [Tutor 3]*
> *I noticed that sometimes they had difficulties in finding an agreement. [Tutor 4]*

Also, the degree of groups motivation and autonomy increased over time:

> *In the beginning, I needed to 'push' more to get their attention and involve them more in the assigned case study […] Later, I noticed an increased engagement and autonomy in discussing the case and proposing meetings where necessary. [Tutor 3]*

Tutors also stress the need to be flexible in this type of design, particularly in terms of time:

> *We also organised meetings in the evening, especially when the entrepreneurs were involved… it is difficult to find the right time to allow everyone to participate [Tutor 3]*
> *In terms of organisation, the most difficult part is probably to organise the meetings between students and entrepreneurs [Tutor 1]*

From their point of view, students reported about a perceived lack of guidance and feeling of disorientation within the project-based learning process. 30% of respondents to the questionnaire (7), stated that they would have needed more examples on how to do and how to proceed, even if the two introductory lessons of the description of process and tools were recorded and available, and the tutors were ready to provide support also to link with entrepreneurs.

The most positive aspect of the process was identified by students as teamwork (37.5%), followed by 'relations with stakeholders' (16.7%). While it should be considered that the sample represents only 45% of participants to the course, it should also be noticed that none pointed out difficulties to work in a group. Only one respondent stressed the group as a subject of evaluation:

> *As a suggestion to improve the process, I would advise reviewing the criterion for assessing individual members of the group.*
> *[Respondent 23]*

Concerning online tools used for the course (OLAT platform and Microsoft teams), tutors, in general, agree that they were adequate, with few remarks:

> *Microsoft Teams was fine. I such an emergency, and the unexpected re-design, the adopted solution was the best possible. Perhaps for the future, the use of more innovative and engaging tools could stimulate better the students [Tutor 3]*
> *The availability of recorded lessons was an added value [Tutor 4]*

Students report an average satisfaction regarding the tools, as shown in Table 4.

Unfortunately, none of the respondents reported, in open questions, about what has worked or not as regards tools, and which features they would have preferred. One respondent commented:

> *The course would have been much better F2F [Respondent 4]*

Assessment

The course planned intermediate and final assessment exercises, as follows:

- Intermediate assessment on modules (MOOC and online course);
- Final assessment of the project produced by the groups (with the participation – and feedback – from stakeholders, and marking from tutors and teachers on the basis of established dimensions);
- Final assessment of the course, including intermediate assessment results and oral exam.

It should be taken into account that within the Italian system, the final exam of the course is carried out by a committee of three members at least, all of them belonging to the university. As a consequence, any form of external assessment, or peer assessment, cannot have formal value as such.

4. Discussion and Conclusions

Open education, open pedagogy and open resources were not at the basis of the design of the course, as a conscious choice of the teacher. However, the analysis of the case highlights a quite good degree of openness in all explored dimensions.

Concerning design, the teacher is a collaborative designer (A2, in Nascimbeni et al., 2018 model), since he designs courses with colleagues and stakeholders, by also sharing decisions about content, teaching methods and roles of involved educational players (tutors, stakeholders, experts at least). In the specific case, the re-design of the course included 100% use of technology and online learning, but also in 'regular' courses, the combination of online and offline work is continuously applied, as well as the use of OERs as readings for the course.

In terms of content, he is familiar with OERs principles: he produces learning materials for the open use of others, he uses OERs provided by others (B2). He cannot be defined as an expert, as the licensing is not always available on all his shared work, and the awareness of the Creative commons licences' use is rather recent.

In terms of teaching, he reaches in some aspects the higher level of openness (C3): the course has been conceived and implemented to promote co-creation between students, researchers (tutors and experts) and stakeholders and promote the use of public resources by students. Yet, while co-creation and sharing of knowledge is encouraged as attitude, the publication of co-produced materials under open licenses has not been pursued so far (C2). However, sharing as such is supported: two groups of students presented and publicly shared their project work, invited by the association of companies involved in the course, during an open event in agri-food.

Finally, he is an innovative evaluator (D2), and he would probably become, at least for some parts of the course, an open evaluator, by including stakeholders assessment, at least for project-based pathways, in a more formal way.

We argue that, regardless of the knowledge about the open education movement, still a remarkable role is played by the pedagogical approach of the teacher in the use of open pedagogies. At least in the studied case, it seems that it was not open education to stimulate the teacher to open pedagogies; on the contrary, the pedagogical approach made the teacher a more open educator.

Item	Average	St. Dev.
The online course was useful	3,50	1,22
The use of the applications OLAT and Teams to attend the online course was easy	3,92	0,93
The discovery of the requested information was easy	4,00	1,02
The online course helped me in understanding better the course domain	3,42	1,14
The online course supported my learning process	3,67	1,09

Table 4 - Results evaluation from the questionnaire (Likert scale 1-5, where 1 = not at all; 5 = a lot) – online course (overall).

The practice, however, is always limited by practical and institutional concerns. As Cronin noted (2017, p.21): "the use of OEP by educators is complex, personal, and contextual; it is also continually negotiated". Likewise, in this case, some limitations and hindering factors, as well as additional issues to open learning design, were observed.

The ICT tools were more or less given. The use of the LMS platform and the synchronous communication tool of the university was a choice of the institution. The option also considers institutional needs of having registered/enrolled students, the need for tracking both activities and testing/assessment. We should recognise that at least in formal education, the choice of technologies is often limited.

Time could be an issue for all involved players. To meet within the group and with entrepreneurs and tutors would require high flexibility in time. On the one hand, it is understandable that entrepreneurs cannot devote much of their working time to meet students; on the other hand, tutors and the teacher need to be available in the evenings. Similarly, students can have problems in finding the right time to work together, or to be available to work with tutors and entrepreneurs in the evenings/unsocial hours.

Finally, data analysis did not provide enough elements on the student perception. More qualitative research is needed to understand the role of the students in open education. The active engagement of students, as well as their autonomy, or the willingness to actively participate, should not be given as assumption. Teachers regularly experience resistance to active pedagogies, particularly to group work, but also open debates, public speaking, peer-assessment or any other method that take out students from their comfort zone. Active learning requires more efforts and time than studying to do the exam. To increase openness in teaching, then, more work is also needed to understand learners better. Concerning that, it is essential to recall that the students' body can be very diverse: it should be therefore considered the responsiveness of OERs and OEPs to different needs.

For this reason, we need to design open educational ecosystems better to support inclusive learning practices (Zhang et al., 2020), so that the right to equitable quality education can be effectively implemented. The characteristics of OERs and OEPs, including the possibility of reusing and remixing, could facilitate the fulfilment of different user needs, through their functioning with the learning context (Giaconi et al., 2020). Therefore, OERs and OEPs could be key resources for the promotion of lifelong learning for all. It is therefore essential to take into account in the design and use of OERs and OEPs' pathways different analysis plans that allow to meeting the needs of students with disability and with Specific Learning Disorders. To this end, the three pedagogical dimensions that can contribute to the implementation of inclusive processes through OERs and OEPs are fundamental, namely accessibility, usability and personalisation.

In any OER/OEP it is thus important to consider the level of accessibility, i.e. "the use of a product, service, framework or resource in an efficient, effective, and satisfying way by people with different abilities" (ISO 9241-171, 2008); of usability, i.e. the "degree in which a product can be used for specific users to achieve specific goals with effectiveness, efficiency and satisfaction in a specific use context" (ISO 9241-11, 1998), and, finally, of customisation, i.e. at what level different paths have been designed and activated according to the cognitive style profile of each user (Giaconi, 2004). To this aim, the model of analysis of OEPs and OERs proposed in Table 5 takes up the conceptual and procedural dimensions typical of the construction of learning courses, by adopting an inclusive perspective (D'Angelo & Del Bianco, 2019; Giaconi et al., 2018, 2020). The categories developed by Nascimbeni et al. (2018) can integrate the principles of accessibility, usability and personalisation in the analysis of OEPs and OERs (Capellini & Giaconi, 2015). The pedagogical dimensions (accessibility,

Design	**Content**	**Teaching**	**Assessment**
Accessibility degree	*Accessibility degree*	*Accessibility degree*	*Accessibility degree*
A3. High A2. Medium A1. Low	B3. High B2. Medium B1. Low	C3. High C2. Medium C1. Low	D3. High D2. Medium D1. Low
Usability degree	*Usability degree*	*Usability degree*	*Usability degree*
A3. High A2. Medium A1. Low	B3. High B2. Medium B1. Low	C3. High C2. Medium C1. Low	D3. High D2. Medium D1. Low
Personalisation degree	*Personalisation degree*	*Personalisation degree*	*Personalisation degree*
A3. High A2. Medium A1. Low	B3. High B2. Medium B1. Low	C3. High C2. Medium C1. Low	D3. High D2. Medium D1. Low

Table 5 - Model for analysis of accessibility, usability and personalisation (Giaconi et al., 2020).

usability and personalisation), concerning the framework developed by Nascimbeni et al. (2018), can be analysed taking into account three levels of compliance, to meet the diversified needs of the users, as follows:

- *High*, when the resource and practice reach the highest level of effectiveness, efficiency and satisfaction for end-users;
- *Medium*, when the resource and practice reach the average level of effectiveness, efficiency and satisfaction for end-users;
- *Low*, when the resource and practice reach a minimum level of effectiveness, efficiency and satisfaction for end-users.

The evaluation of OEPs and OERs in relation to these three dimensions can be carried out either by a staff of experts through the use of specific tools (Alsaeedi, 2020), and/or by involving final users, e.g. people with disabilities and Special Learning Disorders.

Therefore, by taking into account the students' perceptions of open education, it is also essential to include the dimensions of accessibility, usability and personalisation both to OERs and OEPs, to increase the inclusion of all students in the educational contexts (Schiavone, 2017; Zhang et al., 2020).

This study aimed at analysing the degree of openness of an undergraduate course: conclusions highlight that the awareness of teachers about OER/OEPs is not necessarily related to the declared openness of the course, as the course could be open beyond teacher's purposes, and that more research is needed on end-users, therefore students, to increase inclusion and learning effectiveness.

Limitations of the study

The study analyses a case with limited sample of students: it offers insights for further research, but it cannot propose generalised conclusions. The course took place during the lockdown during the 2020's pandemic, thus in an atypical situation and in emergency times, which could have affected students' psychological and emotional reactions.

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DEPIT application: open and shared digital artefacts for visible design

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Abstract

In the complex contexts of nowadays classes, there is the need for a Learning Design not limited to linearize both objectives and contents, but that is guide, orientation, support to the teaching-learning process. This contribution describes the implementation of DEPIT app for learning design, developed as a part of a project financed by the European Community and carried out by three networks of schools and 4 universities through DBIR methodology. This app produces visual, digital and multimodal design artefacts, which can be used with students in a classroom during the action and shared with a community of teachers. According to OER principles, this app is internationally disseminated through a MOOC available on a European platform. Teachers' design becomes common heritage (Open Educational Practices) between teachers and students and it is replicable and reusable in different contexts. The experimentation of this app highlighted its transformative feature in comparison with the teachers' design practices, which become explicit, sustainable and shared with students.

KEYWORDS: Learning Design, DEPIT App, Transformative, MOOC, OEP.

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1. Introduction

The complexity of teaching-learning processes and school in the current liquid and constantly changing cultural context (Barnett, 2013; Bauman, 1997), the cultural, cognitive and experiential differences among students (Rivoltella & Rossi, 2019), the multimodal items in didactics (Kress, 2009) create the need for an accurate and explicit learning design, which is located concerning the context and the class, respectful of differences and inclusive (Laurillard, 2012) and it can be explained and shared through digital artefacts designed in an open perspective (UNESCO, 2019).

The teacher is required to have the competence to design paths related to the context, which enhance and aggregate young people's informal knowledge, to create situated modal maps connecting knowledge, experiences and emotions, intra and inter-personal disciplinary dimensions (Fishman & Dede, 2016). To be effective, this complex design must be made explicit with the students, to whom the awareness of a global path only allows them to be oriented and motivated and to anticipate various steps (Berthoz, 2009). In fact, the design is not simply the process preceding the action, to fix its steps and development, anticipating it and taking into account the students' reactions, but it becomes a space, where prediction, action, reflection and sharing intertwine and create, involving not only the designer teacher, but also the students: this design is both addressed and devolved to them in some of its dimensions and perspectives making them co-creators. The design must also be made explicit with the community of teachers to share it and to try to contribute to the innovation of teaching-learning processes and pedagogical and inclusive approaches in an Open Educational Practices (OEP) perspective (UNESCO,

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2019; Ehelers, 2011) through communities of practice (Wenger et al., 2002), which design, experiment and reflect on teaching activities.

In this way, this design artefact can become a teaching mediator, which builds a bridge between the teacher's idea and classroom practices. If the artefact, used for explicitation, is digital it can be an aggregator between the structure and the materials, a bridge between designing, action and documentation (Bannan, Cook & Pachler, 2016). A digital artefact supports teachers and can be shared with the educational community. If the design artefact is a Graphic Organizer, the students in class can visualise it (Visible Design). It could favour their orientation, motivation and awareness about the global path.

In this way, a school can be defined as a "public good", a meeting place for the enhancement of personal experiences and their awareness and reconstruction, respecting the diversity and the multiplicity of both students and cultural reference perspectives and, at the same time, trying to offer everyone some paths which intercept their personal attitudes and postures. This approach, which sees the creation of explicit, co-constructed and shared digital design artefacts, is consistent with that OER (Open Educational Resources) perspective, intended as

> *"Learning, teaching and research materials in any format and medium that reside in the public domain or are under copyright that have been released under an open license, that permit no-cost access, re-use, re-purpose, adaptation and redistribution by others" (UNESCO, 2019, p. 5)*

and it extends, beyond the mere production and availability of open content, towards what are called OEP (Open Educational Practices), a multidimensional and unifying construct, which recalls all that

> *"collaborative practice in which resources are shared by making them openly available, and pedagogical practices are employed which rely on social interaction, knowledge creation, peer-learning, and shared learning practices" (Ehlers, 2011, p. 6).*

Therefore, it is important to wonder: can a digital artefact turn the teacher into the protagonist in the design phase becoming an orientation tool for the students? Can it join sense and sustainability? What is the added value of being explicit, open and shareable?

This contribution is going to illustrate how the European DEPIT project (http://depit.eu/) tries to answer the previous questions and to introduce and to discuss the results of this project:

- the creation of a shared method and an open app[2] to support the teachers' design and the students' orientation, disseminated and shared in the international community through a MOOC[3];
- the production of open design artefacts, which are shared with students and the community of teachers in the form of a Graphic Organizer;
- the use of these artefacts in the design, action and documentation phase.

2. DEPIT project

National and international research on learning design methods, which were proposed by teachers, generated the idea for the DEPIT (Design for Personalization and Inclusion with Technologies) project, launched in 2017 by an international partnership, who won a call for funding from the European Community. The project leader was the University of Macerata (Italy), supported by the Catholic University of Milan (Italy), the University of Seville (Spain), the University College of London (UK) and the Italian start-up Infofactory and three networks of schools (two Italian and one Spanish).

Starting from the intuition developed by Diane Laurillard through her Learning Designer, this project had as its main objective to develop an application which can be used by teachers for teaching design at the level both of annual course and daily activities. This had to be reified in digital artefacts, which were realised in the form of graphic organizers and did not just describe the teaching path, but they became a support for the action, a guide and a reference point for both teachers and students. These artefacts are produced in the form of a deep and navigable map at various levels of granularity, with immediate shift between upper and lower knots. Moreover, the map also becomes an aggregator, as it allows both the uploading of digital materials, which the teacher is going to use during the lesson or to make available to his/her students, and the addition of the students' products created during the lesson.

The design artifacts provided with the uploaded teaching materials are available both online and offline and the application allows different levels of sharing, which are selected by the designer teacher with his/her school community, the teachers with whom he/she shares parts of the curriculum, the classes and the entire international practice community. This latter aspect takes on a particular relevance from an OER point of view, in fact, the application is open. Moreover, the last phase of this project, which was implemented between 2019 and early 2020, provided for two dimensions of diffusion and dissemination at an international level. On the one hand, it wanted to encourage the sharing of the results of the experimentation carried out both with networks of Italian and Spanish schools and the international

[2] Downloadable at the following link https://infofactory.it/media/trial/files.html

[3] Accessible at the following link: https://bit.ly/30oKhAV

community of practitioners and academics, through a series of seminars for the introduction of the results, and the validation of teaching and pedagogical processes activated thanks to the use of the application both European and American scholars, involved in ICT field for teaching and curriculum studies. On the other hand, it made this application available to the teachers all over the world through the implementation of an open MOOC, joining the diffusion process with both technical, pedagogical- didactic and practical methods, where the experimenter teachers show the possible ways of use, to learn how to fully exploit all the potential of this tool and to share the principles which inspired its realization. In this sense, it is possible to state that we move from an OER point of view towards an OEP point of view, to encourage the creation of an international community of practice, who shares and collaboratively works on design artefacts, starting from common epistemological and teaching assumptions, which are scientifically validated by the researchers who led this project and the experimenter teachers who tried the use of this application in the classroom.

The meeting between researchers and practitioners and the experimentation carried out throughout the project highlighted the needs and the problems which the realization of these design artefacts through DEPIT app and their use in the classroom let them intercept, allowing innovative solutions, which are grounded to the reality of school contexts:

1. The need to make a transition from a bureaucratic vision of teaching design to a fluid, non-rigid, continuously revisable design artefact intended as a support for teaching action, a direction for students and a mediator of knowledge involved in the practice.
2. The need to design explicit, visible, shareable, sustainable and viable paths for teachers.
3. The chance to increase the functions of the design artefact: it is used not only to design, but also to implement, to document, to reflect on the action.
4. The need to overcome the virtual and real walls of the school micro-community, to share and to discuss their design artefacts and the teaching points of view involved in them with colleagues coming from other countries and cultures. This is to build open and shareable digital design resources, available to the whole community: it is a matter of reifying OEP key principles, that is creating flexible spaces, where teachers and students interact and make free and divergent choices and have the opportunity to integrate different subjects and knowledge (Cronin & McLaren, 2018).

3. Background

The need for designing and building digital artefacts for the learning design places itself in the Learning Design (LD) research field (Koper, 2005; Laurillard, 2012; Dalziel et al., 2016).

First of all, designing means planning macro-structures, which are the organizational and conceptual outlines of the learning path and give account of the epistemological, pedagogical and teaching lines followed by teachers: the Curriculum Studies area (Joannert, 2011) epistemologically and didactically explores, analyses and supports the mechanisms underlying this macro-design dimension. At the same time, the design also concerns the micro-dimension, that is the complexity of Teaching and Learning Activities (TLA), linearized in teaching-learning sequences (Rossi, 2017a) and represented by the designer teacher in different and mixed forms: the teacher produces mediation artefacts (Conole & Wills, 2013), through which he/she codifies and represents his/her choices and intentions, illustrating the intrinsic meaning of his/her planned activities. These artefacts can be narrative, iconic, taxonomic and modular (Falconer & Littlejohn, 2009) and refer to the material and semiotic tools through which a person exercises his/her control and manages the change processes on the object of the activities which he/she intends to put in place to produce cognitive development, according to Vygotskij (1990).

So, this multimodal artefact assumes the characteristics of a layout (Kress, 2010; Falconer & Littlejhon, 2009), a Graphic Organizer (GO), intended as a logical-cognitive structure, which can support abstract thinking (Starling, 2017).

This visual dimension (Kimbal, 2013) allows to explicit, to systematize, to organize courses and materials in shared, interactive graphic forms, which favour the management of classroom activities, the awareness, the process orientation, the constructive alignment (Rossi , 2017) between teachers and students, the activation of the Conversational Framework (Laurillard, 2012). All that is favoured if this artefact is a visible object (Visible Design) and can be shared with students.

Representing design and making it visible and tangible also allow to make it a common and shared practice: this is in the perspective of an Open & Participatory Culture (Jenkins, 2006), which requires renewing the skills of those working in the educational field to adapt them to the needs of the contexts based on informal and peer-to-peer learning, having innovative attitudes towards intellectual property, mixing cultural identity to increase a more proactive concept of citizenship: according to Nascimbeni (2018), these are the potentials and the benefits of these emerging, open and participatory dynamics.

The Open Education Practices paradigm (Cronin & MacLaren, 2018), which encourage the reuse of Open Educational Resources (Downes, 2007) to promote the innovation of the teachers' pedagogical models and the empowerment of learners intended as co-producers in their lifelong learning course (Ehlers, 2011) can be used to understand the idea of sharing, interaction and exchange, which is inherent in the idea of an open

application acting as a bridge between teachers and learners at an international level.

4. Materials and Methods

The main methodological reference of this research project was the Design-Based Research (Brown, 1992; Collins, 1992) in its extension of Design-Based Implementation Research (DBIR) (Fishman & Dede, 2016; Gomez Zaccarelli & Fishman 2017), whose application in the educational field enables the cooperation between theorists and practitioners to implement and improve innovative contexts and artefacts (Jacobson & Reimann, 2010; Kelly, 2004). In fact, from the beginning this project provided the main role of networks of schools and teachers, who took part in all the work phases as co-investigators together with researchers, collaborating in the initial examination, the design of the app, the experimentation of the beta version and, in the final phase, the production of video and paper materials to support the dissemination of the project idea and the app through MOOC in other European schools. The school-university relationship was proactive and generative and significantly contributed to the success of this project.

DBR methodology does not concern if a particular technology works better than others, but it focuses on the context where the teaching-learning process takes place, wondering how the whole system can work better to support learning. However, a DBR limitation is that it often focuses on the analysis of a single class or group of classes and not on the school level or the school system. While particularly enhancing close partnerships between researchers and teachers, working on small-case DBR does not usually lead to a product that is designed with scalability and sustainability over the period of its active research and development, and there is a long history of well-validated interventions fading away as their developers turned their attention to other projects (Gitomer & Bell, 2016). For this reason, some scholars (Fishman et al., 2013) proposed a DBR form, which considers scalability and sustainability as a central aspect from the beginning of the design process. DBIR combines the iterative and learning-focused work of the learning sciences field with a focus on organizational change and the conditions for implementation effectiveness (Gitomer & Bell, 2016). On this regard, Fishman, Penuel and some colleagues imagine a particular form of partnership between researchers and practitioners to identify and solve persistent problems of practice in education and they believe that DBIR creates a sort of "third space" understood as a culture and a hybrid place built together by researchers and professionals and that is organised to be self-sustaining over time (Gutiérrez, Rymes & Larson, 1995).

DBIR is a systematic and flexible methodology, which is articulated in the following steps: design, direct implementation, analysis of the effects and redesign (Wang & Hannafin 2005); and it has four key principles: A focus on persistent problems of practice from multiple stakeholders' points of view; A commitment to iterative, collaborative design; A concern with developing theory and knowledge related to both classroom learning and implementation through systematic inquiry; A concern with developing capacity for sustaining change in systems (Fishman et al., 2013).

Therefore, DBIR is connected with

> *"developing knowledge, tools, and practices related to equitable implementation of innovations and the capacity of partnerships to improve outcomes through inclusive research and development processes" (Peneul, 2019, p. 391).*

This methodological approach, which considers the role of partnership between theoreticians and practitioners and collaborative co-design in a community of practice fundamental, can be integrated and find a particular coherence in supporting the transition from content-centred approaches, which focus on educational resources (creation, sharing, etc.), to more practice-centred ones that foster collaboration between learners and teachers for creating and sharing knowledge (Cronin, 2017), that is that transition from creating and publishing OER to practices that can be implemented using OER for education, referred to as OEP (Huang et al., 2020).

4.1 Research approach

According to DBIR principles, extensive data containing different aspects were collected and documented using different research methods, located in a real learning context (Collins et al., 2004). The "real world design settings" perspective was examined in consecutive stages with various tools.

This project was configured according to a recursive work scheme, which included the following actions: statement of the researchers' principles and hypotheses, technical implementation of the product by technicians, practitioners' experimentation, data analysis and their interpretation for co-explanation and co-confrontation to set new perspectives and to identify the necessary innovations for the structure of the application.

The planned steps were the following ones:

1. Initial examination to define the context and to bring out the needs in terms of learning design.

To support the design of this application, a two-perspective research was carried out and firstly included a survey of the international literature relating to curriculum studies and teaching transposition. This produced a collective research report, shared by four universities involved, to create a common lexicon and to establish the theoretical assumptions of the examination. Subsequently, a direct survey was carried out through

questionnaires with closed and open questions to get a general real framework, that is to understand how the teachers' plan. The first questionnaire distributed in both Italian and Spanish schools taking part in this project was answered by 289 teachers.

2. Implementation of DEPIT application.

In the second phase, the exclusively qualitative data were collected through a series of meetings between experimenter-teachers and researchers, which were intended to test and to collect the impressions, the strengths and the weaknesses of the subsequent versions of the application released. Researchers filled in summary sheets noting the explicit requests at a technical and functional level and the shared needs at a design level, which could have been translated into the functionality of the app.

3. Testing the application in the classroom.

The test and the evaluation of this artefact involved more than 40 Italian and Spanish institutes and over 200 teachers. Test data were carried out in two ways:

- questionnaires with open questions to mainly examine three aspects: 1. data collection on timing, organization and design structure carried out through DEPIT app. 2. Involvement and sharing with students 3. Reflection and/or reflexivity activated thanks to the design created with the app. The collected data subsequently oriented the definition of the questions for the focus groups;
- focus groups (Krueger & Casey, 2001) with experimenter-teachers: 7 focus groups were carried out in Italian schools, in which more than 50 teachers took part, selected among those who had made most of the work sessions with this application, also using it with students in a shared way. The transcripts of the focus groups were analysed according to the rules of a dialectical comparison, trying to understand the depths of the evidence and the arguments which supported various points of view.

4. Dissemination, sharing and availability of this application through a MOOC.

The researchers involved in this project developed a multilingual MOOC "Designing for Personalization and Inclusion with Technologies", which is supported by the European Schoolnet Academy international platform and aimed at a both technical and teaching training of all the teachers interested in this project and the dissemination of this application as a freely available tool for learning design in schools all over the world. MOOC is configured as a training, which is made available to all the teachers interested in using this application in their classes and promotes the sharing of practices and the reflection on them through a space for discussion and collective debate. Being still in progress in its first edition, now it is not possible to account for the results of both the diffusion and the reflections generated within the community of learners.

5. Results

The recursive course described above essentially produced three types of results: the first one is linked to the development and the improvement of DEPIT app, which was implemented according to the needs of the teachers and was internationally shared through MOOC.

The development of this project was carried out both in international meetings among partners and local meetings with groups of teachers; the project constraints have been just defined in these meetings:

- map structure of the artefact and connection of the maps in matryoshkas;
- possibility of using the artefact both online and offline or synchronizable;
- working in PCs and tablets, in IOS, Windows, Android;
- structure for schools and discussion of the roles assigned to various types of administrable accounts.

The course is organized on several levels (Dalziel et al., 2016): each of them represents a map where each knot/card refers to the lower level. The macro map represents the curriculum and contains the module cards, the meso map represents the module and contains the session cards, the micro map represents the session and contains the activity cards. Each card is joined to a sheet where descriptors can be inserted. In the activity card it is possible to insert digital materials and in this sense the application acts as an aggregator[4] (Figure n.1).

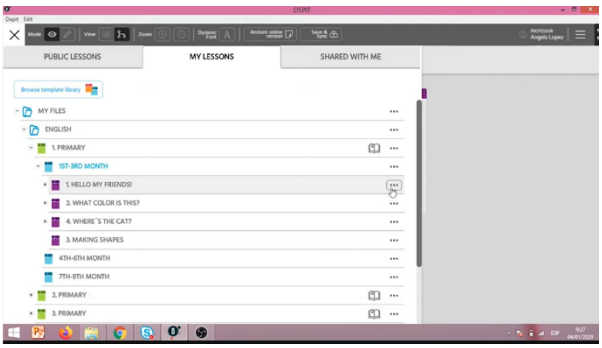

Figure 1 - The tree structure of the maps.

This design artefact can be viewed in the classroom (Figure n. 2), shared and often co-designed with students, promoting their orientation in complex paths and their motivation. Being even implemented with the materials produced during the activities in real time, it

[4] The following video shows an example of map structuring: https://youtu.be/5Qdkj3mpLyw

also acts as a design artefact, as a support during the action, and for documentation.

Figure 2 - Example of a micro level map.

The versions released (Table 1) are the result of various meetings between teachers and researchers and the analysis of the results of the experimentation carried out in the classroom. The application has been progressively modified in order to cover the needs and to overcome the problems which were noted in the use.

The second and the third results involved testing the effectiveness of the design artefacts created with DEPIT app in teaching/learning contexts. Two aspects emerged - one related to the teacher's point of view, the other to the student's one.

As for teachers, the keywords that emerged both from the questionnaires and the focus groups are:

- transformation: teachers chronologically highlight a before and an after in their design methods, especially in the articulation of the course and the timing management;
- safety: the path is always available and can be retraced, both in the design and in the action phases, makes the teacher safer in teaching action in comparison to the course that the class is carrying out;

Version of the app	Implemented features	Research-training support
March 2018 Internal demo version - unsavable artefact	Graphical aspects of cards, map structure and design levels	Micro and macro design. Graphic Organizer for design Initial questionnaire on the teachers' design needs
May 2018 Demo version - unsavable artefact	Implementation of the characteristics for an aggregator (uploading and downloading materials)	Multimodality and depth: integrated design with action Initial questionnaire on the teachers' design needs
August 2018 Closed version with personal account	Releasing personal accounts to teachers. Editing module - session - activity cards	Curriculum for skills and teaching transposition. Teaching and Learning Activities Researchers' assistance
October 2018 Closed version - update with personal account	Development of graphic and structural aspects related to teaching needs. Sharing artefacts among users	Design analysis Intermediate questionnaire on the first results of the classroom experimentation
April 2019 Open version with account released by schools	Central server: schools become administrators and release accounts to teachers. Sharing public and private artefacts	Design analysis Focus group on the transformativeness of the design artefacts Semi-structured interviews
September 2019 Open final version	Greater flexibility of the graphical elements in a design artefact. Arrangement of the inclusive graphics (font for Dyslexia)	Final questionnaire for experimenter teachers. Confrontation during transnational meetings between researchers and teachers coming from various countries

Table 1 - The app implementation process.

- aggregation/availability of digital materials: the application replaces the mobile memories which teachers had to bring in the classroom by selecting materials and mediators from time to time and allows to organize them in a quicker and easily recoverable way, based on various sessions and work activities;
- documentation: the artefact is also a documental support, which summarizes and keeps track of what was done by teachers and students during the school year.

As for students, the main effects of using design artefacts for their learning posture are:

- orientation: students share the entire educational path with teachers from the beginning, they can retrace it and safely move through the topics already carried out and to be carried out;
- awareness: the explicit expression of objectives, activities and contents makes students more aware of what they did and what they are going to do;
- reduction of anxiety/security: the most insecure students are especially reassured by a representation which anticipates what will be done.

6. Discussion and Conclusions

Retracing various phases of this project, its transformative feature is evident among the characteristics of the DEPIT App.

Transformation is not limited to a simple transition from a paper-based design of notes, which is often non-institutional or produced in draft form for personal use and consumption by teachers, towards an explicit design, realized through a technological tool and reified in multimedia and multimodal artefacts.

The analysis of the design and the focus groups carried out with experimenter teachers highlight a transformation in teachers' practice and design posture.

Firstly, design becomes a guide shared between teachers and learners, which allows continuous retracing and, therefore, reflection and regulation in the action of classroom teaching action. Secondly, the function of aggregator of materials, held by design artefacts, makes possible that the activity materializes and directly takes shape in digital artefacts: design and action hybridize; design is part of the action and it is never a concluded process, but in constant evolution.

Thirdly, the possibility of sharing their design products makes them Open Educational Resources both in their own school community and outside it, with the possibility not only of reusing them by other teachers in other contexts, but also modifying, expanding and implementing them. We are always in a hybridization dimension, understood as a form of shared authorship, which is typical of the new production methods in social environments.

Transformativeness is not made explicit only by teachers. In fact, in the interviews released, the latter ones highlight that the use of digital design artefacts also tends to transform the learners' posture.

This is mainly due to the visual dimension of GO products. Indeed, students become aware of what they are going to do and always keep track of what they have already done in an almost tangible visual way. In design, they find out both the annual curriculum and the materials used in each lesson and their contributions, which can be loaded into the cards of the specific activities. This allows orientation and awareness concerning the learning process which makes learners more secure on the one hand and allows them to act in anticipation of what will have to be learned on the other hand, creating cognitive bridges between their experience, knowledge and predictions about the future of their cognitive course.

Research in progress in the experimental classrooms is also showing that the systematization process of knowledge carried out a posteriori is even safer: students can develop different metacognitive and retracing skills of their learning process, which are more organized than the control classes, whose teachers did not use the DEPIT application for teaching design.

Finally, it is possible to generally hypothesize a transformation in terms of flexibility and alignment to the teachers' design needs, which is implicit in the pedagogical-teaching assumptions leading to the creation of the application. In fact, compared to other technological products for learning design (e.g. Diana Laurillard's Learning Designer, that remains the starting point for the idea behind DEPIT project), it has a system designed from below: its features were structured starting from the requests and the needs found among teachers. So, it does not "force" their design into predefined schemes or fields already given, but it adapts and can be modified according to different reference contexts.

From this consideration, some tracks of examination for the near future are opened.

On the one hand, it is possible to wonder how the mutual adaptation between user and tool will be codified in the use of technologies: will teachers adapt and bend the use of the app to their mental models, also finding alternative and unforeseen solutions and methods of use? Or will the pedagogy in the application change and enrich the reference epistemologies and the teaching models of the teachers?

From the beginning, this project was international and designed the app and the multilingual MOOC with the aim not only at conceiving and sharing the product created in OER terms, but also promoting a method and a pedagogical-didactic approach based on Visible Design, the use of Graphic Organizers and the role of designer and director teachers for teaching action, which actively involves students in a work of alignment, co-creation of objectives and courses in action, but also anticipation, orientation and awareness in a constant

hybridization between design-action-documentation. Therefore, this is a possible example of how openness can contribute to innovate practices and teaching-learning processes in an OEP perspective.

