Scaling up blended learning on Innovation and Entrepreneurship: a proposal to increase value in a semi presential module

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Abstract

Education on Innovation and Entrepreneurship (I&E) has increased in the last two decades, specially, through MOOCs. Lately, these reusable online alternatives have tended to be revalorized by HEIs into blended learning activities, posing new challenges for instructors, specially, on how to bridge prior knowledge with in-class activities. Adopting a discursive approach to knowledge, our proposal aims to meet this challenge by identifying student's 'representations', i.e., patterned constructions on disciplinary knowledge. Representations can be found across different cohorts and thus further complemented by instructors. To test this assumption and build our proposal, we analysed student's representations in two observations. We mapped students' representations over key I&E definitions (e.g., 'start-up') and, to know how prior knowledge may be complemented by instructors, we identified students' alignment with expert disciplinary knowledge. Firstly, we found that the two cohorts tended to express representations by turning attention to several dimensions, e.g., referring to different types of *features* or *finalities* associated with concepts. Secondly, the disciplinary alignment description revealed that students tended to focus on the same components present in experts' definitions, but with a greater level of generality. Our results have been packaged into a proposal that aims to help instructors scale their blended activities.

Keywords: representations, prior knowledge, blended learning, scaling up, innovation and entrepreneurship

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1. Introduction

Education on Management, Innovation and Entrepreneurship has increased exponentially in the last two decades as it has been considered 'vital' for economy and wealth creation (e.g., Hanke, Kisenwether & Warren, 2005). In this context, engineering universities, for example, have become aware of the fact that they should graduate students not only with a deep understanding about science and technology, but also about opportunities, market forces, product commercialization, and communication skills (Vorbach, Poandl & Korajman, 2019: 104). Aligned with this commitment, educative institutions have profited from information technologies (IT), particularly, by offering massive open online courses or MOOCs, which have the potential of being reproduced by generations of participants at scale (Kasch, Rosmalen & Kalz, 2017). This type of online solutions, "disruptors of the educational order" (Dodson, Kitburi & Berge, 2015), has offered a valuable entrepreneurial learning experience to students at all levels (Hanke, Kisenwether and Warren, 2005), not only online but also in the classroom (Vorbach et al., 2019). Indeed, nowadays, MOOCs tend to be re-valorised or scaled up by higher education institutions (HEIs) as blended activities (Kjærgaard, 2017).

Blended learning, broadly considered as a combination of online and in-class instruction, with reduced in-class seat time for students" (Dziuban, Graham, Moskal, Norberg & Sicilia, 2018), and content normally delivered online between 20% to 79% (Arbaugh, 2014), has started to be implemented by a wide network of European universities to train students through ready-made online resources on Innovation and Entrepreneurship (I&E). For example, in the Master School programs led by the European Institute of Innovation and Technology (in particular, the EIT Digital consortia), it is possible to find 'flipped classrooms', where online contents are delivered to students before class and then discussed onsite, and 'full blended online courses', in which pre-packaged online sessions with assessments are opened to students before the lessons and, in most of the cases, associated with supervised sessions in class (Pisoni, 2019). The application of these blended learning methods may pose several challenges, for example, in terms of workload, especially for the teaching staff as they must play the role of 'facilitator' of the educational process, i.e., provide students with assistance and additional insights when using the online materials (Zur, 2018),

One critical challenge for blended learning in HEIs, which is specifically tackled throughout our research, is related to the effective integration of online and onsite sources. Online resources available in MOOCs are pre-recorded to meet specific pedagogical purposes, for example, to make students 'remember' a set of concepts provided by different expert sources, often from both academy ('knowledge-based experts') and industry ('experienced-based experts'). This knowledge is usually assessed, for instance, through online multiple-choice activities or one-sided peer review dynamics, often inhibiting further discussions on the topic. As long as online resources are revalorized in blended learning activities, the relation between teaching and learning is reconfigured into a more "active model" (Waddoups & Howell, 2002) or towards a "new paradigm for knowledge" (Graham & Robison, 2007), in which the professor assumes a role of mediator between online-acquired knowledge (either from knowledge-based or experienced-based experts) and face-to-face learning (Peraya, 2010), for example, by highlighting similarities and differences among conceptualizations or complementing topics previously worked in the online activities. Thus, blended learning is not just a technology-enhanced add-on to what is already taught face-to-face; instead, it may be seen as a transformative pedagogical approach (Garrison, 2017; Ross & Rosenbloom, 2011) or a potential game-changer for teaching and learning in higher education (Benson, Anderson & Ooms, 2011; Laumakis, Graham & Dzuiban, 2009).

The treatment of online sources and the impact on students' (blended) learning needs further research, specially, in an era in which information technologies seem to play a dominant role. As Kjærgaard (2017:3) put it, "we need to know more about what teaching and learning activities should be delivered face-to-face (…) Do we know enough about what kinds of activities best complement different online activities, and what changes this demands for the role of the teacher as well as the students?". Olvier and Trigwell (2005) have argued that the discussion about blended learning rarely relies on the perspective of the learner. Similarly, Graham and Dziuban (2008) have claimed that blended learning becomes weak if the focus is entirely on the mode of instruction rather than the holistic nature of the learning experience. However, when the blended learning literature is approached from the learner's perspective, the focus tends to be on learner's satisfaction (e.g., So & Brush, 2008) and perception about blended experience (López, López & Rodríguez, 2011). Thus, there is still a gap in learning through blended learning activities and, specifically, in designing methodologies to efficiently revalorize this innovative form of building knowledge.