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Self-directed open educational practices for a decolonized South African curriculum: a process of localization for learning

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Abstract

This conceptual article explores self-directed localized open educational practices for a decolonized South African higher education curriculum. From the historical context, language demography and especially due to student protests regarding the curriculum the need for a decolonized South African curriculum is evident. In this article, an overview is presented about the context-specific issues in relation to decolonization and language. It is proposed that in order to move towards a decolonized South African curriculum, there should be a self-directed learning approach to open educational practices which would involve carefully planned and supported localization efforts. This process also implies acknowledging both internal and external localization as done in a structured or even student-driven manner. Furthermore, localization means drawing on translations study theories pertaining to specifically dynamic equivalence. This approach would require increasingly accommodating languages other than English in the higher education context and as such language attitude planning efforts are needed. Finally, open educational practices would require an open ongoing process which provides agency to South African teachers and students to use the language of their choice to engage with content applicable and relevant to their contexts. In addition, this would imply including indigenous knowledge in order to address the needs of a decolonized curriculum. In conclusion, this article presents some practical recommendations towards self-directed localized open educational practices for a decolonized South African higher education curriculum.

KEYWORDS: Self-directed Learning, Open Educational Practices, Open Educational Resources, Decolonization of the Curriculum, Localization.

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1. Introduction

South African higher education has been impacted by student protests and a grassroots campaign to decolonize the university curriculum (cf. Jansen, 2019; Lange, 2019; Le Grange, 2019). In addition, within the South African and the wider African context in the literature and educational practices the idea of decolonizing knowledge is not new and has been a reaction to the hegemony of Western or colonial knowledge structures (Le Grange, 2019). Despite a history of efforts to counter the influence of the country and continent's colonial past, Western knowledge still predominates especially in higher education. Consequently, the need has been expressed for a change in the curriculum and this article attempts to address this issue through this conceptual consideration of the affordances of self-directed open educational practices and localization in this context.

The multilingual nature of the country (Olivier, 2011) has also contributed to the complexity of the context as 11 languages are recognized officially but there are more than 25 spoken in the country (Maseko & Vale, 2016; Ssebbunga-Masembe, Mugimu, Mugagga & Backman, 2015) while mainly English remains the major language of learning and teaching. In addition, despite many organizational changes in South African universities since the fall of apartheid and major changes in government and education after 1994 little has been done to address the nature of knowledge in the curriculum (Lange, 2019). This article aims to provide

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options to address this gap.

This article explores the issue of decolonizing the curriculum in the South African context in terms of localized open educational practices (OEP) which relates to the use of open educational resources (OER) in the classroom. This focus is essential as it is considered that the OER movement aims to opening up access to knowledge through technology (cf. Pereira, 2007; Wiley, Bliss & McEwen, 2014). Part of this process is also allowing for the sharing, use and reuse of such knowledge. In addition, the possible advantages of OER in this context is evident from the literature (Olivier, Van der Westhuizen, Laubscher & Bailey, 2019). In this article, it is recommended that OEP are approached within the context of self-directed learning (Brockett & Hiemstra, 2019; Gibbons, 2002, De Beer & Mentz, 2019; Knowles, 1975).

Mulder (2009) acknowledges that "[c]olonialism and neo-colonialism severely affected and still affect the dissemination of knowledge in and on Africa" (p. 5). It is important to consider the role of OER in this context. In this regard, Amiel (2013) observes that OER can cross the divide between those who create and consume educational resources. Therefore, OER can be useful in countering what Jansen (2019) describes as "the regnant knowledge in the former colonies draws its authority from the West and, in particular, from the former colonial powers" (p. 14).

It is proposed that knowledge in the higher education context be adapted to address the needs of a changing South African student and wider academic community. This process implies some form of localization in order to make OER relevant for a South African context. Localization in this article, in agreement with Wolfenden and Adinolfi (2019), relates to both adaptation where the content is made relevant as well as translation where the text is converted from one language or language variety to another that is appropriate for the target learning context.

One way of addressing the curriculum concerns raised at the start of the article, is contextualizing and localizing content and within the context of this article specially OER. The UNESCO *Recommendation on OER* (UNESCO, 2019) also highlights the importance of OER being contextualized and localized.

Towards reaching these goals of creating OER that are locally, culturally and linguistically relevant, issues around decolonization and localization need to be considered. But such implementation should be related or even embedded within the OEP.

These aspects around a decolonized curriculum should also be considered within a wider context of learning that is supportive of diverse cultures, languages and knowledges. Consequently, this article should also be regarded within the wider scholarship of multicultural education especially in terms of technology integration (cf. Morgan, 2014). In addition, this article aims to address the gap in the literature in terms of having theoretical frameworks regarding language accessibility in OER. In this regard, Oates and Hashimi (2016) observe that "*[t]he issue of language accessibility remains an under-supported and under-researched need in developing the OER movement"*.

Consequently, a further important consideration for this article is the issue of language status online and especially in terms of OER. In this regard, the hegemony of English within the context of OER is evident and this has sometimes led to the exclusion of certain language communities (cf. Cobo, 2013; Krelja Kurelovic, 2016; Oates & Hashimi, 2016; Olivier, 2018). This ties in with the need for not only contextualization of OER for specific contexts around the world but also specifically localization with regard to the languages used.

The research question posed by this conceptual article (cf. Jaakkola, 2020) is as follows: *What would self-directed localized OEP for a decolonized South African curriculum entail?*

2. Materials and Methods

In order to address the research question posed above, a conceptual study was undertaken for this article. In this regard this article, as is the case with conceptual articles, focused "primarily on theoretical advances without relying on data" (Yadav, 2010). The process involved a systematic search and selection of relevant key sources. Furthermore, a theory synthesis methodology was followed through exploring the intersections of self-directed open educational practices in terms of a decolonized South African curriculum by means of localization.

3. South African higher education context and the decolonization of the curriculum

As stated before, the South African higher education system has emerged from a racially segregated approach where basically only English and Afrikaans (both Germanic languages with roots in Europe) were used as languages of learning and teaching. After the fall of apartheid in the early 1990s the role of Afrikaans was diminished significantly (Olivier, 2014) due to associations of this language with the former apartheid regime as well as a decline in comparative student numbers who have this language as mother tongue at specific universities. Despite, constitutional recognition of additional nine other African languages as official languages and many efforts to include African languages in language policies and some

practices English is still the dominant language in South African universities (Olivier, 2018).

Due to the apartheid legacy university staff were historically mainly white and curriculums reflected a bias towards Western knowledge. It must be acknowledged that universities are and were not in fact homogenous and that there have been many exceptions to the rule. However, especially from the view of students the mentioned profile and bias remained a key issue. From the South African government, a number of efforts have been launched to transform higher education, but the urgent need for change came in the form of student protests.

A prominent protest was the Rhodes Must Fall protest at the University of Cape Town in 2015 which was aimed at removing a statue of a colonial-era statesman, Cecil John Rhodes. The protest was also supported by a highly successful social media campaign driven with the hashtag #RhodesMustFall. This protest quickly spread and the decolonization of the South African curriculum was demanded by students. (Cf. De Beer & Mentz, 2019; Jansen, 2019; Lange, 2019; Le Grange, 2019).

Since the protests noted here, many universities in South Africa have started with various efforts to work towards some decolonization of the curriculum. In addition, these efforts should also be regarded in the government's drive to support the inclusion of indigenous knowledge (cf. Ezeanya-Esiobu, 2019) in the school context. Policy documents and legislation in South Africa also promote the idea of higher education being responsive to local needs, but in practice most efforts to change in this context was limited to the curriculum structure rather than the knowledge in the curriculum (Lange, 2019).

From the literature it is clear that decolonization is not a new concept and that it also pertains to intellectual decolonization (Le Grange, 2019). However, it is clear that the work around decolonizing the curriculum is not finished and that there is a need for an ongoing inclusive process where communities and students are also involved in the process. However, Le Grange (2019) observes that "students appear to invoke notions of decolonisation for symbolic reasons only, as these students and academics return to the settled curriculum after the protests" (p. 39). Therefore, the need for a continued and embedded is clear.

Contexts like annual protests by students around fees, language and accommodation as well as the COVID-19 pandemic has required universities to sometimes move to online content in a very short time. The #FeesMustFall campaign (cf. Le Grange, 2019) is a good example in this regard. This context has created the ideal milieu where localized OER could be utilized.

Consequently, this article proposes that using OER in OEP should be considered in any discussion around decolonization of the South African curriculum. However, it is also important that the process or OEP be open and inclusive. In addition, it is proposed that self-directed learning, and in this case more specifically self-directed OEP, is considered in this context.

4. Self-directed learning

In addition to the context of decolonization of the curriculum and the possible supporting resources like OER this article also promotes the importance of self-directed learning. The concept of *self-directed learning* is defined by Knowles (1975) as

> *"a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies and evaluating learning outcomes" (p. 18).*

This process and student characteristic are considered in the higher education learning context, however, in this article the relevance of this concept for both decolonization and OEP is highlighted. Central to this discussion is also the self-directed learning ability of students to be able to identify material resources for learning. In addition, the relevance of self-directed learning extends from students to university lecturers as Mentz and De Beer (2019) state that teachers should also be self-directed themselves.

Self-directed learning is also relevant to this research as from literature this aspect is especially necessary in online environments which are typically also associated with OEP. In this regard, Lasfeto and Ulfa (2020) state that *"[t]he level of self-directed learning readiness in using online technology is very significant to reach academic success"* (p. 35). Self-directed learning also supports the creation of student-centered and collaborative spaces of learning (Lasfeto & Ulfa, 2020) which would be necessary for a more inclusive approach to OEP. Research has repeatedly proven the relevance of SDL for effective learning (Brockett & Hiemstra, 2019; Gibbons, 2002, De Beer & Mentz, 2019).

A key requirement for self-directed learning is the fact that options should be provided in terms of technologies (Lasfeto & Ulfa, 2020) but also in terms of content and language. In this regard, the availability of multilingual OER could be beneficial in multilingual contexts. In this regard, Valor Miró, Baquero-Arnal, Civera, Turró and Juan (2018) has shown how multilingual videos can be used effectively.

The inclusion of indigenous knowledge (cf. Ezeanya-

Esiobu, 2019) in the curriculum has been considered as a way to aid decolonizing the curriculum (Breidlid & Botha, 2015; De Beer & Mentz, 2019). Furthermore, the link and the affordances of self-directed learning and indigenous knowledge is also evident from the literature (De Beer & Mentz, 2019; Mentz & De Beer, 2019).

Importantly, De Beer and Mentz (2019) found that holders of indigenous knowledge, which is highly relevant for the decolonization of the curriculum, are self-directed learners themselves. In this context, De Beer and Mentz (2019) observe that the indigenous knowledge "holder's learning is directed by finding innovative solutions to authentic problems" (p. 89).

Therefore, any OEP efforts within the context of decolonization should also foster self-directed learning in order to support student agency but also espouse life-long practices in this regard. In the next section, the issue of OEP are explored further.

5. Open educational practices (OEP)

The concept of OEP is defined by Wolfenden and Adinolfi (2019) as a "wide range of individual and collective practices inherent in conceptualising, creating, adapting, curating and sharing OER" (p. 327). It is clear that OEP depend on the use of OER. In this regard, OER was defined by UNESCO (2019) at the General Conference meeting in Paris in November 2019 as follows:

> *"…learning, teaching and research materials in any format and medium that reside in the public domain or are under copyright that have been released under an open license, that permit no-cost access, re-use, re-purpose, adaptation and redistribution by others".*

Central to OEP is open pedagogy and this pertains to the use of OER in practice. According to Wiley and Hilton (2018) open pedagogy is "the set of teaching and learning practices that are only possible or practical in the context of the 5R permissions which are characteristic of OER" (p. 135). In addition to David Wiley's (2020) 5Rs, within the context of this article a sixth R is proposed:

> *"Recontextualize – the right to append, adapt or modify content to be relevant to a specific learning context while considering existing biases and hegemony of knowledge from the West and the Global North".*

This recontextualization relates to the concept of glocalization where the fusion of Western science and indigenous knowledge at an epistemological level is implied (De Beer & Mentz, 2019). There is already evidence of good practices in terms of localizing open textbooks available online (cf. Jimes, Weiss & Keep, 2013). However, more can be done in this regard at higher education level. In addition, in this article OEP is regarded not only as a teacher-centered activity but rather a range of practices by teachers and students in a student-centered context where self-directed learning is fostered.

For the sake of this article, the revision of OER is prominent. Revising OER depends a lot on language and in the case of opening up the use of such resources implies localization and translation. In this context, Amiel (2013) notes that "[a]n often-ignored barrier to remix and revision is the English-language and western bias of the Internet and particularly OER" (p. 136). So, the challenge remains to situate OER in terms of language and content.

Similarly, Cobo (2013) states that there is a "need for a new understanding of access to content capable of addressing the cultural and linguistic barriers that exist beyond opening the access to resources" (p. 122). Hence, apart from the fact that the use of OER is impacted by access to technology (De los Arcos & Weller, 2018), the epistemological and linguistic access issues cannot be downplayed.

In the following discussion I explore what self-directed localized OEP for a decolonized South African curriculum would entail.

6. Discussion

6.1 Decolonizing content through translation and localization

Decolonizing the curriculum implies a reconsideration of certain content especially content associated with a colonial or neocolonial context. When it comes to the use of OER in higher education the bias in some OER towards the West or Global North (Wolfenden & Adinolfi, 2019) should also be considered.

Hence in the adaptation of OER a process of localization needs to be done in order to make the content relevant to a decolonized self-directed OEP. Localizing content is not a new concept (Wolfenden & Adinolfi, 2019) but the affordances of OER in this context can be extended in the South African context.

Wiley et al. (2014) acknowledge that localization is one of the most important but also least understood facets in terms of OER. In this regard, this article attempts at addressing this gap in the knowledge by exploring the intersections between self-directed OEP, OER, the decolonization of the curriculum and localization. Localizing OER implies rendering content in other

languages but also ensuring that the technology is appropriate for the context (Oates & Hashimi, 2016).

In essence, any efforts of adapting and localizing resources become a translation issue. Consequently, it is proposed in this article that practitioners within OEP draw on translation theories. Despite some attention to translation and the use of languages other than English in the scholarship of OER and OEP (cf. Amiel, 2013; Cobo, 2013; Oates & Hashimi, 2016), there is little focus on translation theory specifically in this context.

Wiley et al. (2014) refer to the "localization problem" in this context and emphasize localization should be done by a "local". Consequently, localization implies some input from users of OER within the context in which it should be used and by implication could also extend to OEP agency among students and communities. Pereira (2007) also highlights the importance of content localizations by "local partners", especially through the creation of pedagogical teams which could be supportive in collaborative localization (Jimes et al., 2013; Wolfenden & Adinolfi, 2019) efforts. Tarasowa, Auer, Khalili and Unbehauen (2014) describe how crowd-sourcing could be used in the translation process of OER.

However, just as much as the fact that instructional design and creating a curriculum require very special skills in addition to in-depth subject knowledge, so should localization and translation also be considered as highly skilled activities. These issues prompt the need for collaborative work between different experts. The use of terminology like involving "locals" or "local partners", as seen above, simplifies the actual needs in terms of localizing OER to the point of undermining the quality and reliability of successful OEP. Consequently, the key would be the users of OER: teachers. But in addition, any self-directed OEP could also involve instructional designers, curriculum specialists, translators and even lexicographers. The latter role is essential in the South African context as in many disciplines terminology would have to be developed or at least standardized.

Preparation is required for localization to be effective, but it does provide a number of advantages for teachers. In this regard, Wolfenden and Adinolfi (2019) showed how localization efforts can contribute to teacher agency, but they also note that it should draw on localisers' knowledge and expertise.

If teachers are to be used in this context, they will have to be supported in order to understand not only the content but also the practices associated with specific OER. However, students could also potentially play an important role in this context.

In this article, it is proposed that localization is also viewed externally and internally. External localization usually happens prior to learning and it is consequently done by content experts with or without the aid of language practitioners. While internal localization is done by students throughout the learning process. This can occur formally through structured localization activities which could be linked to certain learning outcomes But this can also be done in a more unstructured or even covert manner in the sense of students localizing and specifically translating for their own needs. Such activities can even be called open translanguaging efforts.

The concept of *translanguaging* is described by García (2009) as an "act performed by bilinguals of accessing different linguistic features or various modes of what are described as autonomous languages, in order to maximize communicative potential" (p. 140). So, for open translanguaging students make use of their own language resources, in a self-directed manner, in order to make support meaning-making from OER. In multilingual contexts like South African schools and universities this aspect can even be extended to multilanguaging or what Makalela (2018) calls ubuntu translanguaging.

The distinction between interlingual, intralingual and intersemiotic translations (Jakobson, 1959; Mossop, 2016; Pârlog, 2019) is highly relevant for any adaptation of OER. Within specific OEP contexts a teacher might consider translating a resource from another language – within most contexts from English to another language – and this pertains to interlingual translation. Furthermore, intralingual translation might be even more common where an existing resource is adapted to be relevant to a specific context and hence the language of the source resource and target resource remains the same. While finally, in some instances a teacher might decide on adapting a resource from one modality to another (from a text to a video for example) and this relates to intersemiotic translation.

In any of these three ways of translation, the needs of a decolonized curriculum can and should also be considered. The translation of OER has also been addressed in the scholarship around OER (cf. Amiel, 2013).

A further translation-related concept which might also be of relevance for those working within OEP would be translation equivalence. Li (2018) traces the origins of a theory of equivalence back to the work by Federov in 1953 and highlights that equivalence has been central to Western translation theories since the mid-20th century. The concepts of dynamic equivalence and formal equivalence as conceptualised by Eugene Nida are also relevant. Formal equivalence emphasizes a translated text remaining faithful to the source text, while according to Nida (1964) dynamic equivalence relates focuses on the target audience receiving the same message through appropriate changes.

The challenge, therefore, remains on how teachers, students or other OER adapters could ensure dynamic

equivalence in their self-directed OEP especially within the context of a dynamic and decolonized curriculum. This would imply decolonization efforts in terms of languages and practices.

6.2 Decolonizing language

The issue of using languages other than English is imperative to any discussion on OEP and decolonizing the curriculum. In South African universities the prominence of English is clear (Lange, 2019; Olivier, 2018). Historically, English and Afrikaans were used in universities in the country, but after 1994 the use of Afrikaans has been diminished with some symbolic gestures towards recognizing African language formally through language policies but without extensive use of these languages apart from some limited good practices (cf. Maseko & Vale, 2016; Olivier, 2018).

The role of minority and underrepresented languages in terms of OER and OEP have been addressed in the literature. In this regard, Tiedau (2013) showed how a lesser-taught language such as Dutch could be promoted by means of OEP and Amiel (2013) recounted issues around the production of Portuguese OER. However, it is clear that for content in African languages there might be additional challenges as well in terms of terminology creation as well as standardization in spelling and orthography for example.

A further issue that needs to be addressed in terms of practices is to counter negativity towards African languages from the speakers of such languages who would in educational settings prefer English (Maseko & Vale, 2016; Ssebbunga-Masembe et al., 2015) and a number of challenges in this regard (Magocha, Mutasa & Rammala, 2019). This is despite that fact that the advantages of content in the mother tongue are evident from the literature (Webb, 2006). In essence, the availability of multilingual OER would provide options to students without imposing mother tongue content on them.

Only through establishing policies supporting multilingualism and ensuring that they are enacted as well as promoting the use of African languages at individual level can any self-directed OEP be considered. Because, without the availability of languages as resources in the Knowlesian sense of self-directed learning (Knowles, 1975) decolonizing efforts would not be successful. In this regard, activities are needed in terms of language attitude planning (Olivier, 2018; Verhoef, 1998) through which attitudes to certain languages can be critically interrogated and changed. In this context, OEP can be addressed.

6.3 Decolonizing practices

A way in which OEP can be further decolonized is through emphasizing network-driven OER projects. The affordances of network-driven projects are stated by Mulder (2009) and in addition it is evident that this is already quite common in terms of the African context. Mulder explains that this approach, in opposition to content-centered and learner-centered approaches, are quite common on this continent due to cost considerations, creating a critical mass of expertise as well as the need for Western partner institutions having to create equal partnership with African partners for the sake of funding. However, an important aspect ignored by Mulder is the African cultural phenomenon of *ubuntu* which promotes a communal and sharing approach to education amongst other things. According to Letseka (2012) *ubuntu* relates to the African approach that "a human being is a human being because of other human beings" (p. 57) Hence, a network-driven approach to OEP could potentially also be of benefit in the South African context especially in countering information imperialism.

Decolonizing practices also implies accommodating more languages. Valor Miró et al. (2018) found that multilingual video subtitles were useful as OER, but also that automatic translations of subtitles had to be post-edited. Consequently, the role of subtitles as a way to accommodate multiple languages should not be ignored especially in terms of the affordances of bilingual and pivot subtitles (Olivier, 2011). In terms of pivot subtitles, this approach could even be extended to the translation of other OER as time could be saved if OER in closely-related languages are reused and adapted as necessary.

7. Recommendations

From the discussion above some recommendations are made regarding self-directed localized OEP for a decolonized South African curriculum.

- Self-directed OEP should be informed not only by the historical and linguistic profiles of contexts such as the South African one, but also through considering student voices and needs.
- Decolonizing efforts should be regarded within a wider movement towards contextualizing and localizing or even glocalizing content. Furthermore, this process should be open and ongoing.
- It is essential that teachers and students are made self-directed in terms of addressing the needs of decolonizing the curriculum and localizing content to this end. This implies them having access but also being positive towards the use of especially African languages.

- OEP need to extend beyond retaining, reusing, revising, remixing and redistributing but also recontextualizing in order to address the hegemonies in terms of knowledge and embracing indigenous knowledge in the context of OER.
- It is proposed that network-driven (Mulder, 2009), participatory practices (Amiel, 2013) and collaborative authorship (Jimes et al., 2013) as community-driven OER and OEP initiatives.
- Multilingual OER could be considered for multilingual contexts where content is provided in different languages in parallel. Such content should, however, still be localized and not be culturally neutral or generic. Such OER needs to then also be effectively describe through standardized metadata in terms of language, language variety and the target context.
- OEP should be structure to not only facilitate external localization as done by publishers, instructors and other content developers but also allow for opportunities for students to act in this capacity.
- The value of indigenous knowledge and indigenous knowledge holders should be considered in terms of OEP in order to contribute to the decolonization of the curriculum.
- OEP processes should involve not only teachers and students but could also involve instructional designers, curriculum specialists, translators and lexicographers.

8. Conclusion

This article agrees with Amiel (2013) as "[t]here is a need to foment the production of local knowledge and indigenous ways of knowing in order to foster adequate learning opportunities" (p. 136). To this end, it is proposed that any OEP be supportive of self-directed and act as a vehicle towards decolonizing the curriculum. In this way student agency and ownership in the education context can be ensured. Additionally, some of the steps and activities proposed in this chapter could potentially contribute towards wider cultural decolonization within the South African context, that remains to be explored empirically after wider adoption of self-directed localized OEP.

Self-directed localized OEP for a decolonized South African curriculum, therefore, entails an open ongoing process which provides agency to local teachers and students to use the language of their choice to engage with content applicable and relevant to their contexts. This should be done in the spirit of OER sharing or ubuntu but also with cognizance of quality needs which might imply appropriate peer review steps throughout the OEP. Self-directed localized OEP imply students and teachers taking charge of the learning context towards opening up epistemological access for all South African students.

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An Open and Multi-Layer Web Platform for Higher Music Education

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Abstract

This paper describes an open platform for the advanced experience of music information. Based on the IEEE 1599 standard, such an environment supports an integrated and synchronized multi-layer description of music pieces. This approach can be particularly suitable in higher music education, where the structured organization of a multiplicity of free resources can foster advanced and engaging learning activities. After addressing the subject of openness in music education and introducing the key features of the IEEE 1599 format, some clarifying examples and educational scenarios will be discussed.

KEYWORDS: Music Higher Education, Web, Multi-Layer Description, IEEE 1599

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1. Introduction

The adjective "open" implies the ideas of flexibility, freedom, and welcome, in opposition to "closed", that recalls the concepts of limitation, restriction, prejudice. Such a qualifier refers to the elimination of barriers that can preclude both opportunities and recognition for participation.

When applied to education, openness has a deep impact on space, time, and processes (Blessinger & Bliss, 2016) of learning activities. Regarding the spatial dimension, open education lets people access and participate regardless of their physical/geographic location; concerning the temporal dimension, it supports asynchronous forms of communication and participation, unlike traditional formal models. At present, open learning experiences are strongly linked to digital technologies (e.g., computers, mobile devices, network infrastructures, etc.), since space and time limitations can be easily removed by making educational materials available online. Nevertheless, open education has a number of implications that go far beyond mere online sharing, rather asking to rethink processes, too: only learning tools based on valid design principles, reliable teaching methods, and well-established learning theories can achieve the pedagogical results expected from open education.

The basic idea is to democratize learning and training activities, bringing them outside formal education systems and places, such as schools, universities, and academies. Since the focus is on autonomous learning, it is crucial to provide learners with suitable content and tools. In the digital era, open initiatives can rely on a technological infrastructure able to access and integrate heterogeneous information, possibly in a highly-customizable environment able to adapt to users' needs.

The rest of the paper is organized as follows: Section 2 will provide some key references from scientific literature to better understand the fundamentals of open education in the digital era; Section 3 will focus on open approaches in higher music education; Section 4 will introduce the so-called IEEE 1599 ecosystem, that includes an international standard for the multi-layer description of music content, a suite of applications to produce materials in this format (not treated in this paper), and a web platform to enjoy IEEE 1599 documents, thus constituting the theoretical and technological basis for our proposal; Section 5 will present two higher-education scenarios dealing with music learning and practicing; finally, Section 6 will draw the conclusions.

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2. Related Works

The key concepts of technology-enhanced open education have been discussed in a number of scientific works, such as (Seely Brown & Adler, 2008; Iiyoshi & Kumar, 2010; Llorens et al., 2014), to mention but a few. In general terms, they focus on the design and release of open educational resources on one side, and on the technological infrastructure required to support learning activities on the other. Both aspects are relevant in our proposal, and they will be discussed separately in Sections 4 and 5.

Concerning *open educational resources* (OER), the final report of the 2002 UNESCO forum on higher education defined them as "digitized educational materials and tools freely offered for educators, students and self-learners to use and reuse for the purposes of teaching, learning, and research" (UNESCO, 2002). Other commonly accepted definitions emphasize practical rather than theoretical features. For instance, Wiley (2000) considers open educational content and resources as digital learning objects that can be reused a number of times in different learning contexts, deliverable over the Internet, accessible by any number of people, also simultaneously, in opposition to traditional instructional media which can only exist in one place at a time. Other definitions of open content have been provided, but, in general, all of them converge as it regards some key features: open content is used for educational purposes, is usually free, and is available in a managed collection of learning resources via the Web.

Please note that free and unfettered access to a resource is a necessary but not sufficient condition to determine whether or not an item can be considered open. In addition, the use of such a resource should be governed by D. Wiley's 5 Rs:

- *Retain* – the right to make, own, and control copies of the content;
- *Reuse* – the right to use the content in a wide range of ways;
- *Revise* – the right to adapt, adjust, modify, or alter the content itself;
- *Remix* – the right to combine the original or revised content with other open content to create something new;
- *Redistribute* – the right to share copies of the original content, personal revisions, or remixes with others.

As it regards higher education, which is the focus of this work, openness is often associated with *Massive Open Online Courses* (MOOCs). Also in this case, the scientific literature is very rich. For example, Yuan & Powell (2013) start from current UK policies to analyze issues, challenges and implications of MOOCs; Jansen et al. (2015) broaden the perspective to the European level; Stracke (2017) investigates how to improve the design of open education and online courses; finally, Wiley (2015) makes a critical analysis of MOOCs in the context of open education, reporting some misconceptions and drawbacks. Even if MOOCs are coherent and well-organized collections of open items, openness in higher education can be implemented also in other ways, as we will discuss in the next section.

3. Openness in Music Higher Education

Music education is a very articulated field that embraces a number of heterogeneous activities, ranging from instrumental practice to theoretical subjects, and presents different goals, including the acquisition of instrumental or analytical skills and the development of creativity and expressiveness. The present work narrows it down to open experiences in music higher education.

As mentioned in Section 2, openness in higher education immediately recalls the educational model of MOOCs. Important institutions regularly release and update music-oriented MOOCs, thus enabling Web users to access them, or a part of them, for free. For instance, Berklee College of Music offers more than 40 MOOCs, available on different platforms (*Coursera*, *edX*, and *Kadenze*) and in different languages (English, Spanish, and Portuguese). These courses cover a wide range of subjects, dealing with music technology, music theory and harmony, ear training, music business and entrepreneurship, music therapy, performance and improvisation, songwriting. Many other examples could be mentioned, usually rooted in academia (e.g., Harvard University, Massachusetts Institute of Technology, National University of Singapore, University of Edinburgh, Yale University). For more details on the subject of music learning with MOOCs, please refer to (Steels, 2015).

However, openness in music higher education is not limited to MOOCs: there are also collections of high-quality digital resources available for free over the Web. An example is the *International Music Score Library Project* (IMSLP), also known as the *Petrucci Music Library*,[2] which was first released in 2006 as a virtual library of public-domain music scores, mainly old musical editions out of copyright. At present, the platform also admits scores by contemporary composers who wish to share their music by releasing it under a Creative Commons license. Moreover, it offers public-domain recordings, MIDI files, and score transcriptions. The relevance of IMSLP in the field of music higher education is certified by the high number of academic partnerships; for example, the Massachusetts Institute of Technology uses its content extensively for providing scores for its *OpenCourseWare* courses. Concerning other initiatives similar to IMSLP, it is worth mentioning the media collections of the *Internet Archive* digital library; for example, its Audio Archive includes more than 200,000 free digital recordings. Finally, recent

[2] https://imslp.org/

digitization campaigns and the current trend to share materials over the Web are encouraging the birth of specific projects also useful for music learning and teaching, such as the *Bach Digital* initiative by Leipzig Bach Archive [3] and the digital collection of the Beethoven-Haus Bonn web site. [4]

The availability of open and high-quality materials for music education is only the first step. The success of technology-enhanced educational activities requires also the adoption of smart learning environments. *Smart pedagogy* can be defined as an educational approach based on technologically-augmented systems (Daniela, 2019). As demonstrated by a number of successful experiences (e.g., Baker, 2007; Luo et al., 2018; Avanzini et al., 2020), smart pedagogy can be profitably applied to music education. In this kind of approaches, technologically-enhanced devices clearly play a key role, but they should be as transparent as possible to the user: technology should only provide support tools to acquire skills and competences in a more intuitive, engaging and effective way.

Our proposal, discussed in next sections, is based on the two pillars of openness and smart education, and specifically addresses remote music teaching, learning, and practicing. This field is particularly challenging for the experimentation of digital technologies, even more so in the context of higher education. In institutions such as music academies, universities and conservatories, the requirements to meet in order to guarantee quality education are demanding, e.g., in terms of sound fidelity, low latency, number of media streams to be combined and precisely synchronized; events such as the loss of packets, perceivable delays, high compression of media streams – commonly accepted in a best-effort network communication, such as in videoconferencing – would not be tolerated.

During an instrument lesson or a ballet class, a typical scenario is the continuous interaction between teacher and student in a multi-modal environment, with an active and plural exchange of information. Similarly, when making music together, all musicians in an ensemble give their own contribution following the indications of the teacher/conductor and listening each other in real time, thus collectively influencing the final result. The mentioned scenarios, that are routine activities for in-presence education, in distance education can pose critical problems.

4. IEEE 1599: A Multi-Layer Educational Environment for Music

In this section, we will introduce the key concepts of the IEEE 1599 format. IEEE 1599 is an international standard explicitly conceived for the multi-layer representation of music in the digital domain. Mentioned in more than 60 scientific works,[5] mainly belonging to the area of sound and music computing, such a format is well documented in scientific literature and described in detail in the official specifications retrievable from the IEEE web site.[6] Its applicability to the field of music education has been already explored in other works, such as (Baratè & Ludovico, 2012) and, more recently, (Baratè et al., 2020), but never in an open perspective nor in the context of higher education.

The goal of this paper is to show on one side how IEEE 1599 can support the creation of open and high-quality educational resources (the content), and on the other side how already-available Web applications experienced via high-speed networks can provide a suitable learning platform (the technological infrastructure). Together, these two aspects constitute the IEEE 1599 ecosystem.

4.1 Key Features of the IEEE 1599 Standard

IEEE 1599 is an XML-based format whose goal is to provide a comprehensive representation of the information related to a music piece. To this goal, an IEEE 1599 document presents a multi-layer structure composed by 6 layers. The main feature of IEEE 1599 is the possibility to embed within a unique XML document all the materials related to a given music piece, including its symbolic score (logic layer), metadata (general layer), graphical score versions (notational layer), audio recordings (audio layer), computer-driven performances (performance layer), and relationships among musical entities (structural layer). All layers can host multiple representations, e.g., many audio tracks or score editions for the same piece. Heterogeneous information is not only collected within a unique document, but also interconnected, with synchronization among all time-based materials and links from/to the corresponding graphical content. Score to audio alignment is one of the most typical functions implemented by an IEEE 1599-based tool; other common scenarios include the interactive experience of music content and on-the-fly comparison of different sources.

The granularity of the description (i.e. the identified music events) can be fine-tuned depending on the user's needs, ranging from single score symbols (e.g., notes and rests) to aggregations (e.g., measures or even whole sections of the piece).

IEEE 1599 finds application in different categories of music software: digital score editors, optical music recognition systems, web and mobile apps, musical databases and archives, and musicology-oriented applications. For a comprehensive overview of the format, that would be beyond the scope of this work, please refer to (Baggi & Haus, 2013).

[3] https://www.bach-digital.de/
[4] https://www.beethoven.de/en/archive/list
[5] https://ieee1599.lim.di.unimi.it/documentation_papers.php
[6] https://standards.ieee.org/project/1599.html

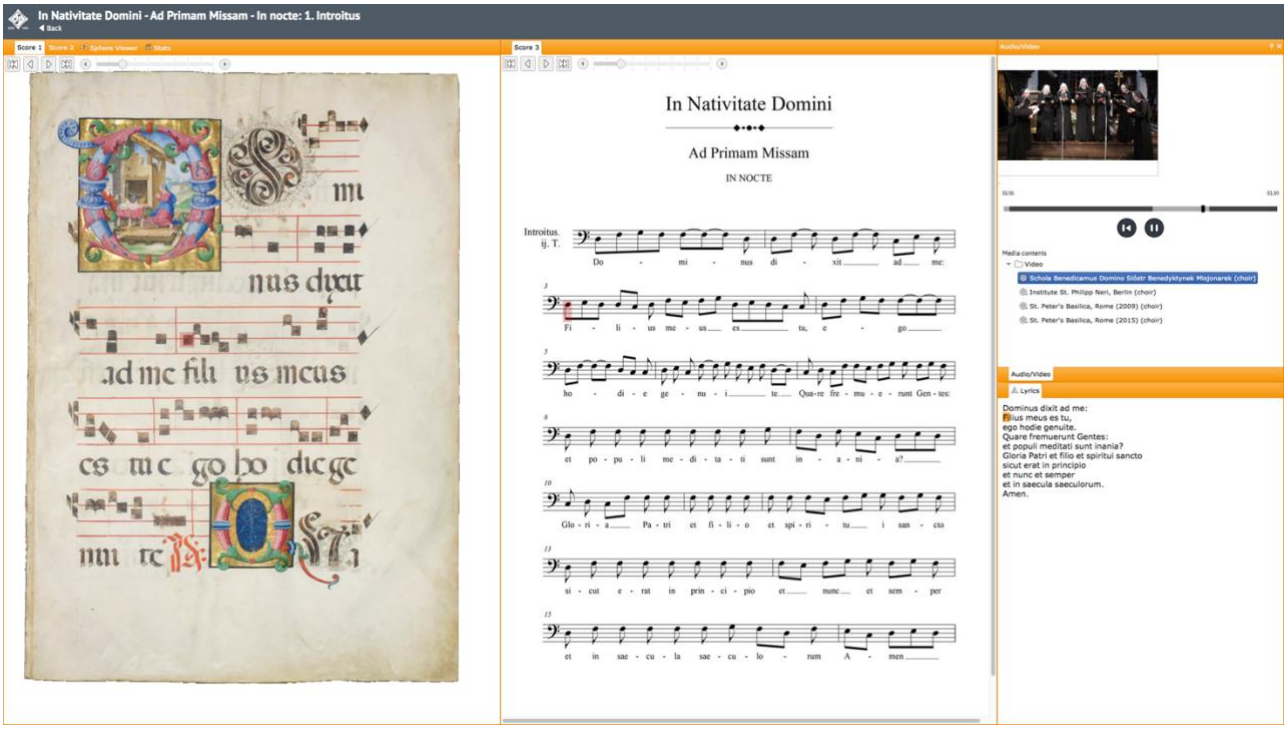

Figure 1 - The graphical user interface of the *IEEE 1599 Web Player*. Two side-by-side panels in the main area show different score versions, while the right column contains a media player, a list of audio/video materials and the lyrics panel. Multiple cursors, colored in red and orange for scores and lyrics respectively, highlight the elements being played.

4.2 Research Method

Before describing the web interface to enjoy IEEE 1599 documents, it is worth providing some details about the research processes that led to the realization of such an environment.

The official origin of the IEEE 1599 initiative dates back to 1992, when the IEEE Computer Society Task Force on Computer Generated Music was established. Several intermediate milestones – including the constitution of the IEEE Technical Committee on Computer Generated Music (1994), the creation of the IEEE Standards Association Working Group on Music Application of XML (2001), the organization of an international symposium (2002) – led to the approval of the IEEE 1599 standard, occurred in 2008. All these steps involved scholars and experts in the field of sound and music computing, coming from both academia and industry. Their different background, expertise, and vision influenced the development process.

The original goal of the format (and of the applications built on it) was the release of novel multimedia products supporting rich and advanced experience of music through user-friendly interaction. Some experimental prototypes, presented at conferences and stakeholders mainly as a proof of concept, went in that direction, thus originating the later development of a class of applications for a general-purpose audience. The first examples were off-line software programs running on local computers.

The educational purpose, in the developers' early vision, was only a side effect of the adopted model: even a user with no music knowledge could enjoy and interact with the synchronized presentation of notation and audio, so as to learn something from the experience in a non-formal and non-mediated way. Examples include a number of IEEE 1599-based products released for exhibitions and multimedia installations.

The explicit applicability of such an approach to educational scenarios emerged later, when scholars with a pedagogical background noticed the potential of the IEEE 1599 format in school and higher education. Consequently, a spin-off of the project focused on software applications conceived for music teaching and learning. Such an activity culminated in the release of support material in IEEE 1599 format to be attached to textbooks edited by Pearson (2014).

In parallel, technological evolution has pushed the development team to investigate more and more the potential of web applications, so as to extend the audience and release cross-platform solutions.

Finally, also the authoring tools to produce IEEE 1599 documents have evolved over time. At the beginning, the approach was to write XML code by hand, with no support tools, and even synchronization cues in graphical and audio files were determined through manual operations. Of course, the process was very time-consuming and the final encoding presented many mistakes. The following evolution, achieved as soon as the format became a standard, was the development of

software plugins to export notation (and other available information) from score editors commonly in use, such as *MakeMusic Finale* and *MuseScore*. In the meanwhile, a number of computer-aided tools to improve synchronization was released. In this sense, a milestone was the development of the *IEEE 1599 Framework* for Microsoft Windows, later reimplemented in Java so as to foster cross-platform compatibility. Current efforts are aiming to port such an authoring platform into a web environment, whereas the web player described in Section 4.3 is already available.

It is worth remarking that the design and development of educational experiences based on IEEE 1599 was not a linear process, since hundreds of contributors with heterogeneous skills and competences have been involved at different stages, and the research effort in this direction is still ongoing.

4.3 The Web Interface

A core application for online experience of IEEE 1599 documents is the *IEEE 1599 Web Player*, whose synchronization engine was first released in 2011 and is constantly updated. The most recent release is publicly available in the "Music Archive" area of the IEEE 1599 web portal,[7] which also collects a number of clarifying examples (see Section 4.4).

The graphical user interface is shown in Figure 1. The main area lets the user watch graphical content. Scores and alternative symbolic representations (e.g., lyrics, Petri nets, and additional notational representations, when available), they can be opened in multiple tabs. For example, it is possible to watch multiple score versions simultaneously. To do that, drag the label on top of the panel to move, and release it in one of the allowed locations (top, bottom, left, right, center).

In the right column, all audio and video materials are listed; in the top area, there is a media player with common controls.

The basic functions provided by the player are:

- Score following - When the user clicks the "Play" button, music starts and multiple cursors over the graphical representation of the score move so as to highlight the chords and rests currently playing;
- Synchronization - All media (e.g., scanned scores, audio tracks, transcribed lyrics, and video contents) are mutually synchronized: the user can switch among them in real time, even while music is playing. In the case of audio/video content, only one media can be selected at a time, and the new selection will automatically discard the media currently playing.
- Interaction with music content - The IEEE 1599 viewer provides multiple ways to interact with music content in order to change the current playback timing. In particular, some areas in the score representations are sensitive to mouse click (a typical example is the bounding box around chords and rests, which can be clicked). Other representations allow this kind of interaction, e.g., lyrics and Petri nets diagrams (when available) are clickable and present a similar behavior.

Among advanced features, particularly relevant for educational purposes, it is worth mentioning diagrams and statistics and automatically-computed graphical representations. The Stats tab contains diagrams with the results of musicological and mathematical analyses conducted on the original XML files. Examples include the distributions of pitch classes, rhythmical values, and MIDI pitches. Alternative graphical representations are computed starting from the information in the logic layer of the IEEE 1599 document. An example is the Sphere Viewer, that shows notes and rests as spheres, horizontally spaced according to the position in measure, vertically placed according to pitch, sized on the base of rhythmical values, and colored differently based on the part and voice.

4.4 Examples

The list of music pieces publicly available in the Web repository, under the Music Archive area, is constantly updated. Please note that the goal of the platform is not to provide a comprehensive corpus of documents concerning an author, a genre, a historical period, etc.; this kind of activities is addressed by specific applications that can been realized and released through the IEEE 1599 ecosystem (some examples will be introduced in the following). Rather, the objective is to showcase the potential of the format. For this reason, the available examples are very heterogeneous.

The possibility to compare many different audio performances is well illustrated by Reynaldo Hahn's "A Chloris", in origin a romance for voice and piano. At the moment of writing, the corresponding IEEE 1599 document embeds 10 audio and 5 video tracks, performed by different types of voice (soprano, mezzosoprano, tenor, countertenor) and accompanying instruments (piano, harp, wind ensemble, symphonic orchestra).

The possibility to compare different score versions is emphasized by Giovanni Paisiello's "Il mio ben quando verrà", an operatic aria excerpted from *Nina, ossia la pazza per amore*. Four scores are available, including the autograph, a historical handwritten version, a reduction for voice and piano, and an old printed libretto.

Concerning music notation, the potential of the IEEE 1599 format goes beyond so-called Common Western Notation (CWN). In this sense, clarifying examples are:

- the "Introitus" from *In Nativitate Domini, Ad Primam Missam*, that includes two neumatic scores together with a modern transcription;
- the "Prèlude" from *Suite n.3* by Silvius Leopold Weiss, that provides an example of tablature for lute;

[7] https://ieee1599.lim.di.unimi.it/

- "Pas de six: Variation III (Falling crumbs)" from *The Sleeping Beauty* by Pëtr Il'ič Čajkovskij, that presents not only the full score and a piano reduction, but also a Labanotation version, namely a system for recording and analyzing human movement commonly in use in dance;
- "Music for khomus", that demonstrates the applicability of the format to the notation for ethnic musical instruments.

All the mentioned examples can find suitable application in higher education. The possibility to watch and listen to a music piece within an integrated environment is fundamental to train ensemble-score reading, which is a curricular subject in conservatories. The option to select and compare in real time different performances is useful to improve instrumental, singing or conducting skills, thanks to the confrontation with great artists or professional performers. The support offered to multiple scores, and specifically non-CWN notation possibly aligned with its CWN counterpart, finds application in curricular subjects such as ancient music and ethnomusicology.

5. Case Studies

In this section, the characteristics of the IEEE 1599 ecosystem are applied to two scenarios typical of music higher education: musicology-oriented applications and ensemble-music experiences. Please note that openness in distance education and remote participation in music activities are issues particularly relevant in this period of forced isolation due to Covid-19.

5.1 Musicology-Oriented Applications

As mentioned above, the IEEE 1599 format has been conceived to allow on-the-fly comparison between different versions of the graphical and audio content referable to the same piece. Focusing on scores, the learner can easily trace author's revisions, differences among score editions, and so on. The possibility to jump from a material to another in real time and to support in-depth analyses and explanations via additional media (e.g., while listening to audio performances or watching video recordings) make this kind of learning activities more effective and engaging. Similarly, audio performances can be switched and compared on the fly, e.g., to investigate the evolution of interpretative models or recording techniques. In this case, the function of score following, namely the synchronization between audio and music notation, can greatly help learning. On the base of these characteristics, the IEEE 1599 format has been employed in lectures and conferences in order to support and clarify musicology observations. An evidence of this in scientific literature can be retrieved from (Dalmonte, 2008).

A different category of didactic experiences potentially enhanced by IEEE 1599 concerns computational musicology, an interdisciplinary research area where computer systems are used to study music. Single pieces as well as collections of IEEE 1599 documents can be automatically analyzed to extract meaningful information. The advantage offered by the format concerns the availability of an ecosystem of open and Web-available applications to provide learners with an effective interface to enjoy research results. This aspect is already present in the *IEEE 1599 Web Player*, under the area of diagrams and statistics, but at present it is mainly a proof of concept. The range of available analytical tools can be greatly extended and customized so as to answer specific research needs.

Finally, a relevant filed of application for the format is the study and promotion of music-centered cultural heritage. IEEE 1599 has been successfully used in a number of dissemination activities, including exhibitions at the Museum of *La Scala* theater of Milan, *Residenzgalerie* of Salzburg, and *Tinguely Museum* of Basel.[8] Even if these initiatives occurred in presence and do not specifically fall in the area of musicology, they have demonstrated the IEEE 1599's potential in the wider field of cultural heritage education.

Being available over the Web, didactic experiences can be remotely guided and customized to meet the learner's needs. This aspect is particularly relevant in higher education, where the skills and competences to develop can involve complex analytical tasks. Moreover, such a Web-based model can integrate synchronous and asynchronous peer-cooperation tools, including videoconferencing, chats, and forums.

5.2 Ensemble-Music Applications

As already discussed in literature (Baratè & Ludovico, 2012), IEEE 1599 can be employed also in the context of live musical and theatrical performances. During past experimentation, the idea was to simultaneously broadcast via the Web a number of synchronized media streams, so as to allow a distributed audience to configure their own experience by choosing in real time the audio track to listen to, the video take to watch, and the additional content (text information, graphical materials, etc.) to enjoy. In other words, the variety and number of media streams simultaneously broadcasted let the users choose – and reconfigure on the fly – their own combination of "foreground" content, thus personalizing the experience of the live event.

Provided that audio and video content are suitably acquired, such an approach can find a relevant application in music education, since it allows the

[8] A complete and up-to-date list of exhibitions is available at https://ieee1599.lim.di.unimi.it/practice_exhibitions.php

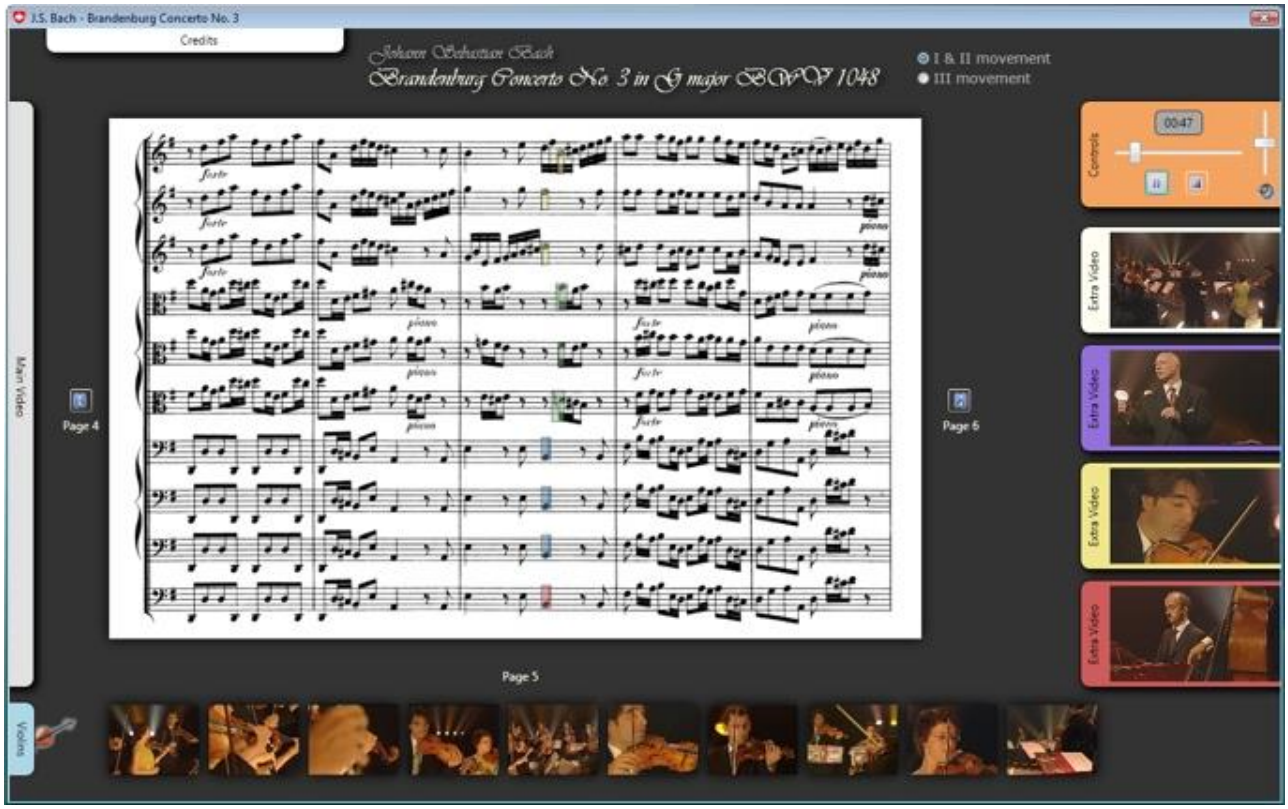

Figure 2 - The graphical user interface of the application dealing with the *Brandenburg Concerto No. 3* by J. S. Bach.

learner to focus on specific aspects (e.g., the hands of the piano player, the bowing of the violinist, etc.). In this sense, an early experimentation involved the University of Milan, the University of Applied Sciences and Arts of Southern Switzerland (SUPSI), and RSI Radiotelevisione Svizzera. The project focused on a performance of the *Brandenburg Concerto No. 3* by J. S. Bach encoded in IEEE 1599. The presence of 40 video tracks and an interface supporting the simultaneous experience of up to 5 multimedia streams (see Figure 2) allowed to analyze in detail the movements and gestures of each music player within the multi-layer and fully-synchronized environment already described. The application was released in 2007, one year before the official standardization of the format, and it was a stand-alone software for Microsoft Windows. In the following years, the synchronization engine was ported to the Web environment, so as to enjoy the IEEE 1599 experience in any HTML5-compatible browser.

Extending these concepts to curricular activities in music higher-education, IEEE 1599 can also support enhanced experiences of ensemble music, where performers are geographically distributed. With respect to the already mentioned scenario of live shows, in this case multiple streams are originated from remote nodes and combined together so as to form a unique performance. Based on a master tempo signal – not necessarily a fixed beat – shared by all musicians, audio content can be synchronized with score information, texts, images, graphical effects, etc., which is a typical advantage of the multi-layer approach of the format. All these elements have been already discussed in the context of advanced interfaces for music enjoyment, like in (Baratè & Ludovico, 2016), but they can be profitably applied, e.g., to a class of instrument students practicing together from remote locations under the guidance of a music teacher. In this scenario, IEEE 1599 can offer a number of advantages: for example, score alignment can help learners in keeping the pace; the availability of multiple score versions can improve readability by young musicians, thanks to a simplified or user-tailored notation (e.g., alternative symbols for visually or cognitively impaired learners); statistics and diagrams can foster analytical skills in order to better understand the music piece (e.g., recurrent rhythmical patterns or harmony-related features); and so on.

In all the scenarios described above, network technologies must be able to broadcast a huge amount of multimedia data, possibly preventing information loss and minimizing latencies. In this sense, a promising technological advancement is offered by 5G networks, whose documented features and expected advantages in the music field have been discussed in (Baratè et al., 2019).

6. Conclusions

Thanks to its characteristics, IEEE 1599 has constituted the theoretical and technological platform for a number

of higher education experiences. For instance, it has been presented at the University of Milan during the doctoral course in "Computer technologies for musical information encoding". In that occasion, observations and opinions by students in Musicology have been collected in the form of interviews. Remarks mainly focused on the applicability to specific domains (e.g., ethnomusicology or pop/rock music analysis), the workload required to encode a music piece in IEEE 1599, and the existence of a huge corpus of documents available for automatic analysis. As a further example, the format is regularly discussed under the perspective of information structuring in the Music Informatics Lab, a curricular course of the Bachelor's Degree in Music Information Science given at the University of Milan. To pass the exam, students are required to encode in IEEE 1599 a music piece that, after the final evaluation and potential amendments, is added to the list of publicly-available materials, thus obtaining a "learn, implement, share" effect.

Concerning openness, the IEEE 1599 ecosystem allow for anywhere, anytime access to music information through a Web browser, and non-copyrighted content is available for free. Recalling Wiley's 5 Rs presented in Section 2, the IEEE 1599 approach grants users the rights to retain, reuse, revise, remix, and redistribute music materials; in some cases, the format even encourages such activities: for example, the idea of employing content in a wide range of ways (reuse) and the possibility to combine content with other open materials in order to create something new (remix) underpin the key feature of the format, namely its multi-layer structure.

When applied to the music education field, IEEE 1599 can fully unveil its potential, fostering advanced and engaging ways to acquire musical skills and competences.

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Wikipedia as OER: the "Learning with Wikipedia" project

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Abstract

Wikipedia is the world's most widely used collaborative encyclopedia, contributed to by a community of users who read, write and edit the content of the articles, embracing the principles of Open Knowledge. The paper presents the results of the "Learning with Wikipedia" project which involved 1200 students and 30 faculty members at the University of Padova in creating and expanding encyclopedia articles on various subject-specific topics. Teaching activities were developed which considered Wikipedia not so much as a container for Open Educational Resources, but as a true learning environment, well organized with precise rules that can stimulate instructors to adopt Open Educational Practices. Students attended workshops where they were introduced to the project's aims, the competences expected of them, and the procedures for contributing to the encyclopedia. One of the most significant points that emerged during the project was the importance of stimulating the full set of digital competences (for example finding and evaluating information). Gaining these competences is essential for the activities' success and for participating, now and in the future in an extended community based on OER. That's why we investigated students' and instructors' perceptions regarding a set of digital competences gained by working with Wikipedia. The project was also able to make students and instructors understand that writing encyclopedia articles is not a mere academic exercise, but is a Service Learning activity that benefits the entire community, and that Wikipedia should be considered as a participatory social process and not just as a means of learning subject-specific content.

KEYWORDS: Wikipedia, OER, OEP, University

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1. Introduction: Wikipedia: an encyclopedia or an open movement?

Wikipedia is the world's most widely used collaborative online encyclopedia: the English version contains over 6 million articles, and the total number of articles in all language editions exceeds 50 million. Wikipedia is based on a community of users who write and correct the articles, adhering to the principles of Open Knowledge (García Peñalvo, Figuerola & Merlo, 2010; Pomerantz & Peek, 2016). Wikipedia does not impose limitations, and anyone can contribute to drafting articles in accordance with their skills and expertise in specific topics, and the community itself will then correct, discuss or rewrite each contribution.

Wikipedia has spawned a large number of other projects supported by the Wikimedia Foundation and local associations in countries around the world. The users who identify with these communities and share the values of free culture make up the Wikimedia movement. Many of the movement's projects involve collaboration between the community and cultural institutions, and are called "GLAM-wiki", dove G.L.A.M. stands for "Galleries, Libraries, Archives and Museums". This collaboration is important, because the projects' cultural content is made publically available according to the paradigms of Open Access (Tennant, 2016) and Open Content (Iiyoshi & Kumar, 2010) under free licenses such as Creative Commons that permit content to be adapted and reused. Wikipedia thus contributes to the visibility and distribution of freely licensed cultural content. Increasingly, institutions and organizations host "Wikimedians in Residence", or WIRs, to help them share content complying with the encyclopedia's guidelines by training personnel, and, in the case of schools and universities, tutoring students and working together with faculty in targeted teaching projects.

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2 Wikipedia and the university: an interesting challenge

2.1 Academia's changing perception of Wikipedia

The encyclopedia has always been extensively used by students, who see it as a fast, flexible and easy to use resources that provides clear, straightforward information in all subject areas (Blikstad-Balas, 2016), especially when they need background information about a topic they are not yet familiar with (Head & Eisenberg, 2010). Initially, many educators viewed Wikipedia use with suspicion, maintaining that it is an incentive to plagiarism (Premat, 2020) and a less than reliable source (Garrison, 2018), not least because of the difficulty in finding out who wrote the articles, which may be entirely anonymous. Educators' opinion of Wikipedia is an important factor, as it appears to have a significant influence on their colleagues (Konieczny, 2016) and on students (Lim, 2013), and hence on how they use it as a teaching aid and in private life.

In general, the objections to using Wikipedia do not hinge only on the articles' perceived quality, or in other words on their reliability, but also concern the more specific dimensions of Comprehensiveness—or breadth of coverage and level of detail—Readability, or complexity of style and lexical density, and Currency, or the degree to which articles reflect up-to-date information about their topics (Yaari, Baruchson-Arbib & Bar-Ilan, 2011).

In recent years, however, many educators' attitude towards Wikipedia has changed (Minguillón et al., 2018), particularly as regards two important factors: there is a growing realization that even though the online encyclopedia is not a primary source, it has very strict rules for citing sources and verifying their reliability, and that the articles' anonymity does not substantially affect the quality of their content (Fallis, 2008), and indeed may be an opportunity to rethink the links between the concepts of credibility, trust and authority in the broader context of collaborative knowledge building (Sahut & Tricot, 2017). The world of academic and scientific research also seems to be increasing its use of Wikipedia: a recent study found that word-usage patterns appearing in Wikipedia articles show up in many papers published in scientific journals dealing with the same topic, a sign that the papers' authors had read the articles (Thompson & Hanley, 2018).

2.2 Wikipedia in university teaching

Wikipedia is now widely used in teaching: the Wikipedia page on the topic numbers over 300 projects instituted by universities around the world since 2003 (Wikipedia: School and university projects, 2020). Interestingly, university teaching projects with Wikipedia invariably involve active collaboration between teachers and students. According to a review of the literature on the topic (Mesgari et al., 2015), activities can be classified in six areas:

1. *Consulting* educational material.
2. *Writing* new articles or expanding existing ones.
3. *Reviewing* sources.
4. *Translating* Wikipedia articles written in different languages.
5. *Exercising critical thinking* by interacting on the discussion page of an encyclopedia article.
6. *Uploading free-use files* (audio, images, video) on the Wikimedia Commons online repository.

In the first case, the teaching approach uses Wikipedia articles to supplement traditional materials such as textbooks and the like, and as a starting point for further investigation using the primary sources cited in the articles (Selwyn & Gorard, 2016).

The most common activity is undoubtedly that of collaboratively editing encyclopedia articles (Wannemacher, 2010; Soler-Adillon, Pavlovic, & Freixa, 2018), which is chosen as an alternative and highly motivating approach to learning content and at same time developing the digital and communication skills needed to make complex concepts accessible and understandable to the general public (Leuthold & Gilli, 2019).

A closely related topic is that of reviewing the sources of encyclopedia articles, which enables students to go into further depth and check the quality of the literature on the subject concerned (Sormunen & Lehtiö, 2011; Dawe & Robinson, 2017).

Translating articles from one Wikipedia language edition to another is an interesting teaching activity, not just because it builds linguistic skills, but also because it helps develop reflexive and critical abilities such as those involved in translating articles dealing with terms or concepts that are difficult to convey in other cultures.

Exercising critical thinking is very much in the nature of Wikipedia editing, and is encouraged in a special discussion area associated with each article: the so-called talk pages provide a forum for exchanging views with other users in order to improve and elaborate on content. When there are disagreements or divergent interpretations of the content of an article, the Wikipedian community urges users not to engage in an "edit war", i.e., stubbornly continuing to override deletions or additions for the same content, but to use the talk page to discuss the question and reach a consensus concerning the content.

The last activity is that of uploading material on Wikimedia Commons: an online repository database of multimedia files (video, photos, animations, audio or images dealing with science, the arts and history) released under a free license available to Wikipedia and all Wikimedia Foundation projects (Gutiérrez-Madroñal, 2014).

2.1 Wikipedia as a new form of open, participatory assessment

An undoubtedly important part of university (and school) teaching is the student assessment process. Any Wikipedia-based activity where articles are edited necessarily involves co-participatory review by the community of readers and contributors. This makes Wikipedia a potentially revolutionary educational environment, and one which is ideal for trying alternative forms of evaluation drawing on authentic and open assessment practices (Nascimbeni et al., 2018; Petrucco, 2019; Johinke, 2020). A number of studies have confirmed that the feedback from the community of Wikipedia readers and editors as a whole results in levels of quality that come quite close to those provided by expert raters (Cope et al., 2013). There are thus two forms of assessment:

- one by the instructor in the university's formal educational context, and
- one in the informal/non-formal context to which the various external actors belong.

Here, we use the term informal context to mean the simple users or experts, while the non-formal context refers to identifiable individuals belonging to institutions such as museums, agencies and associations. The forms of evaluation that can potentially be employed are thus formative and summative assessment in the formal context, and participatory, open and formative assessment in the informal context (Fig. 1). While "authentic tasks" usually simulate how a student's knowledge is assessed in a real-world context, in a Wikipedia activity, the context is real.

On the basis of these considerations regarding alternatives to traditional assessment, our university is promoting the "Learning with Wikipedia" project which will involve subject-specific teaching and learning processes open to the Wikipedian community Over and above its teaching aims, "Learning with Wikipedia" is thus an innovative educational research project.

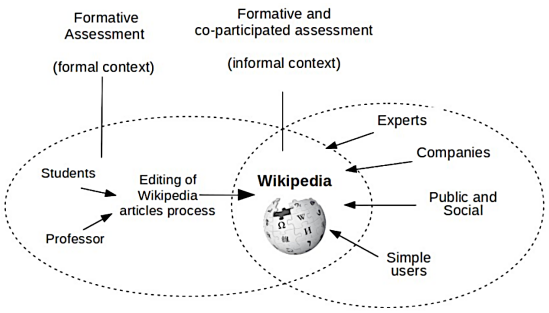

Figure 1 - Open and co-participatory assessment in a Wikipedia activity between students/instructors/users.

3. Open Education and the "Learning with Wikipedia" project.

The project is a response to the need to promote Open Education, which has been on the European and UNESCO policy agenda for a number of years (UNESCO, 2015). This framework offers multiple ways of teaching and learning, and of building and sharing knowledge. It also suggests access routes to formal and non-formal education (Dos Santo, Punie & Munoz, 2016). The concept of Open Education includes the use, provision and publication of OER, open resources that can be accessed and adapted by students and instructors (Havemann, 2016). As regards the effectiveness of this teaching strategy, many scholars have found a positive correlation between the use of OER and students' academic performance (Fisher et. al, 2015; Grewe & Davis. 2017; Hilton, 2019).

3.1 Wikipedia as a learning and OER publishing environment

Collaborative writing on Wikipedia as part of a university course requires that students express and give shape to subject-specific knowledge. At the same time, it engages them in active learning processes. Editing an encyclopedia article also gives students an opportunity for open access publishing, and thus for making the content they create available to other students and all encyclopedia users. In addition, it enables students to explore and work with subject-specific content that will help them pass their examinations.

Wikipedia thus serves as a true learning environment. As a result of collaboration between students and supervision by the instructors, the students' articles are reasonably reliable Open Educational Resources: open in the sense of being available for self-learning or for classroom activities, and also in the sense of open-ended, so that they can potentially be revised or expanded by other contributors in the future. They are also open in the sense of being subject to other forms of assessment in addition to that provided by the instructor, the evaluations by the Wikipedia tutors and the community of readers and contributors. As we have seen, not only do the "talk pages" offer very detailed feedback that encourages metacognitive processes of critical thinking that often serve as the drivers of deeper learning, but feedback and continual revision and improvement are also typical characteristics of OER.

This is thus formative assessment, consisting of feedback and constructive criticism centering on the following competences:

- Specific digital competences needed to use the wiki platform, and for searching, selecting and evaluating sources,
- Competences in organizing and framing the article as required by Wikipedia rules, and

- Competences in scientific writing and critical thinking.

It should be emphasized that these competences are in line with the European Framework for the Digital Competence of Educators (Redecker, 2017) which identifies areas for improvement in educators' digital competences, and with DigComp 2.1: The Digital Competence Framework for Citizens (Carretero, Vuorikari & Punie, 2017), which has become a model for the competences to be developed in educational systems at all levels, and thus also at universities.

These are processes for improving digital competences that involve educators and students alike. One of the potential outcomes of this activity is that students in the future will become active and independent contributors to Wikipedia. In view of their experience, this will make it possible to improve the quality of the articles and support the OER philosophy even after they complete their university program.

3.2 Project description

The "Learning with Wikipedia" project's essential aims are as follows:

- Make Wikipedia part of individual single university courses to determine the effectiveness of learning subject-specific content with alternative forms of assessment and encouraging Open Educational Practices (Jacobson, 2019).
- Create knowledge and make it readily accessible to everyone in the spirit of Open Content and Open Educational Resources, providing opportunities for interchanges between academic and non-academic settings.
- Stimulate specific digital competences, especially those involved in Information Literacy (Jemielniak & Aibar, 2016).

The project started in 2017 but the finalized program was adopted only last year. Overall, it involved 30 faculty members and 1200 students who wrote 210 Wikipedia articles. The courses involved represented a wide range of subject areas: Economy, History, Art history, English language, Spanish language, Italian literature, Pharmacy, Mineralogy, Veterinary sciences, Astrobiology, Engineering, Chemistry, Educational sciences, Scientific communication, Botany and Philosophy.

The project is divided into the following stages:

1. Involving instructors and training them in the Wikipedia "philosophy" and rules.
2. Designing the specific activity for each course.
3. Starting and reviewing workshops conducted by a Wikimedian in Residence, both in person – particularly during the COVID-19 emergency – and online.
4. Direct online support on the "sandboxes" (student test pages) to check compliance with Wikipedia rules and the quality of each article written for the project.

Teaching design was based on a number of specific learning outcomes that were already part of each course syllabus. This ensured that the project was flexible, as it could be adapted in the field in collaboration with instructors and students. In planning each activity, the instructor was assisted by a learning designer, who organized group design sessions to help the instructor bring the type of activity into sharper focus. In this stage, instructors were thus able to plan one or more of the following activities:

- Select a high quality article addressing a mature discipline on the English Wikipedia and translate it into Italian, as an introductory activity for the entire course.
- Elaborate on content that had already been presented in the course, associating it with a search for sources.
- Propose an activity that calls for critical thinking in comparing the validity and quality of content and sources.
- Write biographical entries or articles dealing with narrative literature using the Wikipedia templates.
- Write articles requiring that multimedia resources (original images released under Creative Commons licenses) be uploaded to provide iconic information (pictures of horse breeds, drawings of molecules, monuments, etc.).
- Write articles that call for reconstructing the history of a phenomenon.
- Write new articles in the English Wikipedia (for courses using English as vehicular language).
- Reconstruct a scientific controversy.

Students attended workshops where they were introduced to the project's aims, the competences expected of them, and the procedures for contributing to the encyclopedia. Near the end of the activities, all participants worked together as a group for the final review of the articles. Ongoing assistance in writing the articles took place online, as did overall project monitoring.

This design approach enables the instructor to propose a teaching and learning process based explicitly on the Open Content philosophy and sharing knowledge through the development of transversal skills (teamwork, digital competences, social and communication skills, etc.). One of the most significant points that emerged during the project was the importance of stimulating the full set of digital competences: gaining these competences is essential for the activities' success and for participating, now and in the future, in an extended community based on OER.

We refer in particular to information literacy (i.e., developing skills in finding, selecting and evaluating information), digital citizenship actions, applying guidelines for online etiquette (netiquette or wikiquette),

creating and developing digital content, becoming familiar with copyright issues and the use of Creative Commons licenses, protecting personal data and self-assessment of e-skill needs (Dawe & Robinson, 2017).

4. Perceptions of Wikipedia and the development of digital competences in the OER creation process: results and discussion

4.1 Method, context and research questions

To investigate perceptions of Wikipedia and the role of digital competences, questionnaires were administered to instructors (N=30) and students (N=1200, with response rate of 74%, corresponding to 888) before and after the project. The percentage of females was 70% and that of males 30%, with the following frequency of use of Wikipedia at the beginning of the activity: 55,6% at least once a week; 23,3% at least once a month, 14,4% at least once a day, 6,1% several times a day, 0,6% never.

Questionnaires were developed on the basis of the following research questions:

1. How do teachers and students perceive Wikipedia?
2. What digital competences do teachers and students believe have been improved by creating a Wikipedia article in the project?

The entry questionnaire administered to students consisted of 37 items, while that administered upon exiting consisted of 39 items. Questions were divided into the following sections: socio-demographic data, use of Wikipedia, beliefs about Wikipedia, role of digital competences in creating OER, and open assessment. Teachers were asked to answer 25 items, many of which were open-ended questions in order to give them freer rein to reflect on the teaching experience, which was quite new for them as well as for the students. Some of the findings from these questionnaires that are particularly relevant to the topics addressed in this paper will be presented below. One especially significant aspect is the opinion of Wikipedia held by university students and teachers. Investigating this aspect enables us to understand the extent to which an OER culture can be instilled by using and creating encyclopedia content. Other important aspects include students' and teachers' beliefs regarding the role of digital competences in the proposed activity, and hence in producing OER.

4.2 Results

As regards the opinion of Wikipedia, comparing responses by instructors and students (on a scale of 1=not at all good to 5=very good) shows that the two groups' opinions are almost diametrically opposed: on average, teachers seem to have a poor opinion of Wikipedia (around 54% assigned scores of either 1 or 2), while students on average have a good opinion, with around 52% scoring the encyclopedia at either 4 or 5, as shown in Figure 2. This data shows how important it was to involve teachers in planning, implementing and assessing the project in order to prevent any negative biases from influencing their experience. The teachers who joined in the project were active, motivated and informed partners in the OER production processes and in the open education practices involved in working with Wikipedia. In the literature, academic teachers generally express caution about judging Wikipedia to be sufficiently reliable for use in keeping up to date or doing research (Aibar et al., 2015). In our case, by contrast, a full 63% of the faculty members involved in the project reported that they use Wikipedia to keep up to date, and 25% use it for their scientific research. These are significant figures, and probably also depend on the high degree of open-mindedness that these teachers demonstrated by choosing to participate in the project of their own accord.

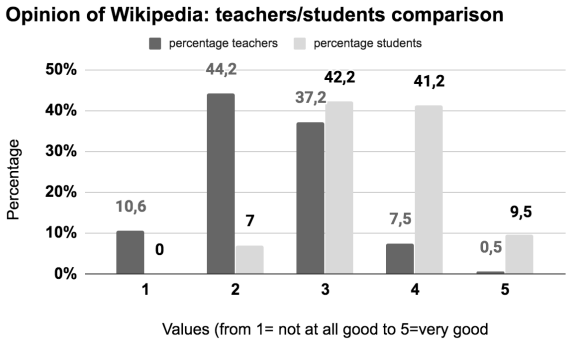

Figure 2 - *Opinion of Wikipedia: instructors and students compared* (Percentage distribution - Instructors N=30, Students N=888).

Students also expressed their views about what specific skills can be improved by publishing Open Content/OER with Wikipedia. Results and trends from the entry and exit questionnaires are shown in Table 1.

The table is the result of different answers concerning eight competences elaborated from DigComp 2.1 (Carretero, Vuorikari & Punie, 2017, p. 11) and emerged from the following question: "Do you think that an educational activity with Wikipedia is a way to improve your digital skills? Please indicate which ones (more answers are possible)". The positive trends enable us to assume that the students perceived that these specific digital skills improved beyond initial expectations. In this connection, the students reported that the aspects that had been stimulated most during the project were "Browsing, and searching for data, information and digital content", "Learning the rules of netiquette (wikiquette)" and "Learning to create and manipulate digital content". It should be noted that these aspects are also important in producing OER.

The negative trends draw attention to shortcomings in the proposed teaching activities in relation to certain

specific skills. For example, "Evaluating data, information and digital content" and "Learning to protect personal data and privacy" were not sufficiently stimulated, or at least not to the extent that students had expected prior to the activity. The question of privacy, in fact, was not the main focus in designing the project and setting its goals, whereas the ability to evaluate content was regarded as essential.

Digital skills	Entry	Exit	Trend
Learning Wikipedia's rules	16.7 %	27.3 %	+10.6
Browsing, and searching for data, information and digital content	54.8 %	63.6 %	+8.8
Learning to create and manipulate digital content	48,4 %	56,8%	+8.4
Learning about copyright rules and digital licensing	52.4 %	52.3%	=
Self-assessing e-skill needs	23 %	22.7 %	=
Exercising digital citizenship	34.9 %	33.0 %	-1.9
Evaluating data, information and digital content	76.2 %	65.9 %	-10.3
Learning to protect personal data and privacy	17. %	6.8 %	-10.7

Table 1 - *Digital skills and activities on Wikipedia*: Data from entry and exit questionnaires administered to students.

This divergence from expectations was analyzed with attention, particularly in view of the fact that the instructors' answers were markedly different in tenor. By contrast with the students, the instructors felt that the project was particularly successful at stimulating such specific aspects of digital skills as "Browsing, and searching for data, information and digital content" (87.5%), "Evaluating data, information and digital content" (100%) and "Learning about copyright rules and digital licensing" (75%). In addition, instructors believe that the project was successful in stimulating skills in scientific writing and manipulating digital content, as well as the culture of collaborative writing, which is essential for shared production of OER.

4.3 Discussion

The comparison between teachers and students is limited due to the different numbers of the two samples, anyway we can conjecture that the notable difference in instructors' and students' perceptions regarding the evaluation of sources and content was due to the fact that although evaluation was considered to be a priority skill, its importance was only implicit: in most cases many bibliographic sources used in writing the articles were suggested by the instructors (especially in the scientific subject areas) and then searched by the students on their own. Consequently, the students did not perceive a clear improvement in their evaluation skills at the end of the project. Greater attention will thus be given to developing digital skills, considering them not only in terms of technical ability but also as key competences for creating OER and participating in OEP.

Analysis of the open-ended questions indicates that collaboration between instructors and students in writing Wikipedia articles had a clear impact on several aspects of subject-specific learning, but above all on Open Education culture. An intrinsic characteristic of the OER produced as Wikipedia articles is that they involve a process of improvement by the community and are artifacts that can be reused in subsequent years as part of university teaching. At the same time, the fact that they are published under free licenses ensures that they are open to users outside the university. In our case, the project itself is "open", as it is available on a dedicated Wikipedia page and demonstrates that the encounter between academic educational practices and the world of Wikipedia can promote OEP.

5. Conclusions

The first results of the experimental project that brought Wikipedia to our university have shown that designing teaching programs whose sole aim is to create OER necessarily involves addressing the broader issue of open educational practices (OEP) (Koseoglu & Bozkurt, 2018). In this sense, Open Educational Resources must be seen as the dynamic product of a process defined by Open Educational Practices. The technologies selected for creating OER can facilitate these processes, and Wikipedia-based activities are ideal for this purpose precisely because the encyclopedia is not only a container for open resources, but a true learning environment, well organized with precise rules that can stimulate the adoption of Open Educational Practices.

On the basis of our experience, implementing these practices in university teaching calls for careful planning and constant monitoring in order to overcome technical difficulties and effectively manage learning strategies for subject-specific content and digital competences. A primary concern is to provide adequate support and training, as there is a high risk of breaking Wikipedia's rules when writing articles, thus causing a conflict with the community of Wikipedians which, if unresolved, can lead to the article's deletion, bringing all of the effort that students and instructors have put into the project to nought. Second, it is necessary to define students' and instructors' educational needs for specific digital competences, particularly those involved in searching, selecting and evaluating information. For example, in redesigning the approaches our project will take in the

coming years, it will be recommended that instructors try giving students a freer hand in finding and choosing sources.

Lastly but not least importantly, a sense must be instilled in participants that writing a Wikipedia article – an Open Educational Resource – involves an open, spontaneous and collaborative process (Xu & Li, 2015): this means that both the student and the instructor must share the "open" philosophy, seeing their work with Wikipedia as a service to the community, not unlike the Service Learning approach, and interpret it as a social process and not simply as a question of learning subject-specific content.

Author contributions

Although this paper is the outcome of both co-authors' joint reflections and analysis, Corrado Petrucco wrote sections 1, 2 and 5, while Cinzia Ferranti wrote sections 3 and 4.

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Start@unito as Open Educational Practice in Higher Education

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Abstract

Open Educational Practices mainly refer to the use of Open Educational Resources, the adoption of innovative pedagogical models, and educators and learners' engagement in both formal and non-formal learning settings (Cronin & MacLaren, 2018; Koseoglu & Bozkurt, 2018). There are many experiences of open education context all over the world, and international organizations are redefining concepts of education that contribute to a change of perspective (UNESCO, 2019). In the context of open education, start@unito is an experience that delivers 50 open online courses in a Digital Learning Environment. Moreover, start@unito teaching practices are devoted to improving actual and prospective university students' learning and training, using innovative methodologies, like automatic formative assessment and adaptive teaching and learning, and technology, with advanced tools connected via an integrated system. This research analyzes the model of start@unito to show that it falls under the Open Educational Practices. The analysis compares the pedagogical strategies and evaluates adherence to the international OpenEdu Framework (Inamorato dos Santos et al., 2016). Quantitative and qualitative data promote the positivity of the start@unito experience. This research will show how such a model can improve OEP because of some of its peculiarities, such as the continuous availability and the use of adaptive methodologies.

KEYWORDS: Higher Education, Open Educational Resources, Open Educational Practices, Open Teaching, Start@unito

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1. Introduction

There has been a slow but steady increase in papers related to Open Educational Practices (OEP) in recent years, detected by (Koseoglu & Bozkurt, 2018), which collected paper abstracts and bibliographic data indexed in the Scopus database combining descriptive statistics, text mining, social network analysis, and content analysis. The reasons for this growing interest can be drawn from the recent development of other quite famous concepts like Massive Open Online Courses (MOOCs) and Open Educational Resources (OER), whose recommendations and standards are continuously stressed and developed by international organizations (UNESCO, 2019). For all these topics related to "openness", there is a tendency to view access as the principal concern of open education (Knox, 2013). On the other side, open processes aim at engaging learners with participation and dialogue, and policymakers should better understand them.

Numerous experiences try to evolve and develop good practices in open education. In Italy, the University of Torino is one of the largest universities, with more than 79000 students, covering all subjects except engineering and architecture. In the last years, our university has invested in e-learning methodologies and tools to explore new ways for teaching and learning: one of its largest open education actions is start@unito (https://start.unito.it), which is a Digital Learning Environment (DLE) that actually delivers 50 Open Online university Courses (Marchisio et al., 2019). Start@unito wants to facilitate students' transition from secondary school to university, with open courses related to the main first-year disciplines, offer an opportunity for education to all people, promote

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internationalization, and support in-person module leaders. Start@unito DLE mainly consists of a Virtual Learning Environment integrated with tools that facilitate autonomous and effective learning, like Automatic Formative Assessment (AFA) to provide students with immediate and interactive feedback and increase the interactivity and the adaptivity. The start@unito model provides the users with a repository of contents available to anyone through a Creative Commons license.

This paper aims to analyze the model of start@unito to show that it falls into Open Educational Practices. The analysis compares the pedagogical strategies and evaluates adherence to the international OpenEdu Framework (Inamorato dos Santos et al., 2016). Quantitative and qualitative data promote the positivity of the start@unito experience. This research will show how such a model can improve OEP because of some of its peculiarities, such as the continuous availability and the use of adaptive methodologies. Section 2 illustrates the state of the art in which the research of this paper is inserted. Section 3 presents the research questions and the methodology adopted to carry out the research. Section 4 shows the adherence of start@unito to OEP. Section 5 discusses the impact analyses. Section 6 delineates opportunities and future challenges.

2. State of the art

In literature, the definition of Open Educational Practices (OEP) is not universally acknowledged, and various authors provide different nuances of it. As this is a research field born in recent years, a collection of different definitions and perspectives about OEP was carried out in (Cronin & MacLaren, 2018). In so doing, they also considered expansive definitions of OEP that encompass open content but also allow for multiple entry points.

One of the most used is given in (Ehlers, 2011) who defines OEP according to the previous background provided by the OPAL report as "practices which support the (re)use and production of OER through institutional policies, promote innovative pedagogical models, and respect and empower learners as co-producers on their lifelong learning path". Open practices address the whole OER governance community: policymakers, managers/ administrators of organizations, educational professionals, and learners (OPAL, 2011). This definition emphasizes different aspects and stakeholders that take part in OEP development. Open nature is necessary because it is in the name of OEP themselves, but it is not enough because changes in educational, institutional, and pedagogical architectures need to be facilitated.

(Beetham et al., 2012) analyzed the outcomes of the UK OER program, which provided funding and reflections on more than 80 projects. They highlighted six distinct practices that characterize OEP:

- OER production, management, use and reuse, open licensing materials.
- Developing and applying open/public pedagogies in teaching practice to facilitate students and teachers and contribute to public knowledge resources.
- Open learning, with peer-to-peer learning, sharing outcomes, and open accreditation.
- Practicing open scholarship, including open research, open data, and open access publication.
- Open sharing of teaching ideas, sharing examples of teaching practice.
- Use of open technologies in an educational context, including social media and digital open tools.

Inside OER Commons, the project created by the Institute for the Study of Knowledge Management in Education (ISKME), the managers state that "the move to Open Educational Practices (OEP) is more than a shift in content, it is an immersive experience in collaborative teaching and learning. OEP leverages Open Educational Resources (OER) to expand the role of educators, allowing teachers to become curators, curriculum designers, and content creators" (OER Commons). Even other OER repositories relate to OEP. In (MERLOT), they state the following practices:

- Adopting OERs to make college more affordable.
- Redesigning courses to improve student learning in academic courses.
- Redesigning programs and courses to improve career and technical education outcomes.
- Adopting virtual labs to innovate STEM education.
- Applying quality assurance methods to improve online and hybrid instruction.
- Supporting institutions migrating to online instruction.

Following this last point, some experiences in creating communities of practice in open education were created (Tovar et al., 2017).

OEP have different meanings and different nuances and areas of application (Hodgkinson-Williams, 2014):

- Technical, which concerns interoperability, open formats, connectivity, technical skills, equipment.
- Legal, about open license parameters; open license knowledge and advice.
- Cultural, concerning conceptions of knowledge and curricula.
- Pedagogical, for student engagement, assessment strategies.
- Financial.

Moreover, the area of institutional support plays a pivotal role. In (Nascimbeni et al., 2018), the authors mapped the openness and capacity of universities across all dimensions of open education, providing hints to raise the overall openness capacity of institutions' teaching staff.

To sum up, in the literature, the most used definitions focus on OER and collaborative practices to transform education, with many other details about pedagogy, stakeholders, institutions, curricula.

3. Research Questions and Methodology

How can a particular action be considered an OEP? This is the question that underlies this research in the framework of the Open Online Courses provided by start@unito.

More precisely, the research questions are the following:

RQ1. To what extent does the teaching and learning model develop with start@unito fall within the Open Educational Practices?

RQ2. What are the contribution and the impact of the start@unito OEPs on Higher Education in learning from students' perspective and the innovation of teaching practices from professors' point of view?

To answer RQ1, we will consider the ten dimensions of open education depicted in the OpenEdu Framework (Inamorato dos Santos et al., 2016). We selected this framework among others, because it's directly supported by European Commission through the Erasmus+ Programme: this choice could help us in targeting a compliance with the European strategies for open education. We shall look for features of start@unito that reveal the presence of elements related to the four transversal dimensions:

- Leadership
- Quality
- Strategy
- Technology

and to the six core dimensions:

- Access
- Collaboration
- Content
- Pedagogy
- Recognition
- Research

To investigate RQ2, we will provide the reader with quantitative data from platform usages, such as the number of users and resources. Moreover, we will delineate some qualitative remarks from open answers to various questionnaires submitted to students and teachers. On one side, students who complete an online course are forced to submit a questionnaire underlying strengths of their experience to obtain the certificate. We have answers from around 8000 students. The search for particularly relevant experiences was carried out looking for keywords in the text submitted by students. On the other side, teachers were interviewed during focus group activities and through a subsequent questionnaire. We collected answers from 47 teachers over 69 module leaders.

4. Adherence to Open Educational Practices

We answer RQ1 by discussing the various items related to OEP in the following subsections, according to the international OpenEdu Framework (Inamorato dos Santos et al., 2016). We will discuss the various strategies that have been adopted in start@unito according to the framework and we will provide an overall evaluation that covers all the 50 Open Online Courses, see Figure 2.

Figure 1 - The ten dimensions of Open Education as depicted in Inamorato dos Santos et al. (2016).

4.1 Transversal dimensions

In the OpenEdu Framework, the four transversal dimensions of open education (Leadership, Quality, Strategy, and Technology) provide the structure for realizing of the six core dimensions.

Leadership concerns the promotion of sustainable open education activities and initiatives by inspiring and empowering people. Strategies and activities are decided not only at the executive level (top-down). They also arise from the feedback provided by students and other participants (bottom-up) to guide future developments of open education at the institution in different strands. The same method was used to develop start@unito, which has its basis on institutional guidelines, provided by the Scientific Committee of the project after a cycle of meetings with teachers and students, to understand the needs and requirements. Module leaders have didactic autonomy and expert

guidance, with focus group meetings and feedback on the newly created content. The leadership in start@unito is transversal because it is based on different levels: personal motivation of the teachers who prepared the materials, organization of tasks coordinated by a group of digital education experts, cooperation between teachers, and management of results by the scientific committee.

Quality in open education refers to different aspects, such as efficacy, impact, availability, accuracy, and excellence, making the institution's offer more reliable and trustworthy for open learners. Quality evaluates if the purpose of the various dimensions is achieved and the extent of the achievement, considering transparency and ease-of-access. Different actors, such as the project leaders, learners, or external organizations and people, can measure quality. It can have a smaller or larger focus, from an institution's overall reputation to a particular OER. In the rest of the paper, when dealing with quality, we will provide a description of different strategies, whose presence or absence partially reflect on quality.

Strategy defines the values, the commitments, the opportunities, the resources, and the capabilities of a Higher Education institution for open education. The relationship between other aspects of the institution's policy should be clearly stated and developed by a strategy that can enhance and enrich the educational offer. With start@unito, the University of Torino has invested human and financial resources in favor of open education, declaring it a common value for the whole community. The commitment was made to take care of the platform as it represents an opportunity for training and a possibility of enriching the University's training offer for all students, especially the most disadvantaged, weaker, or simply distant ones.

Technology refers to infrastructures, platforms, and software to facilitate opening up education. Technology is necessary and plays an important role in validating authentication, assessing and managing large numbers, and granting the contents' continuous availability. The degree of technology openness directly measures the institution's openness culture, which should prefer interoperable systems with many platforms. It should allow learners to interact, upload, share, download, peer-review, and modify existing content. In start@unito, the openness was exploited by putting the open source LMS Moodle on servers based on the Linux platform at the core of the software architecture. All the other solutions were chosen based on their interoperability, which enabled us to develop custom solutions to find suitable solutions to the project's special needs.

4.2 Access

Access in open education is the removal of the barriers which obstruct the way to knowledge. Three levels denote the feature of Access in Higher Education: access to programs, access to courses, and access to educational content, which is in very close relation with the concept of Accessibility.

Start@unito provides full access to the course contents. On the other hand, administrative offices manage programs and courses, for which a cost for enrollment is due. Cost is one of the biggest barriers. From the learner's perspective, it cannot be avoided altogether. For example, the cost of internet connection or the time invested in studying: the lower the cost, the more open the access. Start@unito contains OER and provides contents without requesting any fee, so the cost is somehow shifted from the learners to professors, who dedicate time in preparing effective contents, and to the University, financially supported by foundations, that takes care of the costs of infrastructure, server, connection, and staff. Students are encouraged to give their feedback on digital content, thereby enhancing corrections and improved usefulness.

Access can be facilitated by adopting accessibility measures and adaptive contents that serve specific needs. Examples of accessibility measures are assistive technologies, like screen readers, that convert text-to-speech or screen magnifiers, responsive interfaces, readable fonts, and text. The Web Content Accessibility Guidelines (WCAG) recommend that content should be robust enough to be interpreted reliably by a wide variety of user agents. Textual descriptions or transcripts should accompany video and audio materials. Start@unito platform adopted a font called EasyReading, with high readability, suitable for students with dyslexia. Even though we have no performance measure about this topic, professors and content designers were trained on the various measures to adopt while developing the course, like proper color contrast, clear lexicon, readable documents, and web pages. Flexibility is essential for non-traditional learners who have more constraints.

Open education should not restrict entrance based on a minimum level of education, or country of residence, even though the prerequisites' assessment is important for the student to understand how much they are suited for the program. This is another aim of start@unito, which wants to help students recognize the right path. This action has been done in synergy with the Orient@mente project (Barana et al., 2017).

Open education content, courses, and programs should facilitate the interaction between learners and teachers or other learners to exchange ideas. The peer interaction is not provided by start@unito: at the moment, students can only contact the teacher of the module; the

scientific committee intends to use tutors to support learners in their alone or group activities in the future.

4.3 Content

The Content dimension in open education refers to teaching and learning materials, like textbooks, course materials, pictures, games, podcasts, video lectures, software, data, and research outputs in open access. Content can be openly licensed, in the public domain, or copyrighted, but should essentially be free and accessible.

In this context, start@unito uses and offers self-created OER also as a visibility mechanism to attract students and increase its reputation. Teachers and content designers explored different digital tools to create and make available meaningful content with appropriate granularity.

Few restrictions in the course structure were given. One of them was the presence of a minimal amount of video lessons, because the scientific committee recommends using audiovisual resources to enhance its content.

During content production, properly trained instructional designers supervised content designers to fulfil properly international standards and guidelines. Students can leave feedback on the course's different aspects when contents are delivered, guiding the renewal process (Marchisio & Sacchet, 2020).

After two years of activity, the different stakeholders plan to monitor the content to check if updates are needed. This process is planned to be repeated every 2 or 3 years, even though different courses require less or more updates: as an example, basic courses in Mathematics usually do not need updates of contents, but maybe changes from the point of view of didactics, while other courses, such as the ones in law, follow the updates of legislations. Module leaders are not allowed to edit content, which is a role that only belongs to the platform managers, to avoid any accidental generation of errors.

4.4 Pedagogy

Open pedagogy makes the range of teaching and learning practices more transparent, sharable, and visible. Open education emphasizes learners. The goal is to enhance the learning design's effectiveness and increase students' involvement, making pedagogical practices and learning descriptors visible, transparent, and accessible. Pedagogy should also enable learners to design their own learning path with a wide choice of learning resources.

Start@unito supports open learning, for which learners take the initiative and are responsible for their own learning processes. Learners decide what to study, select the most fitting learning resources with a self-paced approach, assess their learning outcomes at any time, in any place, and at any age. The only requirement is commitment and self-discipline.

Another pedagogical approach supported in start@unito is adaptive teaching. With technologies, more personalized teaching and learning can be carried out. The use of automatic formative assessment with immediate and interactive feedback has proven its effectiveness in different contexts (Barana et al., 2019). Moreover, future developments concern learning analytics to detect learners' online behavior and preferences. There is, however, a lack of other pedagogies, such as collaborative and networked learning, because of the self-paced educational strategy.

4.5 Recognition

Recognition in open education refers to issuing a certificate with a formal value and acknowledging and accepting credentials. Credentials should attest that the student achieved a set of learning outcomes. Recognition enables learners to complete a program more flexibly. Credentials can be issued in a variety of formal or informal ways, and the institution can choose whether to recognize them or not.

At the end of the online learning path, start@unito issues a non-formal certificate that students obtain after submitting a final unsupervised online test. Start@unito online courses are part of the educational offer of many degrees at the University of Torino. The non-formal certificate is mandatory to sit the exam, with which students can obtain formal recognition.

4.6 Collaboration

Collaboration facilitates the exchange of practices and resources to improve education around and through OEP. Collaboration promotes networks of individuals and institutions. Learners should be empowered to collaborate and connect with the institution to define a unique learning path to achieve their goals. Agreements should be supported for the development of OEP. Agreements can occur between individuals, intra-institutionally, inter-institutionally, nationally at the policy level, or cross-border.

In start@unito there is no collaboration between learners because of its self-paced approach. On the other side, start@unito promotes collaboration between different departments in the same institutions, with online courses offered in a larger number of programs. Moreover, some international students are allowed by specific agreements to attend start@unito courses without leaving their home university for a semester. Both universities accept and recognize certificates and credits.

4.7 Research

The relation between OEP and research relies on open access to data and research outputs and ways to broaden participation in research to advance science faster by sharing and collaborating. Researchers co-develop and become project participants and commentators on research ideas and progress because extended networks provide more expertise.

The literature referring to start@unito is increasing, and results and discussions are published as soon as the research is carried out. This happens because the leading scientific committee is composed of professors with different backgrounds and areas of expertise.

4.8 Summary

Figure 2 shows a summary of the evaluation of start@unito over the six core dimensions and through the four transversal dimensions. For the evaluation process, we used the grid provided by (Inamorato dos Santos et al., 2016) as a checklist. According to the following scale, there is a score for every core dimension: 0 means not achieved, 1 means partially achieved, 2 means largely achieved, 3 means fully achieved. On average, the result is largely achieved (Median 2, Average 1.95).

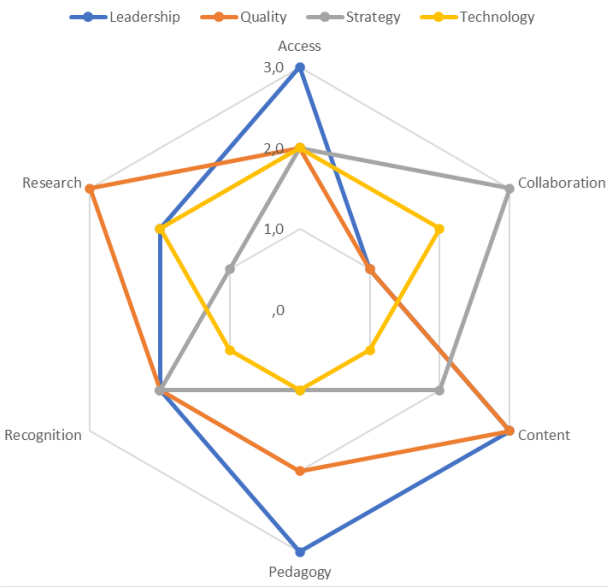

Figure 2 - The evaluation for start@unito of the 6 dimensions of Open Education according to the various transversal dimensions.

5. Analysis and discussion

In this section, we provide quantitative data about platform usage to give a weight of the contribution of start@unito OEPs, and qualitative data, which are mainly feedback from students and teachers, to evaluate the impact on learners and future university students. Examples of students' sentences are collected according to the following indicators: Usability, Self-awareness, Objectives, Kind of learners. These indicators were selected because of their importance in Open Education. Usability refers to the interaction between the users and the system, a topic for research and analysis. Self-awareness and Objectives help in understanding the perception from the students' point of view and in designing support activities. Kind of learners helps teachers and start@unito managers in profiling who uses the courses. According to the following topics, teachers' sentences are collected: Objectives, What teachers appreciate, During Covid-19. These topics were chosen because they were the most present in teachers' responses.

5.1 Platform data

Around 70 university professors dedicated time to preparing the online courses, together with around 50 postgraduate students. The platform currently hosts more than 37000 users (update December 14th, 2020), a number that comes from 2 years of activity. Half of the users, around 18500, made their first access after the start of the Covid-19 crisis in Italy. As showed in Figure 3 and Figure 4, the Covid-19 pandemic that arose in February 2020 generated a lot of activity and many new users because students could find online ready to use contents. From Figure 3 we can see the high amount of activity, which blew up in November 2020 with more than 270000 logins, a number composed both by new online students due to Covid-19 and by exam study. From Figure 4 we can highlight the large amount of new users in October and November 2020, mainly due by the start of the new academic year, numbers that are comparable to the one in March 2020, the start of the Covid-19 crisis. On the other side with respect to students, professors made large use of the newly prepared materials to switch to fully online teaching.

It is tough to accurately count the number of resources because teachers used them in different ways, sometimes embedding one into the other to maximize effectiveness. In 50 open online courses, there are more than 2000 file resources, more than 1200 videos, 1100 pages, almost 1000 tests, and other kinds of interactive content like conceptual maps, podcasts, components for the guided resolution of exercises, adaptive assignments.

Thus, the contribution to the usage of OEPs in the framework of start@unito is quite large.

5.2 Students feedback

At the end of the attended course, students were asked to indicate the strengths of the experience. Their answers help in the evaluation of the impact of

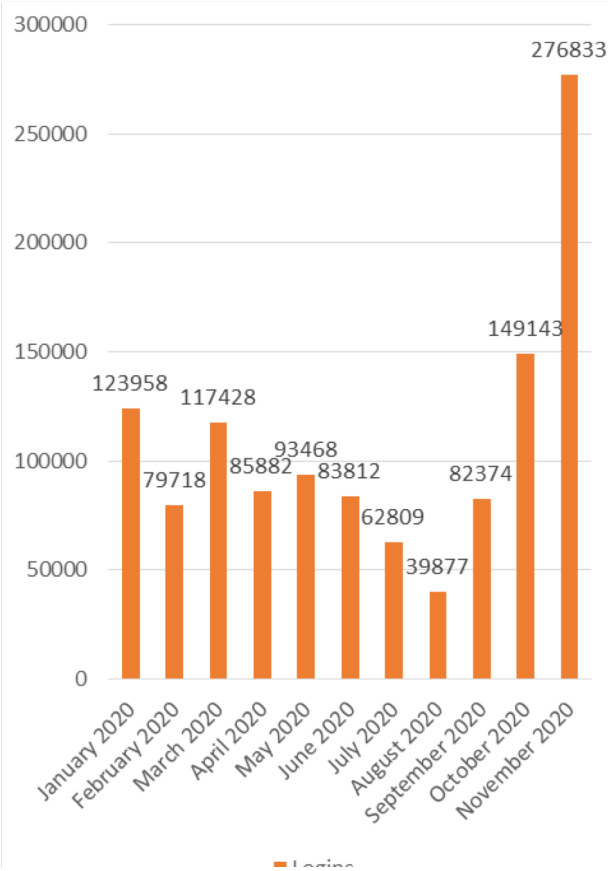

Figure 3 - Number of logins to the start@unito platform divided by month.

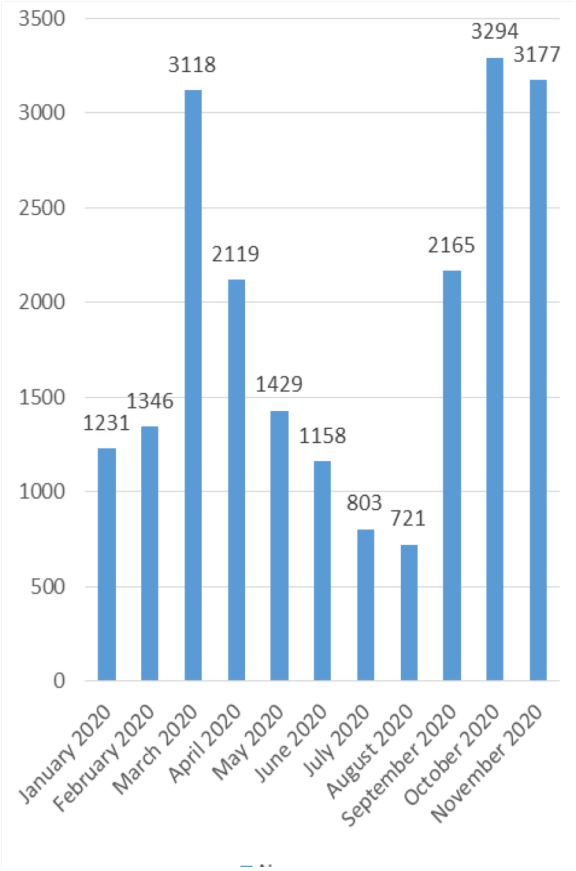

Figure 4 - Number of new users that subscribed to start@unito divided by months.

start@unito. Some examples of the numerous answers are reported here with comments.

Let us start with comments about USABILITY.

> *"For me who have a visual memory, it was very useful to have explanations through videos and images and not just documents of words and words. Thanks for thinking of us too!"*

Content designers were trained to pay attention to the multimedia principles for effective teaching. There are twelve principles listed in the Handbook of Multimedia Principles (Mayer, 2014) that provide very useful and practical guidelines on combining different channels such as images, narration, on-screen text, animations, and other media.

> *"The course was really well structured and well-finished, especially thanks to all the tools we have available such as videos and practice tests."*

The guidelines for content designers were more related to the pedagogical topics, while more freedom was left to the different tools that teachers could use. Thus, there could be some differences among different courses; however, all of them receive feedback by experts on digital education and the various tools. When decisions had to be made between different approaches, the module leader's autonomy was respected.

Now some comments about SELF-AWARENESS.

> *"Nice opportunity as it allows you to take an exam at a more intelligent time than scheduled, ease in finding the content you need and about which you have more doubts."*

This emphasizes the non-formal learning context, which takes place before students start any university program. The open education provided by start@unito allows students to get off the strict schedule of university lessons and to free to choose the best timing for themselves. In this feedback, the student emphasizes that the contents are easy to access and flexible to be watched and listened to often in case of doubts. Moreover, many teachers provided students with proper in-depth content, even external to the platform.

"Convenience in being able to follow the course from home also means greater concentration. Great way to test individual skills."

Attending from home or any other place makes education open, bringing the university into day to day life. This student emphasizes the ability to focus more on the topics when at home. A self-paced approach indeed requires good skills in time management. Good or excellent students can take more advantage. In contrast, students with more difficulties need more support, which is partially provided by adaptive teaching and interactive feedback from the platform, but sometimes this is not enough. Thus, to receive more personal support from the teachers, the university enrolled students can ask for meetings and make appointments with professors.

"Self-regulation of the amount of daily work, monitoring of the objectives achieved through the percentage next to it, self-assessment tests very useful because they allow testing what has been studied immediately, also giving possible importance to parts [that are usually studied] more superficially."

Students can monitor themselves with the completion progress, the grade book, and proper feedback while practicing formative assessment.

Now some comments about OBJECTIVES.

"The course allows you to understand if you are really interested in the subject, so it is an excellent orientation tool, also it already provides knowledge that will be deepened at the university."

Start@unito students are usually interested in enrolling in university. Thus, they need to understand if a certain program suits their attitude. Beyond this, students can attend a course that will be recognized in their university career plan.

"I appreciated the opportunity to prepare independently to take an exam in advance of the curricular timetable, thus moving forward with it and gaining precious time."

The chance to boost students' careers in advance is one of the main strengths of start@unito: openness means acceleration of learning, teaching, research.

Now some comments from different KINDS OF LEARNERS.

"As a worker, I appreciated the possibility of following the course according to the time available. Short but comprehensive videos, very clear in highlighting the main concepts."

Working students are a group of learners who need education to be open more than others. The more restrictions they have in other contexts, like working time, the more open and adaptive education should be.

"It is useful and precious, especially for those like me who cannot attend, to still have a course available, a very convenient way to be able to study."

There are many possible reasons why a student cannot attend classes. Online learning is not suited to all kinds of learners. There is a strong need for self-regulation. We do not know the percentage of university students who prefer these methodologies, but we are sure that it is good to allow students to choose the way of learning that best suits them.

5.4 Teachers Feedback

From the point of view of OBJECTIVES, teachers believe that start@unito is a tool that fulfills different purposes: it orientates students, it attracts students from other regions, it facilitates students in acquiring credits for master degrees, it allows forms of internationalization without mobility. In general, teachers' evaluation of the experience is very positive. After an initial time-consuming effort in content creation, teachers save time in the next semesters, also due to the facilitation in the management of exams. Moreover, teachers showed an improvement in their digital education skills.

Teachers appreciated the opportunity for students of different degree courses to get credits through the open online courses in different disciplines enriching their personal curricula. Start@unito is appreciated as an opportunity for all citizens to study topics of interest, with continuous availability. It is a stimulus for the teachers themselves: useful experimentation of new shared ways of teaching. Moreover, teachers were extremely grateful for the online content available during the lockdown.

During Covid-19 emergency, teachers used their online courses as integration, as a remedial path, as a review of topics, as a valid alternative of in-person classes, as a reference for synchronous online lessons, to replace part of exams with completion of the course, to summarize topics generally treated in a complex way. Many online topics were a starting point for organizing blended teaching, and teachers suggested that students take all the tests and guided exercises to better prepare for the exam.

6. Challenges and opportunities

This experience gives rise to some reflections, valid for all open practices.

Tutoring can facilitate collaborative learning between peers and peer evaluation and better support students:

for this reason, this is a planned activity for the future of start@unito.

Other challenges are provided by microcredentials, to offer students and professionals a chance to enrich their resume with specific topics and skills. Start@unito teachers can guide microcredential attendees with an open online course. In this direction, the creation of new Open Online Courses that cover new areas, such as the medical area, should make students more easily insert credits in different curricula (smaller micro credentials).

The higher the number of teachers, the greater the use and the quality of OER and OEP. This comes with a big effort in training. The University of Torino proposed seminars to give teachers extra tools, ready-to-use contents, and autonomy on open education matters. It is important to create networks to share materials, to facilitate access to students from disadvantaged regions closed to partner institutions. This does not just refer to Higher Education, but also to secondary school: it is important to ensure that the benefits of OEPs and their dissemination are increased in this setting, too.

7. Conclusions

Start@unito can be considered a positive experience, which makes education open. The commitment of the University of Torino in OER is increasing thanks to this experience. According to the description and adherence to the various dimensions, the start@unito model is close to the framework of OEP (RQ1). The large numbers of users and platform usage, the numerous comments and feedback received from students and teachers confirm the strong impact on university policies (RQ2). Moreover, this work suggests reflections for the future's educational policies, as depicted in Section 6. The usefulness and benefits of the experience both for students and teachers were highlighted during the Covid-19 pandemic. Teachers were able to continue the lessons and the students found materials available. The direct benefit concerns continuity of the teaching activity, it was not interrupted. Moreover, even those teachers who switched from in person classes to platform activity were able to monitor and intervene in support students with targeted synchronous moments.

A future improvement will be the expansion of start@unito offer with new courses and microcredential modules so that more university programs can take part in it. Moreover, after two years of operativity, it is important to improve the contents and the effectiveness of the teaching methodologies, integrate possible missing parts, update to the new standard and discoveries, cover all disciplinary areas, and provide microcertifications and more international courses, for example, courses that are completely held in English.

The international benchmark is coming closer, with agreements between universities to let their students attend start@unito online courses. The recent consortium UNITA - Universitas Montium between the University of Torino and other European universities promotes the interaction between institutions. Opening up education is a common goal and a useful method to collaborate. Open Education also means international education.

Acknowledgments

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Making Open Educational Practices real. The case of "The Grand Challenge 2020"

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Abstract

The article presents a case study of a course design which is based on the concept of open educational practices. The course took place during times of lockdown due to the COVID-19 pandemic in which universities in Europe had to stop their presential operation and had to move teaching and learning entirely online. The case study presents in which way the concept of student-centred learning, of problem-based learning and of involving the public into higher education learning has been realised. Students' feedback is analysed and conclusions are drawn.

KEYWORDS: Open Education Practices, Course Design, Students' Feedback

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"Teaching someone (a field of knowledge) is not about getting them to memorize the finished results, but about teaching them how to participate in the process of gaining knowledge... Knowledge in this sense is not a product, but a process" (Bruner, 1974, p. 74).

1. Introduction

During the past digital semester 2020, all Higher Education Institutions across Europe have had to close down their campuses due to the corona pandemic. This has fuelled the need for digital teaching formats and courses on a broad front. All courses at European HEI were held online for the entire semester without any face-to-face interaction with students. While for many teachers this was their first encounter with such an intensive online teaching, there are varying degrees of expertise and experience across all HEIs. These differences tend to occur less between institutions than between groups of teachers, departments or institutes. Wherever extensive experience in online teaching and learning was available, the digital summer semester 2020 has been regarded less as a challenge or deficit format than an experimental space. In these cases, the shift to online teaching was often perceived as an opportunity, where learning designs beyond the synchronous online lecture mode have been explored. Within these experimental space, often open educational scenarios have played a role. Then educational scenarios were designed around problem-oriented, student-oriented and competence-oriented learning experiences and digital tools were seen to enable such characteristics rather than "the remote" being an obstacle to it. In many other cases teaching in times of Corona shutdowns meant online synchronous lecture format (which we like to refer to as the "synchronous reflex"). The question of how online learning can be designed to facilitate the process of teaching beyond the traditional synchronous lecture format has been the subject of much discussion.

The Grand Challenge 2020 (in the following abbreviated as GC) course concept is an example of such an experiment in which we transferred a student-centred and problem-oriented course into an online setting following the model of open education practices.

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During the last semester of their bachelor's program (6th semester), students in business information sciences at the Baden-Wuerttemberg Cooperative State University developed foresight-projects on the topic "Impact of artificial intelligence for future societies" completely online and presented their results within the scope of an online student conference. This online conference was streamed live and the resulting student works (artefacts: an essay, a short presentation (TED talk format) and a short video (clip/ film) were published on the project website next-education.org (www.next-education.org /grandchallenge2020). The course design fully implements the "shift from teaching to learning" (Wild 2005). The course design has been applied and improved for some years now. Even though it is based on the approach of "open education" (see section 3), it is regularly carried out on campus in blended learning format.

Students were invited to design their own projects and to choose one of five overarching topics related to artificial intelligence and the future society: Work, education, the life of the individual in society, art and culture, and politics. Teachers provide support as coaches during the whole project team work process. The task was to develop a future vision for 2040 on the basis of an ethical analysis. One part was to elaborate the consequences of the increasing influence of artificial intelligence on social processes. The other task was to develop recommendations that have to be implemented to ensure that necessary conflicts of values and interests are socially beneficial and lead to a desirable future.

2. Method

This paper aims to address and answer the question on how online learning can be designed to facilitate student-centred learning in an open learning environment rather than relying merely on a knowledge transfer model in a teacher-centred fashion. To answer this question, we will apply the case study methodology and present one case, analyse its design and the resulting experiences. Case based research can be defined as an "approach in which the investigator explores a bounded system (…) over time through detailed, in-depth data collection involving multiple sources of information (e.g., observations, interviews, audio-visual material, and documents and reports) and reports a case description" (Creswell et al., 2007, 245).

Yin's (2014) two-part definition focuses on the scope, process, and methodological characteristics of case study research, emphasising the nature of inquiry as being empirical and the importance of context to the case.

Within the scope of the present case study we will first give an overview of the course design and the context (section 2). Then we will introduce the concept of open educational practice (OEP) and will analyse the course against the OEP framework (section 3). In a next step the theoretical implications of the underlying teaching/ learning model will be analysed according to learning theory (section 4), followed by an analysis of the students' feedback on the course, that has been collected as qualitative data (section 5). Finally, the paper provides a short summary and conclusion (section 6).

3. The "Grand Challenge 2020": Course structure and design

The course focuses on a red-hot topic: the consequences of digitalisation, artificial intelligence and big data on our society. The students are thus dealing with a topic that affects them personally and will also shape their future (professional) everyday life. Within the curriculum of the bachelor's program of Business Informatics the course is anchored within a module called "New Concepts". During the course of study, it is located in the sixth semester, the final semester of the program.

At the beginning, the following questions are raised, which provide a thematic introduction to the course: What are the consequences of the continuous development and ever-increasing dissemination of artificial intelligence (AI) and big data on our society? What is the actual state of the art? What scenarios of implementation are available? Is our society on the right path - or will there be unpredictable risks? What about the protection of our private data? Is AI mature enough to determine our lives, e.g. when driving autonomously?

In this course, students will address these questions in relation to 5 major topics of the digital future:

1. The digital work of the future under the sign of AI
2. AI in the education of the future - individual, flexible, networked and lifelong, ...?
3. Our life with AI - the transparent citizen: personal data as the gold of the future
4. AI and the culture and art of the future
5. The digital, networked society: politics in the age of AI.

Around each topic, a project group of four to six students is formed. This group works together throughout the entire semester on all artefacts.

The key task of the GC 2020 is to develop a future scenario in the light of artificial intelligence and Big Data of the year 2040. How digitization will develop in relation to artificial intelligence and big data - where might be risks, where should we seize the opportunities?

In this course, students are asked to elaborate their subjective "strong beliefs" and problem statements and then discuss these within their project group. The aim of this discussion is to juxtapose contrasting "strong beliefs", to refine them and thus to approach the subjective-thematic area created by the group on the basis of their respective background experiences and contributions. This results in unresolved problems, questions and thematic outlines, which will be further analysed and developed in the course of the project. A second step is the development of a "mission statement" of the project group, which focuses on possible approaches to the problem statement. The project groups therefore reflect on what needs to be done to achieve a good future for its topic against the background of their "strong beliefs" and problem statements. Those work results consisting of "strong beliefs", problem statements, open questions and outline points resulting from the discussion as well as the mission statement are documented in a set of slides. This first thematic approach is being presented in the plenum constructively involving fellow students as active advisors and feedback providers.

The next learning unit focuses on the research-based transfer of the "strong beliefs" into a future scenario. On the basis of assumptions as well as open questions, available literature and foresight studies, the teams develop a probable scenario (probable case) out of a best and a worst-case scenario [On the concept of foresight analysis, see also comprehensively Müller (2008), who reviews the thematic references and the current state of research in his dissertation. For the development of scenarios see also Weinbrenner (1994) and https://www.sowi-online.de/praxis/methode/szenariotechnik.html]. Based on this scenario, the working groups derive policy recommendations to address the problematic aspects of the future scenario from their perspective and identify the conditions for a successful future scenario that is as constructive as possible.

In total, the student groups produce a portfolio consisting of three artefacts:

- 3-5 pages long essay "Future with AI in 2040" (on the respective group topic),
- Challenge 2020 video on the respective topic (max. 5 minutes),
- seven-minute TED-Talk presentation that is presented along with the video to an expert jury during the public final conference.

The course concludes with the "Grand Challenge Conference". Since the course was offered within three different classes of the business informatics bachelor's program at the same time, there was the possibility to have groups with the same topics compete against each other during the GC. An expert jury evaluated the group work (artefact b and c) and selected the three winning groups with the best concepts and most convincing arguments. Through a peer-assessment process, students also act as feedback providers and jurors, as they evaluate the essays (artefact a) vote to award the best essays. All essays and videos have then been published online under a CC-Licence [during publication, various general conditions must be taken into account, such as the students' declaration of consent to publication and the clarification of copyright issues regarding the material to be seen in the video].

The course is designed as a 12-week course. The basic framework of the course includes three to four 3-hour online conferences, so-called challenge conferences:

- Challenge Conference 1: In this conference, the project-oriented way of working is developed together with the students, the groups are formed, and the topics are defined.
- Challenge Conference 2: Based on their "strong beliefs", the students elaborate problem and mission statements and vision descriptions for a desirable future on the basis of their group beliefs. They present and discuss these with each other.
- Challenge Conference 3: In a next step, they carry out ethical analyses of their subject areas, in which they identify important value and interest conflicts resulting from the influence of AI in possible future scenarios 2040 and evaluate the consequences. The results are presented and discussed in the plenum.
- Challenge Conference 4: Grand-Challenge Conference: The students present their overall results in the form of a seven-minute TED talk and a video clip presentation to a jury within a public (student) conference.

The development of the artefacts is organized by the student groups themselves. Between the individual Challenge Conferences, students have the opportunity to discuss and consult with the teaching team about their questions and topics, work progress, and the learning materials used in approximately one-hour group coaching sessions. In practice coaching has proven to be an important success factor for the open educational design. It allows students to gain feedback, certainty and affirmation about their learning pathways, learning methods and learning progress, as these aspects are widely student driven activities in open educational learning scenarios. The consulting and coaching processes explicitly includes both themes, a) the content dimension of learning with feedback and advice on the student's development of the respective group topics and artefacts, as well as b) the process dimension of learning including feedback on the group collaboration process. In addition to these coaching appointments, students always have the possibility to organise further spontaneous, self-initiated advisory and coaching processes with the teaching team. The course concept is displayed in Figure 1.

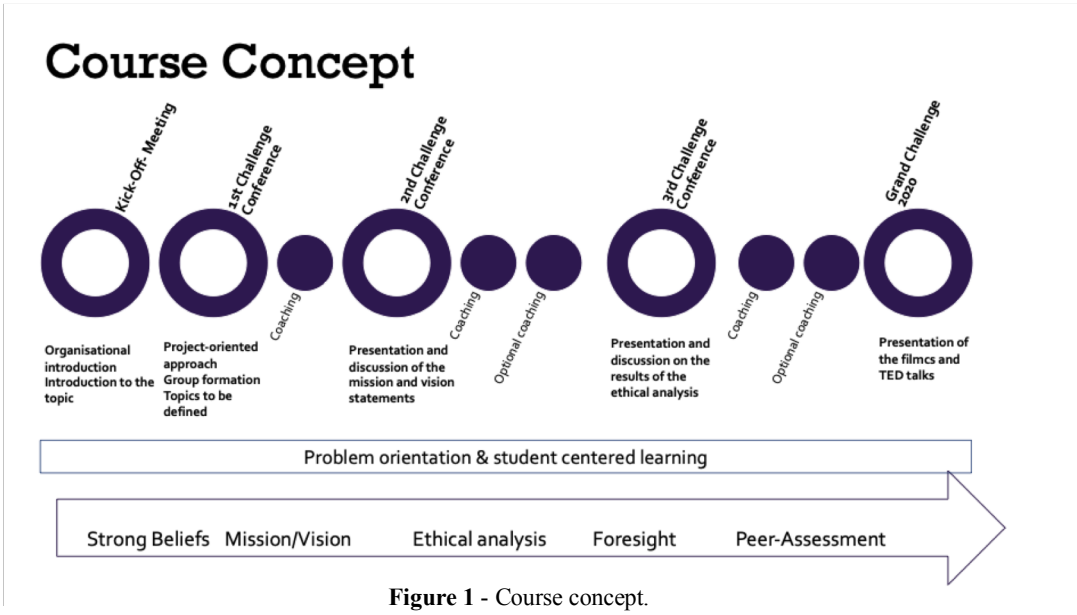

Figure 1 - Course concept.

4. The Grand Challenge as an open educational practice

The didactical design of the GC follows the concept of open educational practice (Ehlers 2011). The concept was first published by Ehlers in 2011 and has continued to develop ever since, among others by Huang et al. (2020). Didactically, it is based on a combination of so-called "open" educational approaches with the use of free and openly licensed learning materials, so-called Open Educational Resources (OER). It is a framework concept, which will be discussed here particularly from the perspective of its implications for the micro level, i.e. the teaching/learning process, but in principle also has effects at the institutional level (meso level) or policy level (macro level). It is a framework concept that does not contain any concrete educational approaches, but rather provides a framework that defines normative categories (which are basically: openness, learners' participation) according to which existing educational approaches and teaching/ learning methods can be classified.

In addition to the free availability of products and content, the core idea of the Open Movement is the culture of participation (Ehlers, 2014). Open software thrives from the involvement of users, who develop applications based on their own ideas and needs. Open content is created when users spread their knowledge and share it as free educational resources. Open innovation takes place when users participate in value-added processes and benefit from the results. Thus, in open education, students are not seen as "products" of educational institutions, but as active participants and potential innovators in an educational environment.

The goal of open education is therefore to create a teaching/ learning culture (Ehlers, 2014) in which learners and teachers mutually see themselves not only as "knowledge transmission agents" (teachers) or "knowledge receiving agents" (students) but also as producers of knowledge and innovators of their own learning environment. The underlying concept of learning as an activity is not "transmission – acquisition" but "participation – transformation" (Ehlers 2014). This perspective goes beyond the provision of teaching/learning materials and strives for an open educational culture. Although financial resources are a prerequisite, they do not guarantee the success of open education initiatives. Cultural aspects play a decisive role in the sustainable anchoring of such initiatives. To motivate learners and teachers to participate in open education initiatives, participation in such projects must be anchored as a value in the teaching/learning culture of an educational institution and be recognized accordingly (Ehlers, 2014).

At the core of the concept there is the combination of didactic openness in the teaching/learning concept with the concept of open educational resources. The conception of OERs is not only about using already existing resources, but also about creating educational resources by completing studies or by developing or remixing existing materials (see Fig. 2).

In addition to its descriptive function, the concept also has a normative objective. While it is initially suitable for classifying existing teaching/learning scenarios and for gradually differentiating open educational practices from rather predetermined (not determined by the learner) educational practices, from a normative perspective it shows that open educational practices are

rather desirable. Higher gradual manifestations on both dimensions are described as desirable in the model. For example, the original model from 2011 points out that a gradual increase in OEP is not only intended to represent other forms of teaching/learning, but also to achieve an improved quality in learning outcomes - measured in terms of teaching/learning goals. OERs should therefore not only be used as a substitute for the mediation processes otherwise carried out by teachers (e.g. by sharing a video) but should above all be accompanied by an expansion of the students' degree of freedom and participation in teaching/learning.

The approach we have chosen to classify didactic scenarios/learning activities in terms of their openness follows the approach to classify different teaching styles by Baumgartner (2007): Teacher - Tutor - Coach. Other involved approaches to classify learning activities have been considered, which come to similar conclusions, such as Paavola, Lipponen and Hakkarainen (2004), which propose learning metaphors along the chain acquisition - participation - knowledge creation, Laurillard (1993) or a comprehensive analysis by Mayes and de Freitas (2004) for JISC. Following this analysis, educational levels of "freedom" or "openness" were conceptualized:

- "Low", or pre-determined teaching/learning scenarios when both the goals and the learning and/or teaching methods are rooted in "closed" unilateral, transmissive and re-productive teaching and learning approaches. In these contexts, the underlying belief is that teachers know what learners have to learn and focus mainly on knowledge transfer.
- "Medium", or co-determined teaching/learning scenarios represent a stage where goals are still defined and predetermined, but where teaching and learning methods are presented as open pedagogical models. They promote dialogue-oriented forms of learning or problem-based learning (PBL), which focus on dealing with developing "know-how".
- "High" degrees of freedom and openness or open teaching/learning scenarios in pedagogical models are given when both learning goals and methods (e.g. learning paths) are determined and controlled to a high degree by the learners. Questions or problems around which learning takes place are determined by the learners (SRL - self-regulated learners), and the teachers facilitate through open and experience-oriented methods that take into account different learning paths, either through "scaffolding" and tutor interactions (according to the concept of the "zone of proximal development" (ZPD) according to Vygotsky) or through contingency tutoring (here e.g. Woods & Woods strategies of reinforcement, domain-specific or temporal contingency).

In continuation of the OEP model of 2011, we have added a further category to the description of the degree of participation of students in the didactic design. In addition to the determination of learning paths and learning content, as it was done in the original model of 2011, we have added the category of competence goals. The reason for this is that it has been shown that in the context of institutionalised and especially formal educational processes, a framework for setting competence goals by the teachers is the norm. For informal learning processes this factor is in turn more strongly determined by the learners.

With regard to the dimensions of the concept of open educational practice, as shown in Fig. 2 and described here, the didactic design of the GC can be classified as follows:

Dimension 1: Openness of the teaching/learning scenario

The GC can be classified as an open teaching/learning scenario. While the competency goals are set by teachers, both the learning paths and the learning content are determined by the students.

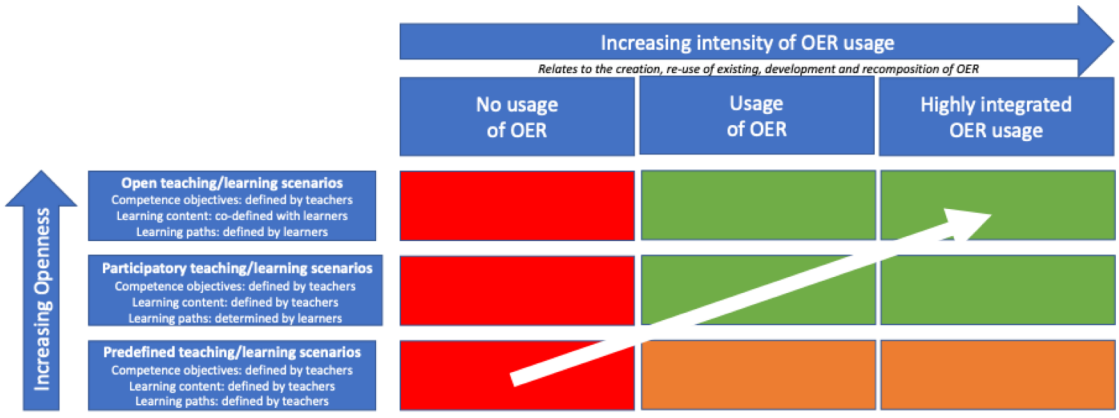

Figure 2 - Open Education Practice (further developed from Ehlers 2011).

Dimension 2: Use of OER

The GC can be classified as a teaching/learning scenario with high didactic integration of OER. All functions of OER are used, since the participants of the course benefit from existing OERs, further develop and recombine some of them, and develop their own OERs.

5. Learning theory and course design

For more than a decade there has been a worldwide discussion of a "Shift from Teaching to Learning", to quote UNESCO (see Berendt, 1999, 2002). The prevailing understanding across the different subjects at HEI, that didactic processes rely on "content-orientation", i.e. the presentation and communication of teaching content, is becoming increasingly less important. Thus, a student-centered approach that focusses on supporting self-organised learning processes and needs of students, consistently implements this change in perspective from teaching to learning. The teaching and learning concept of the GC organises the learning process starting from the student perspective. It focuses on the results of learning, which are achieved by the production of three artefacts, hence an "output orientation" to the "learning outcomes" is assumed. In addition, students and project groups are invited to reflect on their learning and work strategies and the group processes that they have used and experienced during the project work. Consequently, due to its emphasis on dealing with complex authentic problems and multiple perspectives this results in an competence-oriented approach that goes beyond knowledge transfer (for an explanation of the concept of competence and competence-oriented learning, see also Ehlers 2020).

The competence-oriented approach is based on the concept of "situated learning". In this regard, learning refers, in the sense of a "deep approach", to complex problems under most authentic conditions (on the concept of deep vs. surface learning, see also Entwistle (1981), Ramsden (1987) and Biggs (1993)) [Subsequent research by Marton & Säljö produced six conceptions of learning that university students experience during their studying period (Marton & Säljö, 1997). The six conceptions of learning are structured in a developmental hierarchy starting from the lowest: as a quantitative increase in knowledge; as memorisation; as the acquisition of facts for later use; as the abstraction of meaning; as a process designed to understand reality; and lastly for "developing as a person". The diagram shows how the conceptions are related to the amount of knowledge obtained, as well as their relation with deep and surface approaches to learning]. In the GC's student projects, students are not taught about the topic of artificial intelligence, but rather learn what seems relevant from their perspective by working on a self-chosen problem. Experts coach them along the way. As they present their ideas to their peers and to the public learning also happens through exchange and alignment. The problem-orientation allows to take multiple perspectives, stimulates articulated reflection within social exchange.

The course is completely and exclusively digitally supported and carried out online. It is structured in a problem-oriented way. The focus is on competence learning, taking into account the concept of student-centered teaching in a socio-constructivist teaching/learning setting, in which knowledge transfer is less important than student-centered coaching [For the understanding of teaching in this relation, see also Baumgartner's remarks on learning in the socio-constructivist mode, in which teaching is conceptualized as coaching of learners. The problems are not given by teachers but developed by the students themselves. Knowledge generation and development is the main focus. Baumgartner distinguishes this type of teaching from a cognitivist understanding of teaching and from a mediation-oriented behaviorist understanding (Baumgartner & Payer, 1997)]. Elements of peer feedback and peer assessment are integrated into the assessment.

5.1 The concept of situated learning

According the approach of situated learning, learning is conceptualised as an active and constructive process, rather than a passive reception of information (Wild, 2005). The concept is based on the assumption that only can be understood what itself has been (re-)constructed mentally or in reality. Moreover, in problem-based learning, the accumulated knowledge can not only be experienced and envisioned as a product, but also as a process (ibid.). When constantly teaching is solely carried out through direct instruction and transferring knowledge as a "ready-made product" without the associated knowledge process, deprive knowledge acquisition is deprived of its process-related, generative problem-solving, reflexive and contextual character (Baum-Gartner, 2005; Wild, 2005). Individual - cognitive, metacognitive and resource-related - learning strategies and heuristics (Wild, 2005), including strategies of independent and cooperative learning, learning monitoring, learning control and self-management cannot or hardly be acquired through receptive learning and isolated and abstract training of learning skills. For an elaboration on the importance of these learning strategies and especially the development of students' self-organisation skills for their development of so-called "future skills" see Ehlers (2020) [Cognitive psychology and (moderately) constructivist approaches, which aim at self-organized and self-regulated learning and related instruction, also

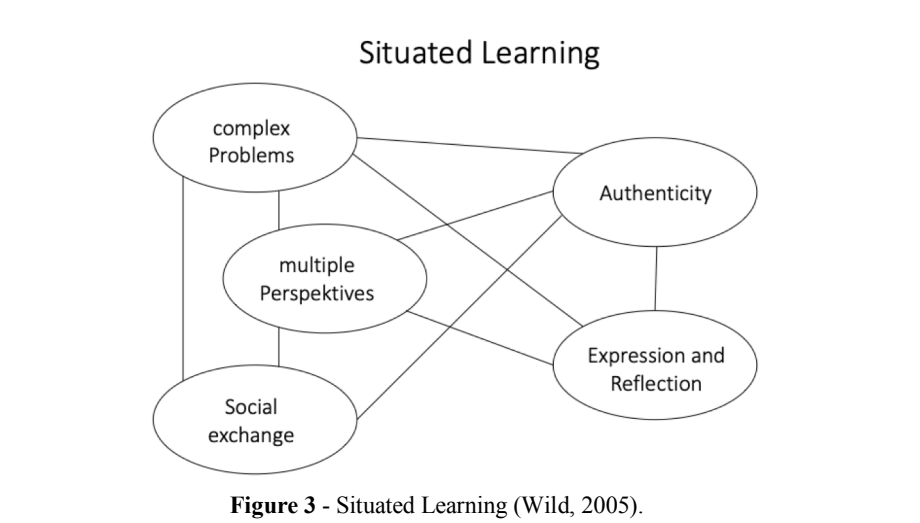

Figure 3 - Situated Learning (Wild, 2005).

provide a foundation in learning psychology (see Baumgartner, 2005; Wild, 2000; Reinmann-Rothmeier & Mandl, 2001)].

5.2 On the concept of problem-oriented learning

The concept of problem-oriented learning has three basic characteristics (see Mayo et al., 1993; Marks & Thömen, 2001):

1. orientation towards complex problems,
2. student-centering through self-directed learning in small groups and
3. supervision by learning guides.

According to the concept, the starting point of all learning activities in the GC event is the assignment or selection of a comprehensive problem task, which due to its complexity can only be solved with the help of the prior knowledge of other students within the given time. In the GC, the task is - according to the socio-constructivist understanding of teaching described above - not delimited as a clearly tailored problem area or task, but is presented to the students as a comprehensive topic area (here: "Effects of Artificial Intelligence on Society") for which they should first work in depth on the problem in order to generate a clearly delimited and defined problem. The thematic area is the stimulus for all further activities, which is why special importance is attached to its formulation and presentation. Students develop awareness to the existence of different positions on the topic of technology assessment in relation to artificial intelligence, as well as to the need of developing basic ethical attitudes towards the topic. By confronting the students with self-developed problems (based on their "strong beliefs" and mission statement) before the transmission of related content, a particularly strong interest in learning new contexts is created (Barrows, 1996; Reinmann-Rothmeier & Mandl, 2001).

Recommended solutions are developed jointly within the group, while each member is assigned a specific task and role (manager, researcher, analyst, rapporteur, etc.) that is communicated externally. The teacher only acts as a learning guide or supervisor; he/she only provides learning resources and takes over the teaching of content only in exceptional cases or to a very limited extent (Reinmann-Rothmeier & Mandl, 2001; De Grave et al., 1999).

While in traditional teaching, committed to a knowledge application paradigm, well-defined problems are usually used primarily to deepen, review and apply knowledge that has already been acquired (Aebli, 1983), more recent concepts focus on problem-oriented knowledge acquisition or generative problem solving (Klauser, 1998) on the basis of technically significant, authentic ("ill-defined") problems. The aim is dealing with those questions that have no correct or incorrect answers.

Through problem-based learning, students generate new knowledge within the process of problem solving (Klauser, 1998, p. 278). Courses in problem-based learning do not - as is often the case - start with longer phases of instruction, but with the challenge of independent learning.

5.3 The concept of public exposure within the learning process

Another important aspect for learning design is the component of public visibility, which at various points in the design of the course progressively becomes increasingly effective. From the beginning, students are informed that the course will end with a student conference, in which all artefacts will be presented to a jury and the public (including both the academic and professional public, as well as the broader public via online media). In addition, the students are asked to

agree to the publication of all student artefacts. Their working papers, video clips and presentation materials are then published on the Internet. This also allows them to access materials of the previous year's students. The final public conference is regularly promoted on social media channels - LinkedIn, Facebook, Twitter and Instagram - and students are encouraged to do so on their own channels.

Hofhues (2010) points out that the integration of public components in teaching can help to create an authentic learning context and facilitate learning according to a constructivist understanding. However, publicity does not make teaching a "self-runner" - on the contrary: Learners have to be prepared for the embedding of the public, otherwise they will easily be overwhelmed by the situation of public learning. Hofhues (2010) writes:

"They are not used to displaying their learning process in public and to having it transparent. Sometimes they also find it difficult to face presentation and discussion in front of external parties. In this relation, the medium of mediation hardly plays any role; the very opening of the learning process causes learners to be emotionally and motivatively involved in the context in a different way than in closed learning spaces." (translated from German).

If - as has happened here - a rather constructivist understanding of teaching and learning is applied, in which learning is embedded in complex or everyday situations, and social aspects of learning are taken into account (Reinmann & Mandl, 2001), the public can certainly be understood as a didactic mean, because: According to Hofhues (2010), embedding the public sphere is usually based on the concept of problem-oriented learning as described above.

6. Feedback from students

The following feedback is based on written and oral anecdotal feedback from students. Feedback was collected formatively throughout the course in form of an unstructured collaborative "Etherpad" online Whiteboard on which students could provide feedback on the content dimension and the process dimension of the course. In addition, the students were interviewed on their experience and feedback on the course afterwards. The interviews in a shortened and complied format have been published as artefacts in form of podcasts themselves and can be found on the website of the research group. A selection of the students' artefacts is also published there. The collected notes were paraphrased and grouped thematically; the results are presented below.

Project oriented design

Through the course design as POL the students felt challenged, but also supported and valued. Problem-based learning was considered more effective and sustainable and was evaluated positively in comparison to traditional teaching methods.

The students rated the didactic design of the course as more conducive to learning than "classical bulimic learning" for exams at the end of a semester.

Self-Organisation

At the same time, they highlighted the challenge of self-organization in this context. This point emphasises the importance of taking responsibility for one's own learning process, which is important for the concept of learner autonomy. The following statements give some hints:

The students consider it particularly important that orientation is provided in the problem-oriented learning process through timetables, milestones and group coaching.

Students encourage the definition of clear goals and milestones in a kick-off event

Coaching and support

Furthermore, the students' feedback reveals the advantages of guidance by the teachers rather than instructions. They emphasize the concept of coaching and differentiate it from other forms of teaching that they experience in their everyday work as particularly positive with regard to their project-based approach. In addition, they note that the coaching has supported the ability for self-directed and self-organized learning.

Students have experienced the intensive coaching sessions, insightful information sessions and many suggestions for reflection as helpful for their own problem construction and solution process.

The students perceived support both in terms of subject matter and explicitly in personal respects.

The students felt that their creativity was being encouraged.

Public

The involvement of the public as well as the publication of the artefacts has created a feeling of recognition by the teachers among the students, what has motivated them to commit themselves beyond the usual level.

Due to the presentation of their work in a public event with high media impact, the students perceived their work as highly valued and important. The media attention led to a reframing of the amount of work to be done.

Workload

Constructive criticism was also expressed, mostly relating to the amount of work that was perceived as too high in some places.

The digital setting and the required artefacts were perceived as very demanding, the time required (student workload) was estimated as too high.

7. Conclusion

It can be concluded that the design of the course can be considered as open educational practice. The framework was designed to involve the students in a participatory way both in the selection of the learning contents and in the learning pathways.

The didactic concepts of problem-oriented learning, student-centred teaching, including in the change from teaching to learning, as well as the involvement of the public in the teaching/learning process were simultaneously incorporated into the concept of teaching.

As a result, the chosen concepts were well suited to promote online learning in an active, student-centered way. In this manner, teaching and learning scenarios do not have to make any concessions or restrictions with regard to open, active, student-centered forms of teaching and learning. The students' perspective on their learning process supports this position. Nevertheless, it is also apparent that the practical experience with the GC concept required a high workload on the part of the students, which was sometimes perceived as too high.

Beyond the shared experience, we feel it is important to note that the needs of students (and teachers) can only be met through a balanced interplay of technical, organizational and social factors, which is the basis of the GC concept. Therefore, in addition to the reported and contextualized experience, we are interested in the model behind the generation and dissemination of content and the associated promotion of knowledge sharing among students, on which the GC is based. The GC is visible via the artifacts produced and published by the students, in the academic and public space. On the other hand, it is also a teaching concept which we want to share openly on the basis of the analysis above, with its didactic ideas and implementation strategy as an open educational practise which could be reused and adapted to specific disciplines and subjects in other courses.

By demanding an open education culture, we take up the topic of sustainability within the discussion on OERs and advocate a change of learning cultures at higher education institutions towards a holistic open education. This not only includes free educational content, but also involves learners and teachers in the process of institutional development to be able to use their needs and ideas as potential for innovation. In order for open education initiatives to become effective as vehicles for HEI development regarding new media, it is important to consciously shape the factors outlined above to influence the active participation of students at the institution. A sustainable change of the learning culture towards a stronger involvement of students can only take place if it is encouraged at different levels of the organisation. A substantial change of the learning culture, in the sense of open education, will only occur if the HEI strategically supports such a change "from the top" and at the same time designs pedagogical-didactic contexts in such a way that open education initiatives can grow "from below" (Seufert & Euler, 2004).

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Student Experiences of Open Educational Practices: A Systematic Literature Review

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Abstract

The purpose of this literature review was to gain a deeper understanding of student experiences of open educational practices (OEP). The research was conducted against the backdrop of a small, publicly funded university in Canada that offers a masters-level program delivered largely though open learning environments. A systematic literature review identified both benefits and challenges to OEP, related to open learning digital environments, tools and activities as well as institutional services and supports. Students further experienced benefits in working with others, developing a sense of self, and increased learning engagement. They also reported challenges associated with anxiety and with practical aspects such as privacy, copyright, and time management. Much can be learned from research into existing collaborative and related educational practices that preceded concepts of OEP. The study recommends increased focus on scaffolding for faculty and students in the implementation of OEP, as well as more research into student experiences.

KEYWORDS: Open education, open education practices, student experiences, OER, OEP

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1. Introduction

Royal Roads University (RRU) is a small, publicly funded institution with a mandate to deliver programming to working professionals. Academic programs are designed to meet the needs of the labour market and are informed by the institutional learning, teaching, and research model (LTRM) which values applied, authentic learning (Harris et al., 2019). Within the LTRM, a sub-category includes "openly practiced". Based on extensive stakeholder feedback, this sub-category was introduced in the 2019 LTRM in recognition that "open, social and participatory media [have influenced] the ways in which users interact, communicate and participate with technologies" (Conole, 2013, p. 47). In the RRU context, openly practiced applied to learning involves "empowering students to learn with, by and through others in communities and networks supporting dialogical, socially constructed learning" (Harris et al., 2019, p. 16). With respect to teaching, openly practiced allows for the design of courses and programs to implement open educational practices (OEP) including participatory pedagogies and technologies for collaborative learning in open learning environments. The application of openly practiced to research undertaken at RRU creates a research approach that incorporates "participatory technologies and online social networks to share, reflect on, critique, improve, validate and further scholarship" (Harris et al., 2019, p. 16).

While openly practiced is identified as an attribute of the LTRM, there is no institutional policy on openness or, more specifically, OEP at RRU. Consistent with current literature highlighting the grassroots approach to the implementation of OEP at post-secondary

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institutions (Morgan, 2019), the MA in Learning and Technology (MALAT) program at RRU provides an example of how in this environment, openness can be taken up as a program design principle. In the MALAT degree, students contribute meaningfully to digital learning networks and communities in the field. The degree prepares students to work within and critically evaluate digital learning environments. They apply theoretical and practical knowledge to critically analyze teaching and learning practices and technologies, and assess their impact on organizations and society.

Openness is central to the achievement of the MALAT program goal, and was implemented with the intent that OEP "lead to collaboration and the development of a digital mindset that values sharing and cultivates networked learning" (BCampus, 2017. para 2). Openness in the MALAT program is viewed as a continually negotiated space, one where a definition is always a work in progress. Cronin's (2017) definition of OEP as including "collaborative practices which include the creation, use and reuse of OER, as well as pedagogical practices employing participatory technologies and social networks for interaction, peer-learning, knowledge creation and empowerment of learners" (p. 10) guided the program design.

Through the program development cycle, initial tensions surfaced including developing a common understanding of openness and what openness can be within the constraints of an institution, how openness supports or detracts from online community, the role of openness in the creation of safe learning environments, and the ways to support students learning in, and designing for, openness. The researchers were curious as to whether the benefits of OEP used in the MALAT program were being recognized by the students. While a body of knowledge is increasingly being established around open practice (Haßler & Mays, 2014; Paskevicius & Hodgkinson-Williams, 2018), students as partners in higher education (Mercer-Mapstone et al., 2017), and co-creation of innovative open learning environments (Ramírez-Montoya & García-Peñalvo, 2018), little is known of student experiences of working in open learning digital environments. Therefore, our goal was to gain a deeper understanding of student perceptions and experiences of open learning digital environments with an aim to identify implications for practice for faculty working in these spaces. Beginning with a literature review, this research is part of a larger multi-year research project investigating student and faculty perceptions of openness within the MALAT degree.

1.1 Background

Within a digital context, OEP have generated a growing interest in the education community over the past few decades. Early research into e-Learning and online education began to appear in the 1990s, emerging out of the open and distance education milieu and gradually expanding to include social media and evolving toward OEP as it increasingly entered the mainstream of higher education (Weller et al., 2017). OEP are described from a diversity of perspectives, including learning environments. In their earlier forms, massive open online courses (MOOCs) were initially designed as loosely configured open learning environments that permitted open access and were based on digital networks and sharing of resources rather than structured delivery of content (Straake et al., 2019). The underlying approaches included a shift from the learning management system (LMS) as a one-shop stop for teaching and learning online to an open learning network consisting of interconnected personal learning networks:

> *Instead of implementing tools that simply help instructors "manage learning," [Gardner] Campbell argued that we should embrace technologies that enable co-learners to frame, curate, share, and direct learning "engagement streams." John Seely Brown and Richard Adler argued that learning with Web 2.0 tools is so different that we ought to call it "learning 2.0." They asserted that, unlike old passive forms of learning, the new learner-centric paradigm (facilitated and reinforced by new tools) emphasizes participation over presentation, encourages focused conversation over traditional publication, and "facilitates innovative explorations, experimentations, and purposeful tinkerings that often form the basis of a situated understanding emerging from action, not passivity". The net result is an "open participatory learning ecosystem" (Mott, 2010, p. 3).*

The pedagogical approach in open learning environments initially was focused on a student centred, constructivist learning paradigm in which students "negotiate learning via unfettered and largely unstructured or ill-structured Web resources to address individual learning needs" (Hannafin et al., 1999, p. 641). Within this paradigm, students have increased responsibility for negotiating their own learning goals and strategies, and locating the necessary resources to achieve them. More recently, open learning environments are envisioned as supporting digital pedagogies that use OER within a larger framework of OEP including such elements as use of social networks, open sharing of ideas and resources, connecting with professional communities, open critique of scholarship and other similar attributes (Hegarty, 2015). From a critical pedagogy perspective, open learning environments can be designed to support agentive

online social spaces (Morris, 2017; De Rosa & Robinson, 2017) and can be implemented to help address social justice intentions (Lambert, 2018).

2. Research Methodology and Methods

A systematic literature review (SLR) (Au, 2007; Okoli & Schabram, 2010; Paterson et al., 2009) was conducted to examine the literature on the student perceptions of OEP and identify gaps in the literature. Searches were conducted in Google Scholar, the RRU Library discovery search, ERIC @ Ebscohost, Taylor & Francis Online database, Springerlink database, and Academic Search Premier @ Ebscohost. The following parameters guided the search: explore peer reviewed articles, published books, published journals, and white papers; include those between 2002 and 2019 consistent with the span of the use of the term OEP (OER) (Rolfe, 2012; UNESCO, 2002).

Keywords and Boolean search terms used included:

- Open including open educational practice/s; open education practice/s; open learning environment/s; open learning systems; open systems; open practice; open platform; culture of open; OER;
- Open learning activities including blogs; wiki/s; e-portfolio/s; Wikipedia; e-book
- Learning activities including collaboration; collaborative practice; inclusive; personalization; self-directed; participatory pedagogy; 5 R's; reuse of learning objects;
- Student perceptions including fear; challenge; experiences; expectations; perspectives; tensions; supports; engagement; best practices; and,
- Digital mindset including digital education/al resources; networked learning; textbook adaptations.

While a total of 36 articles were initially identified as meeting the literature inclusion criteria above, upon further review by the co-researchers, 25 articles were identified as relevant. Articles selected for this review were deemed relevant when they situated their research within a continuum of openness (Kimmons, 2016).

The research assistant generated an initial list of descriptive codes. Four researchers reviewed the 25 articles and individually identified the conceptual categories. These categories were then collectively discussed and refined. A consensus was reached on the five final emergent themes: participatory pedagogy, open educational resources (OER), tools and activities, institutional services and supports, and student experiences.

3. Results

The final themes that emerged from the systematic literature are summarized and described below.

3.1 Participatory pedagogy

Participatory pedagogy was a common theme in the literature reviewed and involved students as co-creators of teaching approaches; co-creators of course design, co-creators of curricula (Baran & AlZoubi, 2020; Bovill, 2014; Bovill et al., 2016), co-creators of open textbooks (Valjataga, Fiedler & Laanpere, 2015), and peer support for co-creation projects (Gordon, 2017). While there did not appear to be one central definition of participatory pedagogy used in the articles reviewed, the various roles identified as being taken by students include:

> *(1) consultant, sharing and discussing valuable perspectives on learning and teaching; (2) co-researcher, collaborating meaningfully on teaching and learning research or subject-based research with staff; (3) pedagogical co-designer, sharing responsibility for designing learning, teaching and assessment; and (4) representative, student voices contributing to decisions in a range of university settings (Bovill et al., 2016, p. 198).*

Various examples of participatory pedagogy appeared in the literature reviewed including collaborative writing projects that used Wikipedia (Di Lauro & Johinke, 2017); e-portfolio projects (Gordon, 2017), and co-authoring of OER (Hodgkinson-Williams, & Paskevicius, 2012). In their systematic literature review of students as partners, Mercer-Mapstone et al. (2017) found that "the majority of partnerships took place outside the graded curriculum as extra-curricular (non-graded) activities" (p. 10). There were positive outcomes for students as a result of engaging in these partnerships including increased motivation and ownership over learning. In addition, increased self-efficacy and empathy, and deepening of trust between students and faculty were identified. Interestingly, the negative outcomes of partnerships for students reflected an inverse relationship to the outcomes outlined above and included a reinforcement of the existing power inequities. The four themes identified by Mercer-Mapstone et al. (2017) were also consistent with this and included: the need for reciprocity in the partnership, the development of a holistic understanding of the partnership, a focus on small scale partnership activities focused on teaching and learning, and creating inclusive partnered learning communities in higher education.

Challenging issues discovered by students in their

experience of co-creating included the level of rigour required (Di Lauro & Johinke, 2017), the time required to build trust and establish connections with other students in an online environment, and the unreliability of technology (Parke et al., 2017). Students also identified the requirement for a base technology skill set (Gordon, 2017). From the perspective of education leaders, students-as-partner initiatives were more likely to be used as a way for the "institution to enhance its educational products" (Matthews et al., 2018, p. 6) as opposed to enriching collaborative practice in student learning environments.

3.2 Open educational resources (OER)

The use of OER by students generated both benefits and challenges. The researched articles represent a variety of contexts, but had in common learning activities that enabled open pedagogy approaches. Among the benefits identified were collaboration in the creation of OER such that a large percentage of students surveyed wanted to continue to use OER (Tur et al., 2016). Students reported an increased sense of agency and social inclusion, and greater access to resources in the co-creation of OER (Hodgkinson-Williams & Paskevicius, 2012). They identified "the potential to contribute to and access resources from other community development organizations" (Paskevicius & Hodginson-Williams, 2018, p. 34). Studies of student uses of OER and underlying concerns also reported challenges encountered. These included the need for guidance on the ethics of downloading and copyright (Czerniewicz, 2017); similarly, Paskevicius and Hodgkinson-Williams (2018) identified a need for improved legal understandings of copyright among students. In addition, Paskevicius and Hodgkinson-Williams encountered such challenges as contextualization of resources, curation and storage, metadata requirements, identifying resource rights holders, and the time and effort involved in relation to the reuse of digital educational resources. Furthermore, Tur et al. (2016) found students were uncertain as to whether OER can increase creativity, pointing to the need for specific examples of research in how OER are actually used and perceived in open learning settings, where students have shown

> *...positive attitudes when asked about general ideas whereas, when the question is focused on concrete aspects such as creativity and the role of textbooks to carry out the general principles, they have demonstrated more reluctance. This is evidence that although they can understand the principle, they have not achieved a transformative level of knowledge (2016, pp. 37-38).*

Similarly, students described their experiences of open pedagogy practices in developing "renewable assignments" and OER from idea stage to completion, both as positive in terms of learning and as generating cautions in such areas as ethics and identifying credible resources. Scaffolding provided by teachers was seen as important in renewable assignments, where "students felt that the guidelines provided throughout the renewable assignment phases were significantly helpful, which in turn enabled them to envision clear expectations and become more structured while developing OER" (Baran & AlZoubi, 2020, p. 9). In addition to the creation and repurposing of OER, the benefits of open access and the value of open repositories were also reported (Czerniewicz, 2017).

3.3 Tools and activities

Learning activities that are potentially open, and the digital tools that could support them are described in many articles identified by the literature review. Student consumption, creation, or co-creation of written material featured in multiple ways in the literature reviewed including storytelling (Tur et al., 2016), writing for Wikipedia (Di Lauro & Johinke, 2017), and the reading and co-writing of open textbooks (Jhangiani et al., 2018; Valjataga et al., 2015). In addition, social networking and group collaboration tools are the subject of three articles (Veletsianos & Navarrete, 2012; Ozmen & Atici, 2014; and Parke et al., 2017).

However, insight on how they might constitute or support open learning was contextually dependent (Wuetheric & Dickinson, 2015; Williams & Whiting, 2016; Ozmen & Atici, 2014; Haresname, 2015; Tur & Marin, 2015). In situations where an instance of open creation or co-creation by students is described, platforms used remained traditional (i.e., LMS) or are not mentioned at all (Bovill, 2014; Bovill et al., 2016; Hodgkinson-Williams & Paskevicius, 2012). There are a wide range of tools identified in the literature reviewed with e-portfolios playing a prominent role, both as a static assignment (Wuetheric & Dickinson, 2015) and as an opportunity for student co-creation of curriculum (Gordon, 2017). E-portfolios are not described as specific platforms, but as a genre of learning tool. However, the degree of openness of the technology used for e-portfolios varied and was implied by the practice surrounding them in the literature reviewed. Similarly, the degree to which the technology was open varied according to its use in a continuum of open pedagogy in other articles that described categories of tools like repositories and remixing platforms (Hodgkinson-Williams & Paskevicius, 2012; Paskevicius & Hodgkinson-Williams, 2018). LMS were prominently featured not as open platforms themselves, but as major components of a larger learning environment that may or may not include open tools (Hodgkinson-Williams, & Paskevicius, 2012), or

as foils for examining other tools like Ning (Ozmen & Atici, 2014) or Twitter (Williams & Whiting, 2016).

3.4 Institutional Services and Supports

A common thread in the literature on the student experience was the implied or explicit need to support instructors and students in components of open learning as it requires scaffolding for a variety of skills. The most common support required is for technical skills used within open platforms by both instructors and students (Tur et al., 2016; Parke et al., 2017; Paskevicius, 2017; Gordon, 2017). This support can range from tutorials on how to create content in an open platform, to more support on copyright, developing media and effectively distributing it in the open (Czerniewicz, 2017; Paskevicius & Hodgkinson-Williams, 2018).

A variety of ways student support needs can be met were discussed in the literature reviewed. While tutorials can be created that address the gaps experienced by some students, there is a need to provide supports for students lacking the necessary digital skills (Andersen & Ponti, 2014; Tur et al., 2016). One study considered the difference in technical support provided by instructors and students (Gordon, 2017), and found that the formal integration of peer technical support can help to make student creation or co-creation of content more scalable.

Support for design and development of curriculum for open learning, and the technologies that can support it, were also identified as being important for faculty (Paskevicius, 2017; Tur et al., 2016). Similarly, as open learning leads to the use of platforms outside of the LMS, it was noted that faculty need advice on which to adopt and how to configure and use these platforms (Veletsianos & Navarrete, 2012). Guidelines on strategies for curation, approaches to sharing, and methods for increasing discoverability are important for student collection and creation of OER. Institutional support for these issues increases the chances of success of open learning initiatives (Paskevicius & Hodgkinson-Williams, 2018).

3.5 Student Experiences - Benefits

While the literature on student experiences with OEP and open learning environments is scant, topics emerging from the literature explore the perceived benefits and challenges for those working in these environments. The eight sub-themes related to benefits of the student experience fell under three larger areas: (1) working with others (collaboration, peer support, and feedback); (2) sense of self (accomplishment, agency, and voice); and, (3) learning (problem solving and deep learning).

3.5.1 Working with Others

The sub-themes under this heading are collaboration, peer support, and feedback. While participants in open education environments noted both benefits and challenges associated with collaboration, the challenges were mainly focused on expectations that did not match the reality experienced (Parke et al., 2017). On the other hand, benefits included a reduced feeling of isolation, and an increased feeling of being supported, which led to a positive experience (Veletsianos & Navarrete, 2012). Gordon discussed students who received peer support, noting that activities such as peer review resulted in the creation of safe spaces, which allowed students to voice their insecurities (2017). In addition, Kasch et al. (2018) commented that when peer feedback expectations and value were clearly communicated, students felt better prepared. This is consistent with the findings of Baran & AlZoubi (2020) and their themes focussed on student engagement with open pedagogy, including content creation and peer feedback.

3.5.2 Sense of Self

Under this theme, the sub-themes of accomplishment, agency, and voice are found. In their work on the use of wikis to engage students in collaborative writing exercises, Di Lauro and Johinke (2017) noted that students felt a sense of accomplishment when working on a project that was broadly accessible outside the confines of the course. Other students who initially entered an e-portfolio activity with some trepidation about sharing their experiences publicly, ultimately had feelings of accomplishment by the end of the course (Gordon, 2017). In their study on social inclusion, Hodgkinson-Williams and Paskevicius (2012) found that post-graduate students experienced feelings of agency when co-authoring OER, and other studies explored the positive attributes of student voice when co-creating curriculum (Bovill et al., 2016) and co-creating of learning and teaching (Bovill, 2014).

3.5.3 Learning

The sub-theme learning includes the aspects of problem solving and deeper engagement in learning. In a study focussed on co-creation and group problem solving in an open education course (Andersen and Ponti, 2014), students made suggestions about course content. There were tensions with having students involved in the development process when students had different technical knowledge; for example, some had more experience and wanted to create complex tasks. However, through the acts of co-creation and group problem solving, users felt empowered in their learning. Moreover, Bovill et al. (2016) noted that co-creation resulted in students who were more deeply engaged in their learning, and faculty who had a greater

understanding of what was involved in creating effective learning and teaching environments.

3.6 Student Experiences - Challenges

An exploration of the challenges resulted in seven sub-themes, falling into two larger areas: (1) emotional response (anxiety and fear) and (2) practical (privacy, legality, copyright, time commitment, and technical skill).

3.6.1 Emotional Response

Anxiety and fear are the two aspects that fall under the overarching sub-theme of emotional response. Bovill et al. (2016) found that students worried about the unknown and were concerned that their learning would not be scaffolded appropriately. These concerns resulted from a lack of confidence in their ability to contribute in a meaningful way if they did not have sufficient subject matter expertise. Similarly, anxiety was evident in a study conducted by Gordon (2017), when the author found students working on e-portfolios initially felt stressed and worried that the project would be too complicated and time consuming for them to complete. In the study conducted by Baran & AlZoubi (2020), students commented on the value of the scaffolding provided by the instructor during all phases in the creation of OER, and saw it as key to their success.

3.6.2 Practical

The overarching sub-theme practical resulted in the four aspects of privacy, legality, copyright, and time commitment. Privacy was noted as an issue for students taking part in MOOCs (Jones & Regner, 2016) and questions were raised by research participants about how universities are handling MOOC-related privacy issues, as well as the security of information. Similarly, Paskevicius and Hodgkinson-Williams (2018) as well as Czerniewicz (2017) discussed concerns about the illegal reuse and sharing of materials, as well as the lack of students' understanding about copyright. Gordon (2017) highlighted time commitment as a practical consideration when working in the open, linking it to increased anxiety, and Paskevicius et al. (2018) discussed the time and effort it took to reuse digital educational resources. While there was an expectation that technology would perform well, one study found that it was unreliable (Parke et al., 2017). Even though there was a recognition that the dependability of technology was not immediately addressable, one study recommended students receive appropriate preparation for working with technology so their lack of technological expertise would not hinder their ability to develop critical thinking and reflective skills (Gordon, 2017).

5. Discussion and Conclusions

5.1 Discussion

The main student themes identified from the literature review highlighted that students generally felt a sense of accomplishment when they were producing work that had a broader audience. Several studies found that students were more engaged and motivated in their learning and had a less isolated learning experience. Students benefited from faculty who understood learning and teaching more deeply as a result of using OEP as part of their practice. Students using open digital resources appreciated the benefits of access to resources, collaboration in creating OER, and spoke to a deepening of relationships and trust with fellow students and faculty; in addition, they valued peer review and feedback as a result of the experience. From ideation through to the completion of their assignments, students found that the development of renewable assignments contributed to the amplification of their voice and overall learning. The literature reviewed identified that, in general, students valued using OER, experienced an increase in their access to resources, their sense of agency, and their feeling of inclusion in collaborative OEP and activities.

Many activities and tools often associated with open learning were captured more broadly in the literature, but were not always linked explicitly to the concept of an open education environment. Similarly, student experiences with these tools, activities and environments were rarely noted in the literature. Regardless of whether an open education environment is intentional, students could benefit from an initial discussion about the online tools in use and how student learning with these tools is situated on the continuum from private to public. Moving students to OEP requires formal, carefully structured and planned support on multiple levels. Assuming that students know or, and are comfortable in, open environments is perilous. There are key skills, abilities, and levels of awareness that are required to be a confident open learner in open learning environments.

A variety of examples of areas requiring support were evident in the literature reviewed. For instance, students expressed concerns about, and need for, guidance in such areas as copyright, privacy, and ethics, as well as the logistics of locating, use and reuse of digital educational resources and attribution. Ascertaining the credibility of sources is also a concern among students. There is a need for a better understanding of how to adapt OER to new contexts, and for better recognition by students and faculty of the time commitment and level of digital literacy required. Formal support to build relationships, trust, and collaboration skills among students as they work in open educational environments is required. This support comes in many

forms and can be included as part of course or activity design as well as an overall program orientation or mindset. Virtual collaboration skills and team skills are essential when working in open learning spaces. These are some examples of areas requiring clear guidance; students may struggle if left alone to use and make sense of open education environments and OEP. Given the potential disconnect between those who implement OEP with high expectations, and the prescriptive learning culture experienced by students in previous learning environments, adopters of OEP must provide, and advocate for, more appropriate student OEP supports. Implementing OEP using an empathic approach, and fostering a learning environment that supports risk taking and iteration, may help to address this disconnect.

5.2 Conclusion

The main themes of the literature review offer an opportunity for the open community to begin to map out terrain of discourses and research/case studies related to student perceptions and experiences of open educational practices (OEP). We found there was a lack of research in OEP, as opposed to research into collaborative practices (for example, MOOCs). Further research is required to understand more deeply student perceptions and experiences of working in an open learning environment. While involving the student voice can be difficult due, in part, to survey fatigue experienced by many post-secondary students, the lack of understanding of the lived experience of students as they participate in OEP is a gap that is limiting the ability of the discourse around open to include student voices. In addition, research that explores goals for an open initiative against the lived student experience is an underexamined area which could inform ways that institutions can support their inclusion of OEP as part of the student learning experience. In the case of the MALAT program, the the larger multi-year research project investigating student and faculty perceptions of openness within the MALAT degree has incorporated the findings of this literature review in the course redesign process and in designing mechanisms for including student voice in the ongoing iteration of the program.Through the literature reviewed, it is clear that work with students in OEP should be done with care. There are a variety of well established, extensively researched collaborative practices that have been occurring for many years in education, but not all of these have been labelled as open practices. Being willing to learn from these more established practices and the lessons learned from other intersecting disciplines such as online learning, blended learning and distance education has potential to deepen and extend the experience of OEP at the student, faculty, and institutional level.

The implementation of OEP should not be an afterthought. Education continues to respond to a variety of calls from local, regional, national, and international sources, including Conference Board of Canada (2016), and United Nations Educational, Scientific and Cultural Organization (2017), that focus on a need for an increased emphasis on complex problem solving, critical thinking, creativity, and collaboration. In addition, education needs to facilitate more impactful engagement within the open community and society in response to issues of Indigenous justice; global pandemics; Black Lives Matter; systemic racism; climate change and other urgent issues. The thoughtful implementation of OEP has the potential to empower students to increasingly engage with the important issues of our time.

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The impact of a Technology-based approach for the learning of Mathematics at secondary school level

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Abstract

The main purpose of this research project was to determine how technology helps students to engage in Mathematics learning at school. One hundred and forty-five students (girls & boys) of varying learning performances studied the topic fraction using technology-enhanced lessons. The scores of a summative test were compared with those students who had studied the topic using the traditional approach. Results confirmed that the mastery of higher order skills can be enhanced using technological tools. Gender bias was also investigated and the results showed that high performing boys benefitted more from the experiment. Regarding the affective domain of learning, students across all levels of performance were positively impacted and showed much interest in the new learning approach. A theoretical framework, the Technology Integration Model (TIM) evolved from this study and should serve as guiding framework for all major stakeholders involved in the process of empowering students with effective digital learning content.

KEYWORDS: Technology-enhanced lessons, Educational Technology, Mathematics.

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1. Introduction

The ubiquity of computers and their integration in the educational process are redirecting both teaching and learning. Numerous research document positive learning achievement in many subjects, including Mathematics. However, the integration process is still haphazard, loose and undefined, such that outcomes are often mitigated, if not controversial. At times there have been attempts to completely replace traditional methods, while in other cases technology has only been timidly and sparsely integrated. Integration can also be context-laden and can take different dimensions depending on the methodological approach. Finding the right balance between traditional practices and technological functionalities can be promising for both teachers and students. The purpose of this study is to investigate if technology-enhanced lessons can have any significant impact on the cognitive and affective domains of learning.

2. Literature Review

Students are an unavoidable partaker in any innovative learning approach. Learners nourish the hope to see their learning experience take a new turn, where independent and flexible learning supersede didactic and teacher-centered instruction. In a technologically-dominated society, instruction takes a new dimension to meet emerging learning needs, address learning disabilities, bridge the learning gap and engage students in ways that have previously not been possible. According to Hashmi et al. (2019), technology has great potential to increase learners' motivation, improve their learning, knowledge retention and understanding. Barnes, Marateo and Ferris (2007) mentioned that the Next Gen learn differently from their predecessors, being unique in that they are the first to grow up with digital and cyber technologies. They have out-of-school

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access to a wealth of materials from Open Learning Resources (OLR) and spend more hours at home on the computer than at school. Not only are they acculturated to the use of technology, they are saturated with it. This media saturation and ease of access to digital technologies is driving the next generation to think, communicate, and learn in distinctive ways (Carr, 2010). This acculturation with the functionalities of technology offers great propensities and affordances to transform teaching and learning. These out-of-school acquired technological skills can be translated into school settings to help students engage in constructive learning in an already friendly environment (Selwyn, Potter and Cranmer, 2009). Unfortunately, today there is a mismatch between demand and supply, and this is a fundamental cause in the decline of education. Our students have changed radically and today's students are no longer the people our educational system was designed to teach (Pierce and Ball, 2010). They come to the classroom with preconceived notions of how the world works (Bransford, Brown and Cocking, 1999). If these notions are not engaged, students may fail to grasp new concepts that they are taught. Pedagogy is defined as the interactive process by which a student's learning is mediated by teachers using a range of tools (Vygotsky, 1978, p 27). Therefore, the school-day cannot still be constructed as in the fifties, and technology is here to challenge this setting and allow more space for students to engage in formal off-premises and self-learning. By varying the range of tools with emerging technologies we can expect that what was not possible or difficult to explain in the past, can now be achieved.

In an attempt to redirect learning using computers, Mitra (2007) carried out an experiment in India and coined the concept of the "The child-driven education" where students can teach themselves using a computer provided they work in groups. In his project "The hole in the wall" he demonstrated how students in the most remote areas of India, learnt to teach each other how to use the computer and search the Internet and be creative, using a computer fixed in a wall. Capone (2018) also reported this peer tutoring effects whereby students serve as teachers for their weaker peers.

Probably the greatest asset of technology is the motivation, it elicits in young students to take control of their learning and become independent learners (Tubaishat & Lansari, 2011) In a meta-analysis which brought together 15 years of investigations on the effect of teaching and learning with technology on student cognitive and affective outcomes, Lee et al. (2013) found that in terms of magnitude and direction, the overall effect sizes for the two outcomes exhibited a positive effect. Moreover Capone (2018) found out that students showed a positive attitude to those teachers who use technology as a tool for teaching thus allowing the students to easily interact with the educator. Raja and Nagasubramani (2018) also added that teachers and learners can take advantage of technology in good light and eliminate the limitations that draw many students and schools back from achieving excellence.

On the other hand, Pate (2016) brings some precautionary notes to literature review. In her article entitled "*Technology implementation: impact on students' perception and mindset*", she analyzed the current negative impacts of implementing new technological "applications" which include over-reliance on computers to make all the difference, utilizing technology merely for substitution and convenience purposes, the habit of students to adopt a consumer mindset, and the increase in plagiarism.

From a gender bias point of view, research findings on differences among computer users have been inconsistent (Heemskerk, Volman & Admiraal, 2009; Sanders, 2005), at times related to the methods of data collection.

Research questions:

1. What is the impact of technology-enhanced lessons on the cognitive and affective domain of learning?
2. How does technology-enhanced learning (TEL) benefit students with varying academic performances?
3. Is there any gender disparity in the adoption of technology for learning?
4. What is the impact of TEL on the mastery of higher order and lower order skills?

3. Methodology

For the purpose of this study a mixed-method approach was adopted. A quasi-experimental design was adopted whereby 145 students comprising both boys and girls of mixed learning abilities participated in an experiment to learn a topic on Mathematics, namely fractions using the traditional approach complemented with technology-based lessons. The experiment lasted for two weeks in each of the four selected schools, after which a control MCQ (multiple-choice question) test of 30 items was administered to the participants. Control groups of matching learning abilities to the experimental groups in terms of gender, age and learning performance also participated in the test. The test scores of the experimental and control groups were then analyzed to identify any significant differences in learning performance caused by the intervention.

For the qualitative aspect of the research, observation of students was carried out using a rubric comprising of the following main themes derived from literature

review, namely: ease of use, engagement and enjoyment, self-efficacy, group work and peer tutoring, video effectiveness, teacher's reaction, classroom management, reluctance to change. Unstructured personal interviews in the participants' mother tongue were also carried out with some students. The responses were recorded ad verbatim and translated into English and analysed using a thematic approach based on the above-mentioned themes.

Learning is a multilevel cognitive process which is best described by the six levels of Bloom's taxonomy (Anderson et al., 2001). There might be a tendency to believe that ICT (Information and Communication Technologies) is most effective with Lower Order Thinking (LOTS), but according to Lim (2007), ICT tools can also be used to engage students in higher-order type of thinking. Cox and Marshall (2007) observed that it is important to answer how ICT impacts simple and complex learning tasks. The fourth research question was to investigate if technology has varying impact on the level of skills to be acquired. Initially the MCQ test was devised to comprise items at the two levels of difficulty, namely HOT (Higher Order Thinking) and LOT. Comparison of test scores were then carried out for each level of difficulty.

Table 1 shows the profile of the four experimental groups, indicating that boys and girls of both good and average performing levels participated in the intervention.

Group	I	II	III	IV
Target	Good performers-boys	Good performers-girls	Average performers - boys	Average performers – girls
Maths CPE grade	A	A	C	C

Table 1 - Categories of the experimental groups.

Good performers were those who obtained a grade A in Mathematics at the end of primary school examinations (CPE-Certificate of Primary Education), while average performers were those who obtained a grade C. A number of high performers (those with a grade A^+) also participated in the experiment.

4. Data Analysis

One hundred and forty-five Form I students (boys 42.8%) were taught the topic fractions using tablets and slide presentations. The intervention lasted over two weeks and comprised six lessons of 75 minutes each.

Comparison of test scores between experimental and control groups.

To measure the impact of technology-based lessons on learning performance, test scores of the experimental and control groups were analysed and compared for any significant difference. Table 2 shows that high performers who benefitted from the intervention performed better than their counterparts from the control groups when all the 30 items of the test were considered. When these items were considered separately in terms of HOTs and LOTs, the difference in test scores between the two groups was significant only in the case of HOTs. Calculations for Cohen's d indicated high values, hence the high effect size. The intervention thus caused a significant difference in test scores; but more precisely for HOTs. In the case of LOTs, no significant difference in test scores was observed as students (high performers) did well with or without the intervention. To some extent these findings corroborate with those of Wenglinsky (1998) who arrived at the conclusion that the use of computers to teach higher-order thinking skills was positively related to academic achievement.

Items	**Group**	**N**	**Mean Rank**	**Cohen's *d***	***p***
All	Experimental	11	27.82	0.798	.043
	Control	31	19.26		
LOTS only	Experimental	11	26.59	0.509	.060
	Control	31	19.69		
HOTS only	Experimental	11	27.73	0.753	.044
	Control	31	19.29		

Table 2 - Comparison for High Performers.

Items	**Group**	**N**	**Mean Rank**	**Cohen's *d***	***p***
All	Experimental	62	98.52	0.630	.000
	Control	99	70.03		
LOTS only	Experimental	62	92.10	0.446	.015
	Control	99	74.05		
HOTS only	Experimental	62	99.77	0.672	.000
	Control	99	69.25		

Table 3 - Comparison for Good Performers.

For good performers, Table 3 shows that the intervention caused significant differences for both LOTs and HOTs. However, in-depth analysis gender wise (Table 4) revealed that for girls, the intervention caused no statistically significant difference in the case of LOTs whereas for boys the difference was statistically significant for both HOTs and LOTs.

So in general those already doing well in the subject scored significantly higher test scores especially at the HOTS level, after studying fractions using technology. This study confirms that the mastery of higher order skills can be enhanced using technological tools (Lim, 2007). In fact, Handal et al. (2011) wrote that teachers need to be reassured that technology can be useful for developing HOTs skills.

Items	Group	N	Mean Rank	Cohen's *d*	*p*
All	Experimental	23	43.50	0.917	.001
	Control	42	27.25		
LOTS only	Experimental	23	40.35	0.600	.018
	Control	42	28.98		
HOTS only	Experimental	23	44.28	1.014	.001
	Control	42	26.82		

Table 4 - Comparison for Good Performers (Boys).

Items	Group	N	Mean Rank	Cohen's *d*	*p*
All	Experimental	39	55.23	0.420	.049
	Control	57	43.89		
LOTS only	Experimental	39	52.29	0.327	.260
	Control	57	45.90		
HOTS only	Experimental	39	55.87	0.426	.031
	Control	57	43.46		

Table 5 - Comparison for Good Performers (Girls).

Similar analysis revealed that following the intervention, average students did not get higher test scores compared to the control groups. However, as pointed out by Livingstone (2012), notwithstanding the apparently moderate improvements in learning performance, the integration of ICT (Information and Communication Technologies) is still a valid enterprise and there is some merit to this position, as it elicits motivation and compensates for some forms of disadvantage. Karpati (2004) reported that when educational software was used to assist students who were behind, there were not beneficial effects for their students. There were two main causes which were picked up during class observation and interaction with these particular students. The first one was their low level of basic arithmetic skills, showing difficulties with multiplication tables, Highest Common Factor (H.C.F.) and Least Common Multiple (L.C.M.) The second cause was the language barrier, as all the e-learning materials were in English. For these students, class teachers reported using Creole and French frequently in their normal classes. Vygotsky (1978) argued that language is the main tool that promotes thinking, develops reasoning, and supports cultural activities. During the intervention, it was observed that students struggled with the medium of instruction and concept assimilation.

Moreover, the tablet experience warranted a significant level of independent work, whereby students spent significant time learning on their own. Figure 1 summarizes the main findings of this first data analysis and depicts clearly for whom and at which level technology enhanced learning had a significant impact.

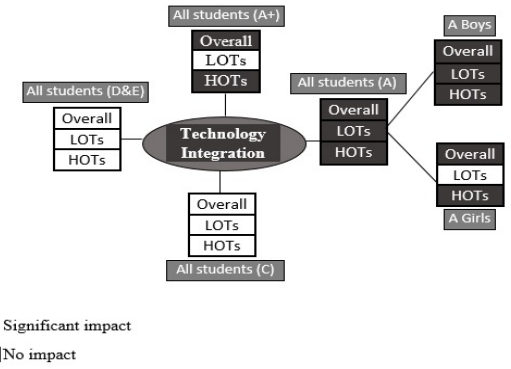

Figure 1 - Impact of TEL on learning.

4.1 Gender disparity

The Cohen's d values from Tables 5 and 6 show that boys benefitted more from the intervention than girls.

Analysis was also carried out to investigate if good performers from the experimental groups had comparable test scores with high performing girls of the control groups. Only the boys could match the latter's performance, confirming that boys benefitted more from technology-enhanced lessons. These findings concur with those of Christoph et al. (2015) who argued that computer-related activities are typically perceived as male-specific. On the other hand, Chinweoke (2016) found that when ICT was used to teach trigonometry, there was no gender disparity. So, further research is warranted in this area.

	Control Group	Experimental Group	Effect
CPE Math grade	A^+ (Girls) 27	A (Boys) 23	No sig. difference
	A^+(Girls) 27	A (Girls) 39	Sig. difference $A^+ > A$

Table 6 - Gender bias on technology adoption.

4.2 Impact on the affective domain of learners

Lipnevitch, Preckel and Krumm (2016) demonstrated that Mathematics attitudes contributed to students'

Mathematics achievement over and above personality and cognitive ability, and argue that attitudes may be more malleable than the later characteristics. Cox (2008) reported that the impact of IT (Information Technology) on learning goes beyond assessing increase in test scores, but learning gains can also be measured in terms of effects on pupils' generic and specific skills and knowledge, effects of group and collaborative learning, taking account of human–computer interfaces, the changing nature of knowledge presented and the role of the teacher. Lim, Lim and Koh (2012) also interviewed teachers who reported that ICT engaged their students and helped them to learn better, even if ICT could not increase their students' academic performance. Moreover, Mathematics anxiety, fear and math-dislike are common among many students, making learning a dreadful experience (Escalera-Chávez et al., 2017; Uchida and Mori, 2017). If technology can help overcome this fear and anxiety, breed excitement and enthusiasm, there will definitely be room for concepts to be learnt and practiced in an environment which is conducive and friendly. This qualitative aspect of learning is further analysed and reported in the following section.

4.3 Qualitative analysis of classroom observation and students' unstructured interviews

Both classroom observation and unstructured interviews with students were carried out to confront participants in their natural setting and this helped uncover unexpected issues and behaviours. The two approaches complemented each other. The findings have been organized around the following central themes: ease of use, engagement and enjoyment, self-efficacy, group work and peer tutoring, video effectiveness, teacher's reaction, classroom management, reluctance to change. In the Results section, simply state what you found, but do not interpret the results or discuss their implications.

EASE OF USE

Students demonstrated much ease working with the tablet. Adaptation was mostly smooth and easy-going for the majority of them who showed no difficulty in completing the tasks set on the tablet. This ease of use was voiced out by students during discussion with them. Some even dared to change the settings on the tablet, like the desktop picture. According to Prensky (2001), today's students are digital natives navigating in the technological world with disconcerting ease.

ENGAGEMENT AND ENJOYMENT

People usually engage in what they enjoy. The most telling truth of this intervention is the level of engagement and positive attitude that it solicited among the majority of students. They were prompt to try the new learning approach and worked hard to successfully complete the e-exercises. Students hardly absented from school during the intervention, except in extreme cases, demonstrating their willingness not to miss the lessons and benefit from the experience. Teachers said students looked forward to the intervention and some even took their break time to enjoy the lesson.

It was fun for them, without their realizing that learning was taking place but in a different setting. Over the two-week intervention, some had developed a liking for the study of Mathematics. So, the approach and platform used to teach Mathematics can make a difference in students' attitude toward the subject.

They found the explanation clear and the class more interesting. One student said "*Our primary school teacher did not explain the concepts so clearly*". Another student said he did not like Mathematics before but now the tablet experience made the lesson very interesting. Another student commented "*this class is so cool, are we going to study other Mathematics topics using the tablet?*"

Most students interviewed had shared the tablet experience with their parents and siblings at home, hence indicating that the enjoyment and excitement crossed the school boundaries. Years of research have shown that intrinsic motivation (including enjoyment) leads to better persistence, performance and satisfaction in a variety of tasks (Baard, Deci and Ryan, 2004; Black and Deci, 2000). And this intervention clearly demonstrated technology's potential to breed enjoyment and foster engagement among students.

SELF-EFFICACY

Jones (2007) suggested that technology is thought to be most effective when the learning focus shifts from the teacher to the student, with students' interests and abilities guiding the content, pace, and learning activities. One common element that cut across all the groups was the extent to which students enjoyed their independent learning, working at their own pace, selecting the exercises to do and receiving instant feedback for their answers. Students preferred to do the exercises that were on the tablet rather than the ones in their text book because they could get a feedback for their worked-out answers right away. Self-efficacy is acknowledged as a key element in successful learning (Azar & Mahmoudi, 2014), helping leaners to try harder to solve problems, be more accurate and show constancy in dealing with difficult issues. Self-directed learning motivated most of them, as they sought help from the teachers or assistants only in extreme cases.

GROUP WORK AND PEER TUTORING

The interaction among the students who worked in pairs helped them to clarify the concepts explained. There were intense moments of learning through sharing,

team work, promoting at times a healthy competition among the pairs of students. They shared the tablet and took turns to key in the answers, while the other one worked out the solution. They celebrated good answers as a team. When all the lessons of fractions had been taught, students eagerly attempted the 20-item quiz. All pairs worked hard to get the best score. Many requested for a second attempt to complete the quiz with the hope of improving their score. This activity promoted a healthy and productive competition, with each pair trying to achieve better.

Peer tutoring helped the slower partner to catch up, promoting at the same time collaboration and group work. When the software indicated a wrong answer, the partners did not give up, but continued the discussion to find the right solution. The classroom environment was very relaxing and team spirit promoted effective learning. Both group work and peer tutoring have been recognized as triggering factors that favour effective learning among learners (Tsuei, 2014) and this intervention has confirmed the contribution that technology can bring to these elements of learning.

VIDEO EFFECTIVENESS

The viewing sessions proved to be very effective especially after the whiteboard explanation. Students watched attentively and reacted promptly to the narrator's questions. The possibility to replay the videos or review the slide animations proved to be helpful where concepts were particularly difficult to assimilate. The researcher could pause the video and step in to clarify further and exemplify the concepts. Some comments about the videos include

"The videos are interesting because it's technology"

"They provide step by step procedures"

"Captions and animations make explanations easier"

High and good performers were the greater beneficiaries of the video viewing sessions as they mastered the English language better and demonstrated higher maths skills. Average performers still enjoyed the experience but often struggled to assimilate new concepts given their restricted prior knowledge.

TEACHERS' REACTION

This intervention confirmed the need for a transition in the teacher's role from the sage on the stage to the guide on the side as purported by Domingo and Garganté (2016). Technology-enhanced strategies saved much teaching time, allowing the teacher to care more for the slow learners, while others worked independently. Thus, individual needs were met more efficiently.

It was noted that the female teachers took a greater interest in the intervention and even tried the e-exercises themselves. However, apprehension was there too. One lady teacher was worried about her job – "*There won't be work for us in the future*". This intervention showed that although there was a general positive attitude towards the integration of technology in the teaching and learning process, apprehension and doubts still prevailed as to how would this integration be implemented if teachers were not adequately empowered to use these tools. This mix feeling has been widely reported in numerous research (Uluyol & Sahin, 2016; Gul, 2015; Handal et al., 2011; Hargreaves, 2005). Two teachers even cautioned that the enthusiasm of the intervention may have been associated with the presence of newcomers in the classroom (the researcher and his assistants), and partly with the new tool, and wondered if the same enthusiasm could be maintained in the event the intervention was to be extended for a longer period.

CLASSROOM MANAGEMENT AND DISCIPLINE

During the e-lessons, classroom discipline was much better as the students were always busy watching the videos, listening to slide presentations or still doing the e-exercises. Ghavifekr and Rosdy (2015) reported that teachers agreed that ICT helps to improve classroom management as students are well-behaved and more focused. One teacher commented: "*At least when given classwork, all are interested and get down to work whereas in traditional classes, some would not even start the work*". Figg and Jaipal-Jamani (2011) pointed out the need for teachers to know the specific classroom management techniques for teaching with technology.

RELUCTANCE TO CHANGE

It was not uncommon to find some students holding firm to their traditional practices, still longing for the teacher's whiteboard explanation, with the lesson notes well documented in the explanation copybook, and a record of completed exercises and mistakes highlighted, and all meant for revision purposes before tests and exams. This concept of learning to the test still prevailed in the mind of some students. Moreover, some students saw e-learning more as an optional or supplementary component to traditional learning. In some cases, the reluctance to change was associated with Mathematic learning difficulties, whereby basic arithmetic skills were missing and students struggled with multiplication tables, H.C.F and L.C.M.

Some wished the interface could provide a working space to avoid doing calculations in their exercise books. One student proposed that the whiteboard be maintained for explanation and the tablet for practice. He commented that "*just tablets would not be enough and some might end up only playing*". Another one added, "*I prefer the copybook. I like to go over the pages to see what I have written before. But the tablet is faster for data entry and to verify the answer*".

TECHNO-LEARNING CONCEPTUAL FRAMEWORK

The Techno-Learning Model (TLM) conceptual framework (Figure 2) has been formulated to summarize the implications, prerequisites and outcomes of the intervention. It describes the implementation of the intervention from the students' perspectives and depicts its effectiveness on learning outcomes. While a major component of the instruction comprised the traditional whiteboard explanation and the technology-enhanced lessons, the intervention made provision for students to maximize on learner autonomy and take control of their learning. In fact, learner autonomy was a consistent observed practice during the intervention and according to Chen (2014), it is affected by both intrinsic and extrinsic factors like learning motivation, learning anxiety, learning strategies, learning style and learning environment. From this study, it was observed that learner autonomy was directed by three main contributors namely, motivation, mastery of basic Mathematics skills and the English language. The greater the motivation and the ability to interact with the learning content, the more students enjoyed the experience and benefitted from it. The TLM relied significantly on learner autonomy for a smooth integration and its success.

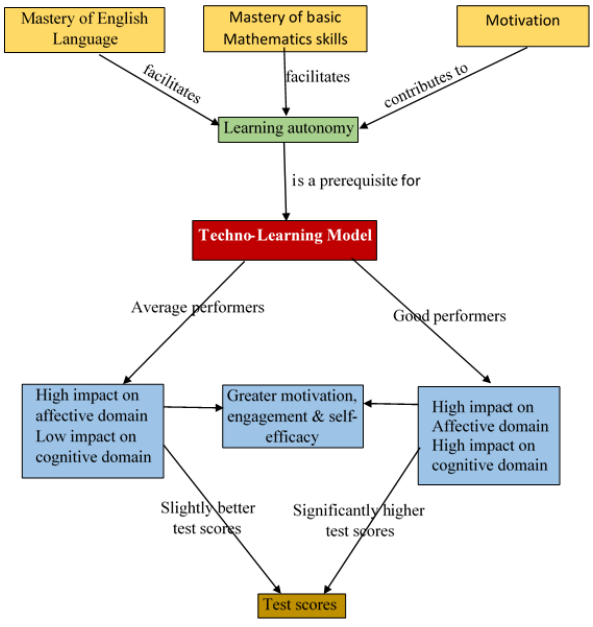

Figure 2 - Techno- Learning Conceptual Framework.

At the grass root level, the intervention created a high impact on the affective domain of learning with greater motivation, sustained engagement and increased self-efficacy for all students, independent of their learning performance. The impact on the cognitive domain differed for average and good achievers with the latter benefitting from the intervention to significantly increase their test scores. The reason is that good performers demonstrated a better level of learner autonomy facilitated by a good mastery of English language and basic arithmetic skills. On one hand, the average students showed difficulties with technical reading skills, trying to grasp concepts, understand instructions properly, and on the other hand they had to struggle with their basic arithmetic skills.

The TLM framework pictures how technology can have a positive impact on Mathematics learning performance. Future research will certainly review the outcomes of this intervention by modifying a few components and adding new ones to the model which with time, will go through many iterations before an accepted one is carved. The TLM has thus laid the foundation on which future works can be modelled.

6. Conclusion

Students who were already doing well in Mathematics, benefitted from technology-enhanced lessons, as they scored significantly higher scores than their counterparts who studied the traditional method. However, this study showed that average students, did not perform any better in terms of test scores as compared to their counterparts who studied the traditional way. We therefore conclude that technology enhanced learning benefitted high and good performers more as they already mastered basic prior knowledge. Data analyses revealed that high and good performers also had good grades in English and were therefore better poised to benefit from this experiment which was mostly English-based. For the average students, the medium of instruction, English, did pose some problems. Many did not understand words like "compare" two fractions or "equivalent fractions".

This study also showed that technology-enhanced lessons were a convenient way to introduce differential learning. Brighter students progressed faster in their learning and tried new exercises and subtopics, while the slower ones took their time to complete the exercises. Some bright students dared to work other exercises for which explanation had not yet been given. The treatment had thus triggered the Mathematics enjoyment that can be vital for boosting learning performance.

For average students, the learning of new concepts is simply additional cognitive overload, when basic Mathematics skills like H.C.F, L.C.M. and multiplication tables have not yet been mastered. Hence, they cannot assimilate the curriculum within the same time period as high achievers and therefore lag behind a bit more with every semester that goes by.

The observations and the interviews showed that there was no gender bias in acceptance and attitude toward the new learning paradigm, in terms of ease of use of the tablet, and the motivation it generated.

When integrating technology in the classroom, it is imperative to determine which learning activities are best facilitated by ICT, as some of them might still be best mediated by traditional means, like introduction of the topic with real life objects, class interaction around the application of mathematical concept, correcting exercises involving drawings or complex workings and identifying simple arithmetic flaws when working out solutions.

Technology must be incrementally integrated to provide a smooth change over from the traditional mode of teaching. Students still have to adapt to the tool as a learning vehicle despite their familiarity with it. This transition can be long, complicated and even painful as both teachers and students struggled to revisit their teaching and learning in a technology-mediated environment. Teachers on their side were not reluctant but hesitant for fear of getting it wrong. Teachers need to be made aware of their changing role and responsibilities in the midst of technology-driven education.

The intervention relegated the use of copybooks, and both teachers and students showed concern for that, especially with regards to proof and documentation of work completed by them and also for revision purposes before exams. Students therefore have to be introduced to innovative ways of revising as they maximize on technological affordances where whole lessons can be previewed again using the videos and the interactive slide presentations. Moreover, e-exercises are always at hand for practice with answers and solutions.

In a nut shell, this study has revealed that technology-enhanced lessons can benefit all students. However, we need to ensure that a second digital divide is not created and this means empowering the less abled with necessary basic skills, so that the learning of new concepts does not become additional cognitive burden. There is definitely much to gain with TEL (Technology enhanced lessons) if the implementation is not haphazard and hasty, but rather properly planned with pedagogical insights as partially provided by the findings of this research.

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Does the sequence of flipped and lecture-based classes affect the academic achievement and satisfaction of medical students?

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Abstract

In a flipped classroom, class' lecture is delivered as a video to students before the class is held, and the actual time of the class is spent on problem solving and discussions. As there is a need for further clarification of the way of using this method, in this study, we assessed the effect of the sequence of flipped and lecture-based classes on medical students' learning and satisfaction in Emergency Medicine theoretical course. For this purpose, 59 medical students participated in this quasi-experimental study who were divided into two flipped-first and lecture-first groups. Eight topics were selected to be taught. Firstly, students took a pre-test covering these topics' objectives. Afterward, in the lecture-first group, 4 topics were taught through lecturing while the next 4 topics were taught through flipped classroom method. Then the teaching method was shifted for the flipped-first group. Finally, students answered the satisfaction survey and post-test questions. Indeed, not only the final score of the flipped-based topics in both groups was significantly higher than lecture-based ones (P-value = 0.022), but also the post-test score of all topics were significantly higher in the flipped-first group (P-value = 0.032). In addition, the satisfaction score for the flipped-based topics was higher than the lecture-based one (P-value = 0.011). As a conclusion, flipped classroom approach could increase medical students' learning as well as their satisfaction and it is recommended that flipped classes be applied from the beginning of the course to be more effective.

KEYWORDS: Teaching Methods, Learning, Flipped Classroom, Emergency Medicine, Satisfaction

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1. Introduction

Lecturing, as the most common method of teaching medical courses (Alluri, Tsing, Lee & Napolitano, 2016), is a teacher centered strategy in which students tend to be passive and learn superficially (Afurobi, Izuagba, Obiefuna & Ifegbo, 2015). In fact, a lecture is *"a talk or verbal presentation with the help of audio-visual aids like black board, charts, etc."* (Bala, Kaur & Kaur, 2017). Meanwhile, this teaching method is useful for teaching essential clusters of knowledge in medical curricula at all levels and in almost all schools and universities (Kaur, 2011). In fact, lecturing has some advantages. It allows teachers to precisely organize their syllabus through defining the objectives, content, pace and theme of the presentation. In addition, it serves as a good mean for clarifying textbooks' contents and at the same time addressing almost all students at once. On the

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other hand, teachers should have effective and powerful speaking and writing competencies in order to be able to deliver a good lecture. Besides, during a lecture session, the teacher is the main provider of information to the students which could lead to a low interactivity among class' participants and students' differences ignorance (Bala et al., 2017; Bove, 2008). These limitations bring medical educators to use different teaching strategies in order to make students "think, find reasons, compare, analyze issues, evaluate and make decisions" (Docherty CHoy, Topp & Trinder, 2005).

In this regard, with the advent of technology, educational systems have undergone various changes, one of which is modification in teaching methods. Indeed, technology provides more possibility for substituting traditional teacher centered teaching methods with more interactive student centered ones (Bala et al., 2017). Flipped classroom, posed by Bergman and Sams in 2007 (Enfield, 2013), is one of these methods that has received much attention in medical education recently (Chen, Lui, Martinelli & Chen, 2017). In flipped classroom, the activities that students do in the class and home are exchanged. In routine classes, students receive the lectures containing the course content in the class and do the assignments at home (Pettit, McCoy & Kinney, 2017). Whereas in this method students study and learn the lecture's content at home before the class and the face to face class is devoted to student centered activities like problem-based learning and group discussions (Tang et al., 2017). Hence, during the face-to-face part of flipped classes teachers are the facilitator of the students' learning and play the role of "guide on the side", in contrast to traditional lecture-based sessions where the teachers play the role of "sage on the stage". Actually, this leads to the change of students' role from being passive in lecture-based classes to active in flipped ones (Bishop & Verleger, 2013).

When it comes to the effectiveness of this method in health science's education, there are recent studies that are performed in different disciplines such as nursing (Della Ratta, 2015), pharmacology (McLaughlin et al., 2013), physiology (Street, Gilliland, McNeil & Royal, 2015), radiology (Belfi, Bartolotta, Giambrone, Davi & Min, 2015), dentistry (Park & Howell, 2015) and surgery (Liebert, Mazer, Merrell, Lin & Lau, 2016) which show the satisfaction of both teachers and students and the positive effect of this strategy on students' problem solving, critical thinking and team work skills. To elaborate the importance of such skills, it is worth mentioning that Organization for Economic Cooperation and Development (OECD) considers these skills among the ones that are going to be essential in classrooms and workplaces in 2030 (OECD, 2019). In this regard, more student centered teaching strategies should be applied in curricula to achieve these competencies, (OEDC, 2018). The same is emphasized in some studies supported by European Commission which place these skills among the top ones that are critical for employability (Dall'Amico & Verona, 2015; Vieira et al, 2019). Bringing together the importance of acquiring these competencies and the potential related effect of flipped classroom, makes this teaching strategy as a favorite one to be applied.

On the other hand**,** reviewing the literature still shows some debate on the effectiveness of flipped classroom in medical education (Enfield, 2013; Missildine, Fountain, Summers & Gosselin, 2013; Sawarynski, Eastwood & Iyer, 2013). Just as an example, Whillier and Lystad (2015) showed that the flipped classroom strategy improved neither students' performance nor their satisfaction in learning neuroanatomy, suggesting that this method may not work for studying abstract and memorization-heavy topics.

As there are some instances that flipped classroom is not as effective as it seems to be, performing further research from different views and considering different methodology designs would help medical educationists and teachers to benefit of this method more and more. One of these study questions would be the effect of time of delivering flipped classes during a course, i.e. whether the flipped classes is better to be delivered at the beginning of the course or after some lecture-based sessions. Since we could not find any study related to the above-mentioned question, we performed this study to assess the impact of the sequence of flipped and lecture-based classes on medical students' learning andentirety.

2. Material and method

This quasi-experimental study was performed on medical students who were undergoing a one-month emergency clerkship in six consecutive rotations in 2019. The first three rotations were assigned to the first group of the intervention and the next three to the second one. The first group was given lecture-based sessions at the beginning of the course followed by flipped topics (lecture-first group). In the second group, the topics were firstly presented in flipped format and then in lecture method (flipped-first group). Furthermore, theoretical part of the Emergency Medicine course consisted of 8 topics for each of which the mode of delivery (lecture or flipped methods) was randomly assigned to each group of students, so that for each group four topics were presented as lectures and four topics in the form of flipped classes, and for the next group, the method of presentation was shifted totally, so that students in both groups experienced both methods but in a different sequence.

3. Instructional Design

Two faculty members of emergency medicine department instructed the above mentioned 8 topics which were seizures, burns, syncope, poisoning, multiple trauma, transfusions, opioid poisoning, and decreased consciousness. Firstly, they participated in

two practical workshops on "how to hold flipped classes" and "how to create multimedia contents". Then, the topics were divided between them so that each of them prepared multimedia for four topics, two from the first part and two from the second part of the syllabus. The e-contents were developed with the help of an instructional designer and were in a slide-synchronized with sound format. The average time of each topic was 40 minutes. To develop these products, professors chunked the content of each topic into subtopics which formed the menu for the final product. After preparing the slide presentation, their instructions were recorded in an acoustic studio by a professional staff. Finally, the voices were synchronized with slides and navigation facilities were implemented in the content. Furthermore, some videos of related physical exams and procedures were selected and added to the content if necessary. The produced multimedia contents were evaluated by two other emergency medicine specialists as well. In addition, in order to prepare the contents that had to be delivered before the flipped classes, the teachers designed clinical scenarios related to the topics to be discussed in face to face classes.

4. Intervention

At the beginning of each rotation, students got access to the university's Learning Management system (LMS), where the e-contents were to be uploaded. Then in the introductory session, they were informed of the objectives of the study, got familiar with the flipped classroom method and learnt how to use the LMS. They were also assured that the satisfaction questionnaire was anonymous and that the information was confidential. In addition, students were also told that a pre-test would be taken at the beginning of each topic's class and these tests would affect their final score.

The study began with the lecture-first group (the first three rotations) who took part in four routine lecture-based and then four flipped classes. At the beginning of each session the relevant pre-test was held, and then the topic was presented by the teacher. The lecture method was presented in the conventional way; i.e. the teacher provided information on the topic through lecturing combined with question and answer. In the flipped class approach, teachers uploaded the related e-contents into the LMS one week before each class, so that the students could study the topics by themselves. Afterward, in face to face classes, a brief lecture on e-content was presented after holding the pretest. Then students were encouraged to participate in a discussion about the pre-test questions and predetermined clinical scenarios to resolve the ambiguities. During these sessions, instructors played the facilitator role trying to guide students on applying theoretical knowledge to clinical situations. They also summarized the main lesson concepts at the end of each class. Finally, students took the post-test at the end of the

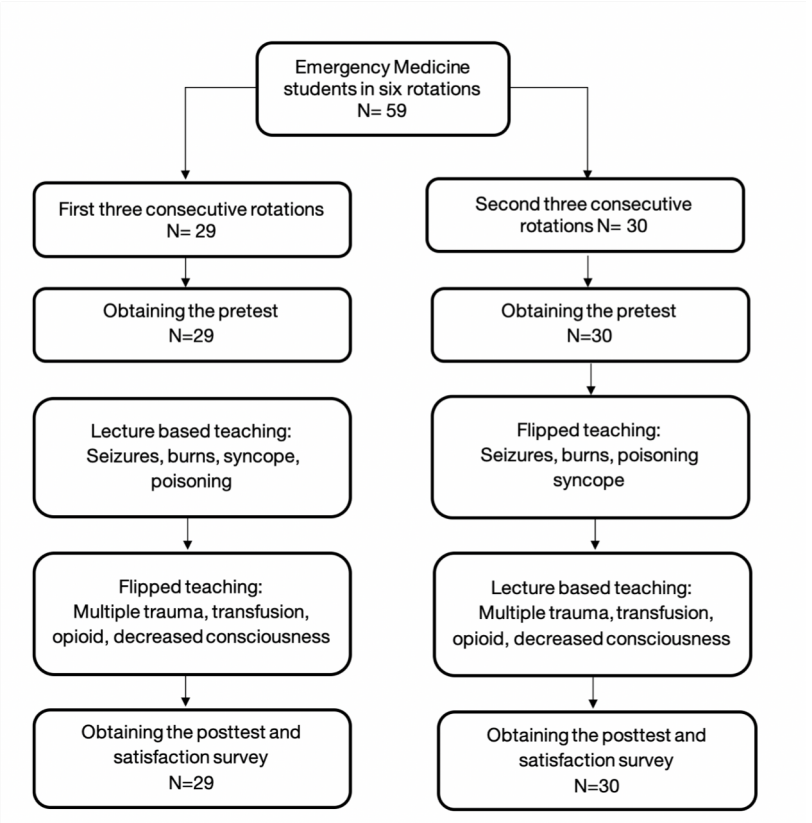

Figure 1 - The diagram of study design in lecture-first and flipped-first study groups.

course that covered the topics of both instructional methods. Figure 1 shows the study design and how the participants and topics' mode of delivery were allocated into the two study groups.

It is worth mentioning that the ethical permission for this intervention was obtained from the university's ethics' committee.

5. Pre and Post-tests and Satisfaction Questionnaire

The pre and post-tests included two different sets of thirty multiple choice questions that covered the syllabus' objectives. Two other emergency medicine specialists rather than the topics' instructors, assessed both tests to confirm their same level of difficulty and objective coverage. Also, the satisfaction questionnaire used in this study was a researcher-made one which consisted of eight items based on a five-point Likert scale (strongly disagree, disagree, neither disagree nor agree, agree and strongly agree) with a score of 1 to 5. In order to validate the questionnaire, it was given to seven experts. Besides, in order to evaluate its internal consistency, Cronbach's alpha was used which was equal to 0.922.

6. Data Analysis

The statistical data analysis was performed using SPSS version 21.0 (IBM Corp, 2012). Analysis mainly included Leven's test (assessing the homogeneity of variances), paired t-test and independent t-test. In order to analyze the data, the scores were converted to the percentage of correct answers.

7. Results

Among the total of 59 participants, 64.4% were female and 35.6% were male. There was no significant difference regarding the participants' sex between the two groups (P-value = 0.472, $\varphi 2 = 0.517$). 29 and 30 students were allocated to the lecture-first and flipped-first groups respectively. There was no loss to follow up during the study period (response rate= 100%). To present the findings of this study, we firstly compare the results of two teaching methods and then go through the effect of their sequence of delivery.

Firstly, the pre and post- tests mean scores for lecture-based topics were compared between two groups separately. There was no significant difference between the mean scores of lecture based topics between two groups in both the pre-test (P-value = 0.655) and the post-test (P-value = 0.312) (table 1). The same was true when related post-test and pre-test scores were considered as the dependent variable and covariance respectively in the univariate analysis of covariance (ANCOVA) formula (f = 0.921, P-value = 0.341). On the other hand, when the same analysis was performed for the flipped-based topics, there was a significant difference between the mean scores of the students in the pre-test between two groups (P-value = 0.040), though this difference was not observed in the post-test scores of these topics (P-value = 0.094) (table 1). ANCOVA was performed here again for eliminating the pre-test's effect and considering the related post-test scores as the dependent variables and the pre-test scores as covariance, resulted in no significant difference between two groups (f = 0.309, P-value = 0.581).

As table 1 shows the increase of scores from pre to post-tests in all study groups, we assessed the effect of instruction on students' learning and compared the mean scores of pre and post-tests of all participants using Paired T-test (table 2), which showed a significant increase in total mean scores from pre-test to post-test (P-value = 0.001).

In the next step to assess the effect of the sequence of teaching methods, the total scores of the post-test in both studying groups were compared (table 3). Indeed, a significant difference was observed between post-test mean scores in two groups. To explain more, the mean score of the students who started their training with flipped method was significantly higher (P-value = 0.011). Moreover, when we considered post-test mean scores as the dependent variable and pre-test mean scores as covariant in univariate analysis of variance, the significant difference was observed again (F= 12.167, P-value = 0.001).

Finally, the mean score of lecture-based topics was compared with that of flipped-based topics for all students (table 4). The result showed that the mean score of the students in flipped-based topics was significantly higher than the lecture-based ones (P-value = 0.022).

In addition to pre and post-test results, 57 participants completed satisfaction questionnaire (response rate = %96.6). Paired T-test was administered to compare the mean of participants' satisfaction scores of lecture-based and flipped-based topics. Table 5 shows that students' satisfaction of flipped based topics was significantly higher than lecture-based ones (P-value = 0.032). In addition, we examined the difference between satisfaction scores with the two types of teaching between two groups, i.e. lecture-first and flipped-first groups. As shown in table 5, there was no significant difference between the mean satisfaction score of the two methods in the lecture-first group (P-value = 0.312). In contrary, the difference was significant in the flipped-first group showing a higher satisfaction of flipped-based topics (P-value = 0.011).

8. Discussion

In this study, we assigned 59 medical students in emergency medicine rotation in to two groups who were taught eight topics, four in lecture-based and four in flipped-based methods. In fact, the sequence of methods

Topics	Test	Group	No.	Mean*	S.D	T**	Sig.
Lecture-based	Pre-test	First-lecture	29	60.92	19.30	-0.449	0.655
		First-flipped	30	63.18	19.18		
	Post-test	First- lecture	29	61.08	22.10	-1.022	0.312
		First-flipped	30	66.11	15.15		
Flipped-based	Pre-test	First-lecture	29	72.12	21.04	2.108	0.040
		First-flipped	30	61.49	17.17		
	Post-test	First-lecture	29	73.93	16.54	1.705	0.094
		First-flipped	30	66.94	14.92		

*Out of 100, **Independent T-test

Table 1 - Comparing pre-test and post-test results in the study groups.

Groups	No.	Test	Mean*	SD	T**	Sig.
Total	59	pre-test	64.41	15.37	3.528	0.001
		Post-test	71.90	12.78		

* Out of 100, **Paired T-test

Table 2 - Comparing the pre-test and post-test results for all participants.

Group	Test	No.	Mean*	SD	T**	Sig.
Lecture-first	Post-test	29	67.61	12.96	3.528	0.011
Flipped-first		30	75.83	10.98		

* Out of 100, **Independent T-test

Table 3 - Comparing the post-test scores in lecture-first and flipped-first studying group.

Topics	Test	No.	Mean*	SD	T**	Sig.
Lecture-based	Post-test	59	63.63	18.82	2.352	0.022
Flipped-based			70.37	15.99		

* Out of 100, **Independent T-test

Table 4 - Comparing the post-test scores in lecture-based and flipped-based topics in all students.

Group	No.	Topics	Mean*	SD	T**	Sig.
Lecture-first	28	Lecture-based	77.65	14.67	1.030	0.312
		Flipped-based	81.22	13.30		
Flipped-first	29	Lecture-based	80.19	14.94	2.726	0.011
		Flipped-based	85.22	10.57		
Total	57	Lecture-based	78.88	14.57	2.203	0.032
		Flipped-based	83.15	12.03		

*Out 0f 100, **Independent T-test

Table 5 - Comparing participants' satisfaction in total and two study groups.

was different in two groups, i.e. lecture-first and flipped-first groups. Students' learning and satisfaction were assessed in order to understand whether the time of delivering flipped classes during a course matters or not. The results showed that although students' scores have significantly increased in each group separately, the post-test score was significantly higher in the flipped-first group. At the same time, the students of this group were more satisfied with the flipped-based topics in comparison to the other group. Moreover, it was observed that the flipped based topics were more effective regarding students' learning compared to the lecture-based ones.

Reviewing the literature shows different results about the effectiveness of flipped classroom method. On one hand, there are studies that show positive effects on some aspects. In a randomized clinical trial performed by Wazney et al., a positive effect of flipped classes on students' final scores was determined that could be the result of students being able to study more after attending classes considering the availability of e-contents. In addition, it was found that above-average students gained better metacognitive skills through experiencing flipped classes (Wozny, Balser & Ives, 2018). Other evidences that have shown the positive effect of flipped classroom on students' learning are the studies of O'Canner et al. in Radiology course (O'Connor et al., 2016), Boyson–Osber et al. in Advanced Cardiovascular Life Support to physiopathology students (Boysen-Osborn et al., 2016), Koo et al. in a pharmacotherapy course (Koo et al., 2016) and Rose et al. in the medical clerkship rotation in Emergency Medicine course (Rose et al., 2018). On the other hand, there are evidences that have not shown a positive effect for flipped classroom method. For instance, in a cohort study performed at Stanford University by Libert et al. on first year residents of surgery in 2016, there was no clear difference between lecture and flipped classroom method (Liebert, Lin, Mazer, Bereknyei & Lau, 2016). The same findings were observed in some other studies, namely, the study on emergency medicine students in two universities (Heitz, Prusakowski, Willis & Franck, 2015), two studies on ophthalmology clerkship (Tang et al., 2017) and the research performed in a neuroanatomy course (Whillier & Lystad, 2015).

It is worth mentioning that the results of a systematic review conducted in 2017 for assessing "the effectiveness of flipped classrooms in medical education" were largely ambiguous and uncertain. In fact, in most pieces of research done by 2015, the effect of flipped classroom method on the knowledge of medical sciences' students was assessed as the main determinant. Also, most of these studies were performed on pre-clinical medical students or nursing students before clerkship. So. It was concluded that one could not be sure of the possibility of generalization of the results to clerkship or residency students (Chen, Lui, & Martinelli, 2017). Hence, as the results of the present study, which was performed on the Emergency Medicine clerkship students, showed a positive effect of the flipped based compared to the lecture based classes, one could add this evidence to the researches that have proven some positive impacts in this regard.

From another point of view, i.e. the students' satisfaction of flipped classroom method, the present study confirmed that the participants' satisfaction of flipped classes was higher than lecture based ones. This finding is in alliance with a systematic review done by Ramnanan and Pond in 2017 that showed the satisfaction of medical students and residents of different majors from flipped classes (Ramnanan & Pound, 2017). In spite of this evidence, in a randomized interventional research conducted by Wozney et al. in 2018, students were equally satisfied with flipped and lecture methods and stated that studying flipped class' content was time-consuming. At the same time, they were satisfied with interactive classes and problem-solving during the face to face part of flipped classroom method (Wozny et al., 2018).

It is worth mentioning that some studies have assessed factors rather than students' learning and satisfaction. For example, in a study on ophthalmology residents by Tang et al. in 2016, participants stated that flipped classroom method had enhanced their motivation, communication skills and clinical thinking. However, they declared that this method was time-consuming and needed more study-time (Tang et al., 2017). In another study by Ma et al., medical students' motivation, self-regulated learning, and problem-solving ability were found to be significantly higher in medical students who experienced flipped classes compared to lecture ones (Ma et al., 2018).

9. Conclusion and recommendations

In conclusion, these undetermined literature results on the effectiveness of flipped classroom method, poses the need for raising innovative research questions to explore more evidence for its best practice. In this regard, we couldn't find a study which examines the impact of the sequence of delivering lecture based and flipped classes during a course on medical students' learning and satisfaction. So the results of this study would suggest some clues for medical teachers and researchers on the way of using this method within a course instruction. According to the results of this study, it is recommended that flipped classes be applied from the beginning of the course. Although the reason for this preference needs to be investigated, one can raise an assumption that maybe flipped classroom effects rather than cognitive learning, i.e. skills like problem solving, self-regulated learning, clinical thinking and teamwork, would work more when they are enhanced from the beginning of the course. In addition, some students discussed in an informal environment with their professors that participating in flipped classes from the first sessions of the course had made them interested in the topics, so that they had

studied better. Although this is not a high level evidence, it can be a clue for further research on flipped classroom.

This study had some limitations, one of which was the low number of participating medical students who were only from emergency medicine rotation. So, it is suggested that the study be conducted with more participants from different rotations. In our study, due to the quasi-experimental method, we had to take a pre-test to eliminate the effect of the prior knowledge. Although the pre-test questions were designed different to the post-test ones to prevent participants from being sensitive to the questions, it is advisable to select the groups' participants randomly in future studies so that no pre-test is required. In addition, as mentioned before further research is needed to not only confirm the impact of the time of delivering flipped classes during a course, but also the reasons for such precedence.

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Community of Inquiry (CoI) Framework and Course Design as Predictors of Satisfaction in Emergency Remote Teaching: Perspectives of Hospitality Management Students

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Abstract

The Community of Inquiry (CoI) is a popular framework to measure meaningful engagement and communication in distance learning environments, where it is claimed that three interactive elements of presence (teaching, social, and cognitive) enhance the quality of education and learning outcomes. However, research suggests lack of empirical evidence on its efficacy in emergency remote teaching. Using a noteworthy research contribution on CoI as the central subject of this research, we examined its applicability in remote teaching environment as a predictor of student satisfaction. In doing so, we tested the proposition that course design variables mediate the relationship between CoI and student satisfaction. A theoretical model is developed and tested using data collected from 621 hospitality students from an Institute of Eminence in India. Students were electronically queried to capture the data within a 10-day time frame. The data collected using a 34 item CoI scale, 6 item course design scale, and 6 item online course satisfaction scale were analysed using structural equation modelling and PROCESS macro 3.4 - Model 4. Overall, the results showed that the proposed model fits the observed relationships and teaching presence is the primary determinant of satisfaction. Likewise, the results implied partial mediation by course design on the relationship between CoI elements and satisfaction. We believe that this model could serve as a guide to possible future studies to explore the relevance of CoI framework in emergency remote teaching. The outcomes provide significant theoretical and practical contributions to the key stakeholders to design a satisfying online curricula as part of blended learning for the post COVID-19 era.

KEYWORDS: Teaching Presence, Social Presence, Cognitive Presence, Course Design, Emergency Remote Teaching, Students Satisfaction.

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1. Introduction

Back in 2009, Davidson and Goldberg, in a report on the future of learning institutions in a digital age, stated "undeniably online learning, at least at the higher education level, will become the new normal". Today, though started as a crisis management solution, virtual education has emerged as the first draft of the "new normal" for thousands of students from schools to higher educational institutions across the world. The dawn of a disturbing new reality emerged from the ravages of COVID -19 escalated the penetration of online education, earlier considered as a supplementary option, into a powerful new value proposition. A seamless transition in the higher education landscape occasioned a new hallmark in teaching-learning process owing to this new dynamo of disruption. Unsurprisingly, this posed a daunting challenge to the academic fraternity to shift to emergency remote teaching mode, expecting them to be confident in the delivery of online education overnight (Eachempati & Ramnarayan, 2020; Hodges et al., 2020). With its inherent limitations, this global experimentation with remote teaching (Golden, 2020; Hodges, et al., 2020) deserves a more in-depth study to understand its effectiveness through appropriate

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theoretical frameworks. It is time for university administrators, professors, and students to keep a record of courses that benefited them from being taught remotely, and the ones that require F2F engagements (Govindarajan & Srivastava, 2020). Though teachers are prepared to teach digitally, there are learning challenges when going online that demand ongoing evaluation to define success for emergency remote teaching (ERT) from every stakeholders' point of view. Zimmerman (2020) believes that this is an educational experiment and an opportunity to measure what 'students actually learn when we teach them online' as against Tobin (2020) who pronounces that it is not the time to assess online learning. However, Cohan (2020) considers it a good time for reflection and reshaping of remote teaching-learning, as it is more about 'transferring information' than altering the intellectual and emotional levels of the students.

Hitherto, the field of hospitality education was an applied discipline (Ladki, 1993) with a commercial orientation, designed to deliver skilled graduates to hospitality industry (Gursoy, Rahman, & Swanger, 2012; Gursoy, & Swanger, 2005; Lashley, 2000). Gradually it has become an emerging discipline of multidimensional nature (Harrington & Parsa, 2015) and curricula have evolved from a domain of vocational skills to a multidisciplinary competency-based education (Lee et al., 2016; Ottenbacher, Harrington & Parsa, 2015; Sisson & Adams, 2013). The landscape of hospitality education involves a complex combination of hands-on skills and a cluster of theory, practice, experiential learning, and specialization courses (Alhelalat, 2015; Sisson & Adams, 2013; Goodman & Sprague, 2011). As the field has developed, the strong focus on vocational values was supplemented thru liberal values that provided students with a foundation for holistic professional development in tune with industry needs (Gross & Manoharan, 2016; Zopiatis, Theodosiou, & Constanti, 2014). Today, when the online learning has become an obligation, the co-existence of vocational and liberal values supports the integration of educational technology, mainly internet pedagogy (Smadi, Parker, Gillham, & Muller, 2019; Sun, Lee, Lee, Law, 2016), in the rapid adoption to online instruction. Of key importance in this scenario is the development of suitable pedagogy to optimize student learning when online platforms are embraced for remote teaching.

The Community of Inquiry (CoI) is a popular framework to measure meaningful engagement and communication in computer-mediated distance learning environments, where it is claimed that three interactive elements of presence (teaching, social, and cognitive) enhance the quality of education and learning outcomes (Maddrell, Morrison, & Watson, 2017). Since its establishment in 2000, the CoI (Garrison, Anderson, & Archer, 2000) is one of the most widely used frameworks that describe the essential elements of successful online higher education (Castellanos-Reyes, 2020). Until now, the extensive adoption of the concept of CoI was in distance education, online (e-Learning) courses, MOOCs, and blended courses (Hilliard & Stewart, 2019; Jan et al., 2019; Micsky & Foels, 2019; Pillai & Shivatanu, 2019; Amemado & Manca, 2017; Annamali, 2017; Gutiérrez-Santiuste, Gallego-Arrufat, & Simone, 2016). There have been a number of studies on diverse predictors of student satisfaction with online courses in the extant literature (Wei & Chou, 2020; Alqurashi, 2019; Cole, Shelley, & Swartz, (2013a, 2013b); Callaway, 2012). More specifically, a few studies have examined the impact of CoI on student satisfaction (Kucuk, & Richardson, 2019; Kang, Liew, Kim, & Park, 2014; Strong, Irby, Wynn, & McClure, 2012; Cobb, 2011). Few studies focused on cohesion of design elements in creation of suitable conditions for quality learning (Ellis, Ginns, & Piggott, 2009; Biggs, 2005). A meta-analysis article by Richardson, Maeda, Lv, and Caskurlu (2017) summarized the applicability of moderators such as demographic variables, course length, type of scale used, academic discipline, and course audience to explain the strength of the relationship between social presence and satisfaction. However, there is a limited research into the potential of CoI framework in understanding the connectedness among learners in F2F courses (Harrell &Wendt, 2019; Smadi et al., 2019; Bage, 2018; Lam, 2015). The existing evidence of the significance of CoI in online learning warrants a closer investigation of its applicability in emergency remote teaching. As the current crisis is the first one to occur on the global scale in the digital era, studies examining the perspectives of online learners and learning in the context of ERT is lacking in literature.

This study makes a pioneering attempt to investigate the relevance of CoI framework for hospitality education. Here, first, we examine in the context of ERT whether students positively perceive the applicability of three interdependent dimensions of presence. Second, thus far no study has tested whether course design variables mediate the relationship between CoI elements and student satisfaction in online learning. Third, this is first study of online learning experience of Indian hospitality students, using CoI framework. We foresee the use of this report in bridging the distance gap among learners while informing the educational practitioners about the necessity to design a satisfactory online curriculum for better learning experience. Thus we propose the following frameworks and hypotheses.

H1a, b, c: A significant positive relationship exists between teaching presence, social presence, cognitive presence and learner satisfaction

H2a, b, c: A significant positive relationship exists between teaching presence, social presence, cognitive presence and course design elements

H3a, b, c: Course design mediates the relationship between teaching presence, social presence, cognitive presence and learner satisfaction

H4: A significant positive relationship exists between course design and learner satisfaction.

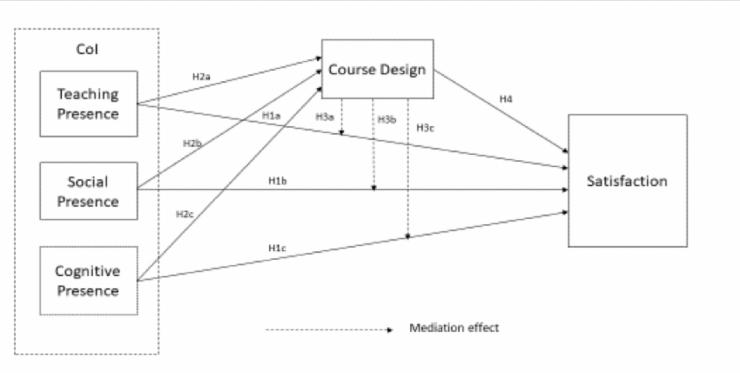

Figure 1 - Proposed theoretical mediation model and hypotheses.

2. Materials and Methods (Data Collection, Sample, and Survey Instrument)

2.1 Background

Starting from the summer of 2020, the outbreak of COVID-19 instigated Indian Universities to close the campuses and initiate online teaching. It was an unexpected massive migration from conventional face-to-face education to online education (Bao, 2020). By the third week of March, 61 countries across the world, including India have announced closure of educational institutions (UNESCO, 2020). This posed a sudden challenge to the teaching fraternity to move all the existing courses online with limited online teaching experience, lesson plan design, teaching materials, technology platforms, and support from technology support teams. Alongside, this disruption in delivery of education expected students to have right learning attitude, suitable learning materials, learning platforms, and congenial learning environment (Choudhary, 2020). Though there is massive loss in the development of human capital with long term social and economic implications (OECD, 2020), the current situation is a stress test for education systems as well as an opportunity to embrace online education strategically.

2.2 Participants

Synonymous with excellence in higher education, Manipal Academy of Higher Education, one of India's leading academic and research institution is home for over 26,000 students from 60 nations (www.manipal.edu). The diversity in student population, multiculturalism, and courses offered in different academic disciplines makes this one of the unique study locations in the region. At present, coronavirus has dramatically changed the academic life of students forcing them to vacate the campus, and subsequently they were notified to complete their course work from home, until further notice. Hence, in June 2020, 1400 hotel management, culinary arts and allied hospitality studies students were electronically queried to capture the data within a 10-day time frame.

2.3 Survey Instrument

All items used in the survey were borrowed from existing scales. CoI was measured using 34 item scale developed Swan et al. (2008). Thirteen items (α=0.943) were used to measure teaching presence (TP), 9 items (α=0.932) to measure social presence (SP), and 12 items (α=0.954) to measure cognitive presence (CP). Issues regarding course design were addressed with 6 items (α=0.900) (Ellis et al., 2009). The standardized web-based survey Online Course Satisfaction Scale (6 items (α=0.844)) adopted from Wei & Chou (2017) was used to measure student satisfaction. Socio-demographic variables (age, gender, year of study, disciplines, length of the course, and number of courses covered) were added to comprehend the characteristics of respondents. We operationalized the constructs using multi-item indicators on a 7 point Likert Scale (Strongly agree = 7 and Strongly disagree = 1). The CoI scale was subjected to EFA to re-categorise the items into distinct factors and to confirm the validity. The EFA results revealed a three-factor structure consistent with the design of the original instrument, showing substantial validity and internal consistency (α=0.974). However, four items of CoI were deleted due to low communalities (TP4, TP13, SP1, CP6, CP11).

2.4 Data Collection Procedure

The web-link of the questionnaire was emailed to the students undergoing Bachelors' degree in hotel management, culinary arts, Masters in travel and tourism, and applied nutrition & dietetics. As a reminder, a follow-up email was sent to students three days after the first email. Since this survey was the first of its kind in Indian hospitality management education, we wanted to administer it to students of all programs at the institute. Hence, it was a census survey with a twist. The survey started with a systematic beginning where every third student of a particular course was sent the questionnaire followed by 5th, 7th and 9th student and so on. During the 2nd phase, survey started with the 4th student of the same course and continued with 6th, 8th, and 10th student and continued thereafter till the last student. In total, we obtained 651 usable responses with

a response rate of 46.5%. Thirty outliers were detected while cleaning the data set, and therefore, 621 cases were retained for further analysis.

3. Results

Slightly more than half (56%) of the respondents were male. Majority of the respondents (54%) were either between18-20 years old or 21-23 (41%) years old and only 5% were older than that. Of the 621 respondents, 559 (90%) were from undergraduate programs, and 62 (10%) were enrolled for their master's degree. For 375 (60%) respondents the length of the online classes was 8 weeks and for the rest it was 12 weeks. Only 245 (40%) reported to have undergone classes for 5 subjects, while the rest had between 6 and 9 subjects.

Presence	Overall mean score	Pooled SD score
Teaching	4.94	1.01
Social	4.90	1.26
Cognitive	5.13	1.14

Table 1 - Overall agreeableness score of the three presences.

The overall mean and pooled standard deviation score confirm that the respondents consider the interdependent elements of CoI as applicable to hospitality education (mean score of 5 indicates 'agree' on the scale of 1-7).

3.1 Measurement Model

Confirmatory factor analysis (CFA) was used to test the extent to which the measured variables represent the constructs consistently. It was conducted to specify the relationships between 40 observed indicators and the 5 factors viz., teaching presence (TP) (12 items), social presence (SP) (8 items), cognitive presence (CP) (10 items), course design (DE) (5 items), and satisfaction (SAT) (4 items). The final model fit indices showed good fit with $\chi 2 = 2470.278$, Degrees of Freedom (df) = 611, $\chi 2/df = 4.043$, $p<0.001$, CFI= 0.914, RMSEA= 0.070 proving that the indicators support good model fit. To check the convergent validity, AVE (Average Variance Extracted) for each of the construct was computed and the respective values were found to be in accordance with the threshold value of 0.50 (Anderson & Gerbing, 1988; (Hair et al. 2010).

2.2 Structural Model Testing

The hypotheses of the conceptual model were tested using Structural Equation Model using IBM AMOS 25. Given the large sample size, the indices obtained were, $\chi^2/df = 3.982$, $p<0.001$, IFI= 0.916, TLI= 0.908, CFI= 0.916, RMSEA= 0.069, which showed that the structural model fit the data sets adequately (Hair et al., 2014).

Table 2 illustrates the results of the hypothesized relationships of the structural model. Hypotheses 1a and 1b suggested that teaching presence (1a) and social presence (1b) have a significant positive relationship with student satisfaction. Results showed that both these hypotheses (1a $\beta= 0.227$, t value= 4.474, $p<0.001$; 1b $\beta= 0.202$, t value= 4.338, $p<0.001$) were supported. On the contrary, hypothesis 1c ($\beta= 0.009$, t value= 0.136, $p>0.05$) was not supported. Hypotheses 2a to 2c suggested that teaching presence, social presence and cognitive presence positively influences student satisfaction. Present results supported these hypotheses (2a $\beta= 0.355$, t value= 6.828, $p<0.001$; 2b $\beta= 0.180$, t value- 3.719, $p<0.001$and 2c $\beta= 0.397$, t value= 5.836, $p<0.001$). Hypothesis 4, which suggested that there is a significant positive relationship between course design and student satisfaction, was also supported ($\beta=0.553$, t value= 9.565, $p<0.001$).

4.3 Mediation analysis

We examined the mediating effect of course design on the relationship between teaching presence, social presence, cognitive presence, and student satisfaction. The indirect effect was assessed using bootstrapping method with PROCESS macro 3.4 - Model 4 (Hayes, 2018). When we test the effect of TP (through course design) on student satisfaction, the covariance between SP and CP is controlled, so that there is no influence of SP and CP on the relationship between TP and Student Satisfaction through CD. The indirect effect is measured using both bootstrapping method and Sobel's test. The hypotheses 3a to 3c suggest that the effect of TP, SP, and CP on student satisfaction is partially mediated by the course design after controlling for the covariates (hypothesis 3a: $\beta_{TP\rightarrow DE\rightarrow SA;}$ 3b: $\beta_{SP\rightarrow DE\rightarrow SA}$; 3c: $\beta_{CP\rightarrow DE\rightarrow SA}$). There exists only a partial mediation for the three hypotheses as independent variable (TP, SP, CP) has both direct and indirect effect on dependent variable (student satisfaction). The results of both bootstrapping method and Sobel's test (Table 3) for hypothesis 3a ($\beta_{TP\rightarrow DE\rightarrow SA} = 0.162$, 95% CI= 0.108, 0.217; Z= 6.86; $p<0.001$), 3b ($\beta_{SP\rightarrow DE\rightarrow SA} = 0.09$, 95% CI= 0.046, 0.142; Z= 5.36, $p<0.001$), and 3c ($\beta_{CP\rightarrow DE\rightarrow SA} = 0.204$, 95% CI= 0.135. 0.279; Z= 7.27, $p<0.001$) suggested that the course design has a significant association between CoI and student satisfaction.

4. Discussion and Implication

CoI is a popular framework for researchers and academic practitioners in distance education (Maddrell et al., 2018), but its applicability in emergency remote teaching remains under-researched. While discussing the post-pandemic pedagogy, Murphy (2020) mentioned about the extension of emergency e-Learning to avoid the possible second wave of COVID-19 and stressed the importance of normalization of online education. Currently, the temporary shift of instructional delivery may have disrupted the educational ecosystem, but in the long run it is likely to become a viable solution to

Constructs and Indicators	Factor loadings	AVE	CR
Teaching Presence		**0.599**	**0.942**
TP7 The instructor helped to keep course participants engaged and participating in productive dialogue.	0.827		
TP9 The instructor encouraged course participants to explore new concepts in this course	0.825		
TP8 The instructor helped keep the course participants on task in a way that helped me to learn	0.811		
TP10 Instructor actions reinforced the development of a sense of community among course participants.	0.81		
TP6 The instructor was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking.	0.808		
TP5 The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn	0.799		
TP11 The instructor helped to focus discussion on relevant issues in a way that helped me to learn.	0.797		
TP3 The instructor provided clear instructions on how to participate in course learning activities.	0.726		
TP2 The instructor communicated important course goals	0.717		
TP1 The instructor clearly communicated important course topics	0.687		
TP12 The instructor provided feedback that helped me understand my strengths and weaknesses relative to the course's goals and objectives	0.684		
Social Presence		**0.656**	**0.93**
SP4 I felt comfortable conversing through the online medium.	0.876		
SP5 I felt comfortable participating in the course discussions.	0.871		
SP3 Online or web-based communication is an excellent medium for social interaction.	0.802		
SP8 I felt that my point of view was acknowledged by other course participants	0.799		
SP6 I felt comfortable interacting with other course participants	0.794		
SP9 Online discussions help me to develop a sense of collaboration	0.792		
SP2 I was able to form distinct impressions of some course participants	0.728		
Cognitive Presence		**0.647**	**0.948**
CP7 Combining new information helped me answer questions raised in course activities.	0.866		
CP4 I utilized a variety of information sources to explore problems posed in this course.	0.841		
CP8 Learning activities helped me construct explanations/ solutions.	0.832		
CP2 Course activities piqued my curiosity.	0.82		
CP3 I felt motivated to explore content related questions.	0.813		
CP9 Reflection on course content and discussions helped me understand fundamental concepts in this class.	0.811		
CP5 Brainstorming and finding relevant information helped me resolve content related questions	0.802		
CP10 I can describe ways to test and apply the knowledge created in this course.	0.788		
CP12 I can apply the knowledge created in this course to my work or other non-class related activities.	0.771		
CP1 Problems posed increased my interest in course issues.	0.696		
Course Design		**0.71**	**0.924**
DE2 The online learning materials in this course are designed to really try to make topics interesting to students	0.877		
DE4 The online learning materials provided in this course are extremely good at explaining things.	0.856		
DE3 The design of the website/platform (online experiences in this course) helped my learning.	0.842		
DE5 The design of the web platform in this course made me want to explore the issues more	0.827		
DE1 The online activities are designed to get the best out of students	0.81		
Student Satisfaction		**0.662**	**0.887**
SA2 I am satisfied with the instructional style	0.868		
SA3 I am satisfied with the learning content and course structure	0.86		
SA1 Overall, online learning has been successful and I enjoyed the online course.	0.787		
SA4 I am satisfied with the instructors/teachers	0.734		

Table 2 - Confirmatory Factor Analysis.

Standardized Hypothesized relationship	Standardized estimates	t value	Decision
Hypothesis1a: Teaching Presence → Learner Satisfaction	0.227	4.474**	Supported
Hypothesis 1b: Social Presence → Learner Satisfaction	0.202	4.338**	Supported
Hypothesis 1c: Cognitive Presence → Learner Satisfaction	0.009	0.136 ns	Not Supported
Hypothesis 2a: Teaching Presence → Course Design	0.355	6.828**	Supported
Hypothesis 2b: Social Presence → Course Design	0.180	3.719**	Supported
Hypothesis 2c: Cognitive Presence → Course Design	0.397	5.836**	Supported
Hypothesis 4: Course Design → Learner Satisfaction	0.553	9.565**	Supported

Note: ns= not significant $R^2_{\text{Course Design}}$= 0.75; $R^2_{\text{Learner Satisfaction}}$= 0.84
**p< 0.001

Table 3 - Standardized Regression Weights for Structural Model.

integrate blended learning approaches, even for a skill oriented profession like hospitality. In higher education institutions, blended learning may support improving the quality of F2F learning by moving the content delivery online and in-person sessions on active learning (Bowen, 2012; Murphy, 2020).

At the variable level, the highest mean score of the three independent variables was CP (M=5.13, SD=1.14) followed by TP (M=4.94, SD=1.01) and SP (M=4.90, SD=1.26). As a first step in the analysis, the mean scores of individual items are important indicators of student satisfaction leaving aside the necessity to confirm the theory presented in the CoI framework. However, during further analysis, though precisely important, certain items with high mean scores, such as TP4 (mean = 5.84), TP13 (mean=5.24), SP1 (mean =5.06), CP6 (mean=5.27), and CP11(mean=5.15) did not load. Likewise, one of the important item in course design DE6 (the course used different categories of media, including power point presentations, lecture notes, audio clips, video clips, website links, etc.) (5.73)) and SS6 (I am satisfied with the continuous evaluations and final exam) (5.00) did not load. The internal structure of the scales used may be inconsistent in the present context, nonetheless, we interpret that they are critical for the optimal design of e-Learning environments.

Online education is a method of teaching-learning carefully planned and deliberately designed to be remote and distance (Hodges, et al., 2020; Uopeople.edu., 2020) that uses combination of technologies. Though the origin of blended learning lies in distance learning, it combines computer medicated instruction with traditional F2F instruction through amalgamation of technologies, models of teaching, pedagogies, and styles of learning (Bryan, & Volchenkova, 2016; Friesen, 2012; Graham, 2006). Hence, the temporary shift to alternate delivery mode adopted due to crisis circumstance is neither comparable with full time online education nor blended learning. However, in prior research, the application of CoI framework in the context of distance education or online courses has found mixed results, with some studies suggesting a positive relationship between TP and satisfaction (Kucuk, & Richardson, 2019; Khalid & Quick, 2016), SP and satisfaction (Akyol & Garrison, 2011; Arbaugh, 2008;), and CP and satisfaction (Kucuk, & Richardson, 2019; Kang et al., 2014; Hosler & Arend, 2012), and course structure on student satisfaction (Harsasi & Sutawijaya, 2018; Ellis et al., 2009;), except a few that have not found any significant relationship between SP and satisfaction (Joo, Lim, & Kim, 2011; So & Brush, 2008). Though the context is otherwise, the results are consistent with few of the aforementioned studies. In our study, the elements of CoI showed significant positive relation with course design items. The study shows the importance of course design, with 84% of the variations in student satisfaction being explained by course design (this includes the effect of TP, SP, and CP, collectively) and had a beta value as high as 0.533. Overall, the results showed that the proposed model fits the observed relationships except for CP, which did not show significant relationship with satisfaction. Further, TP was found to be the major determinant of satisfaction. We can infer that the students are satisfied when the teaching presence is strong. Contrary to expectation, SP was not a major predictor of satisfaction. Possible explanation may be that the students are not accustomed to online lessons and are a cohesive group studying together in the campus. The study intertwines CoI and course design as prerequisite for student satisfaction. It is a novel attempt and the results implied partial mediation by course design in the relationship between CoI and satisfaction. Largely, results indicate that we are successful in meeting the expectation of students in terms of curriculum delivery. Some of the variations in the present findings may be due to the polarity in the observations of students, as their inclination is vis-à-vis experiential value of the courses undertaken.

The present results suggest that hospitality students perceive the CoI framework may apply to hospitality education, though explicit cognizance of CoI is low among the respondents. The outcomes of this study make significant theoretical and practical contributions to the key stakeholders of higher education and present avenues for further research. First, it is among the primary attempts to use CoI and course design as

theoretical foundation and assess the framework to explain students' satisfaction in a remote teaching context. In doing so, it explores the role of course design as mediator in the proposed relationship. Second, in a collaborative learning community, it enables university professors to enhance the quality of remote teaching by re-designing the structure of learning activities. Third, findings offer teachers with useful insights on increased focus towards course design dimensions, as it has the strongest association with satisfaction. Fourth, this is the first-ever study concerning the perceptions of Indian hospitality students of remote teaching, using the CoI framework. Lastly, an important issue that must not be neglected, is the overall learning experience of students that can be enhanced only through concerted efforts by the administrators and teachers. In this sense, each and every variable in the scales used become an important indicator of success to assist students to have a meaningful learning experience.

5. Limitations and Conclusion

As this is a pioneering study in the emerging field, it has just opened the doors to extensive research opportunities. In this pilot study, even though the sample size is large enough, the sampling diversity was very limited, as the students from only one institute were considered.

In a hospitality program, on an average a student studies six theory courses in a semester. He/she has to attend 185 + hours of class room teaching and involve in 200+ hours of self-learning. Teaching involves lecture sessions, videos, quiz, case studies, and demonstrations delivered online through Microsoft Teams, MS Forms and Google Learning tools by the module leaders. Self-Learning comprises listening to podcasts, creating blogs and Vlogs, e- assignments, and undergoing subject specific MOOC's. Therefore, in future studies, the exploration of association between overall time spent in online learning and student satisfaction would provide interesting insights into higher order learning along the three domains of CoI along with identification of discipline based differences in student perceptions of elements of CoI. Generalizability of the findings to diverse campus-based courses need to be tested as this is the first attempt to administer this scale to hospitality students. As a new topic of study, it is narrowly focussed on course design items, based on exterior delivery of content, and the quality of learning activities are not yet addressed. The study also does not capture the completeness of learning where many other contextual variables may be responsible for learner satisfaction. Moreover, we run primarily a campus-based program and adoption of remote teaching was only an emergency measure during COVID-19 pandemic, to ensure completion of the course. Future studies may need to incorporate other factors, such as different dimensions of social presence, emotional presence, components of engagement, discipline-specific course design elements, perceived learning, inclusion of moderators, and student motivation.

According to Kozan and Richardson (2014), teaching presence lead to enhanced social presence and cognitive presence. Our study results exhibited significant relationship among TP and satisfaction and we assume that sooner or later as we continue remote teaching, the pairwise relationships may become stronger with time and experience. As suggested by Richardson, Maeda, and Caskurlu (2017) and Kozan and Caskurlu (2018), SP measures may have to be revisited, and CoI framework may need to be refined with more theoretical and methodological considerations to make it relevant to ERT environment. Assuredly there is scope to improve the awareness about CoI in ERT because it is important to assess the efficacy of this temporary solution (Hodges et al., 2020) as a measure of learner success and satisfaction. Setting aside conventional thinking on teaching, learning, and assessment, COVID-19 offered an opportunity to reimagine higher education and develop coherent digital strategies to deal with eventualities in the future. We believe that the proposed model may serve as a guide to possible future studies to explore the value of CoI framework as a model of learning process in remote teaching.

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