Taking as a starting point teachers' challenge of complementing in class what students learned from online (and external) sources (i.e., prior knowledge), in this research we present a proposal to revalorize blended learning activities that incorporate ready-made online material. Adopting a discursive approach to knowledge, our proposal aims to meet this challenge by identifying student's 'representations', i.e., patterned discursive constructions through which participants make sense of the different social realities or experiences, e.g., underlying the innovation processes. As patterns, representations can be found across different cohorts (i.e., 'common prior knowledge') and thus further complemented by instructors. To test this assumption, we analysed student's representations in two observations (2018, 2020), where participants were asked to provide their own definitions in relation to I&E concepts, such as 'technology transfer', 'start-up' and 'niche market'. To know how prior knowledge (or common beliefs) acquired from online (or other) sources may be complemented by instructors, we identified students' alignment with expert disciplinary knowledge. Student's representations, as we will describe in detail, are 'deconstructed' and identified according to specific entities present in discourse, i.e., 'nature', 'features', 'actions', 'finality' and 'circumstances'. Following a coding process, the identification of the representations' discursive patterns allowed us to identify regularities across time and between groups, i.e., among student cohorts and between students and experts. By mapping student's representation patterns in the two cohorts and identifying disciplinary alignment, we finally aimed at offering a qualitative proposal to design a scalable blended module based on online content on I&E.

We have organized our investigation as follows: first, we describe our theoretical framework, mainly based on three interlinked strands, i.e., scaling online education through blended learning, knowledge representation, and common beliefs versus scientific beliefs. Secondly, we describe the methodology used for identifying possible scalable knowledge. Thirdly, we present our main results and discussion. Finally, we conclude by providing an empirical-based proposal that will

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allow instructors to reach a certain level of scalability within, although not limited to, an I&E blended learning activity.

2. A theoretical framework for a scaled blended education

To develop our methodological proposal, we draw on three theoretical strands: scaling online learning through blended learning, knowledge representations, and common beliefs versus scientific representations.

2.1 Scaling Online Education through Blended Learning

In recent years, after the boom of MOOCs, online education has been scaled through the development of blended learning activities. Blended learning, in terms of Graham et al. (2013), can be considered as a deliberate fusion of online (asynchronous and/or synchronous) and face-to-face contact time between teaching staff and students and/or between students in a course. This fusion has encouraged Higher Education Institutions (HEIs) to develop an increasing number of blended courses (Krishnasamy et al., 2016; Lim & Wang, 2016: 3), which have become a common strategy to meet modern-day demands in a globalized and technology-driven world (Dziuban, Hartmen, Cavanagh, & Moskal, 2011; Means, Toyama, Murphy, Bakia, & Jones, 2010; Overbaugh & Nickel, 2011).

Researchers (e.g., Owston, 2013; Porter & Graham, 2016; Sayed & Baker, 2014; Tshabalala, Ndeya-Ndereya & van der Merwe, 2014; Moskal, Dziuban & Hartman, 2013) have shown, however, that there are still challenges associated with the scalability of this type of learning. When it comes to course design, Julia, Peter and Marco (2020) refer to an “Iron triangle” that accounts for a trade-off between three dimensions: scale, costs and quality. According to Julia et al. (2020), this would mean that an increase in student numbers (scale) would lead to an increase in staff/teachers (costs) to keep a high educational quality (quality). With a critical view about the bias on quantitative metrics, Kasch et al. (2017: 848) proposed that educational scalability should be tackled as “the capacity of an educational format to maintain high quality despite increasing large numbers of learners at a stable level of total costs”.

Considering the challenges observed by the literature, our approach to blended learning puts emphasis in the qualitative perspective. We establish that identifying the role played by the disciplinary knowledge built in a blended learning session is a paramount task. We assume that, at least in the field of I&E education, there is specific prior knowledge among the students that, if correctly identified, can be further and efficiently complemented by the instructor in a scalable fashion.

2.2 Disciplinary Knowledge Representations and Common Beliefs in I&E

One strategy to approach scalability from a quality perspective corresponds to processing student’s prior knowledge. Dochy (1994: 4699) has defined prior knowledge as “the whole of a person’s actual knowledge that: (a) is available before a certain learning task, (b) is structured in schemata, (c) is declarative and procedural, (d) is partly explicit and partly tacit, (e) and is dynamic in nature and stored in the knowledge base”. Prior knowledge, mostly studied using control groups in which students are trained in certain topics and subsequently compared with others, has been particularly relevant to predict the learning performance of students (Azevedo, Moos, Greene, Winters & Cromley, 2008). For example, a wide variety of investigations in the field of mathematics (Hudson & Rottmann, 1981), writing and text processing (McCutcheon, 1986), economics (Dochy, 1992), and computer programming (Klahr & Carver, 1988) have established that prior knowledge benefits students' learning and achievement.

In our proposal, we approach prior knowledge differently to identify which disciplinary contents tend to be well-known by students of different cohorts (i.e., as "common prior knowledge") and how they can be further developed by the instructor. Common prior knowledge is accessed here through *representations* built by students about a certain topic, e.g., "entrepreneurship". Representations, more specifically, are understood as patterned discursive constructions through which people make sense of the different social worlds. Ontologically, according to Pesqueux (2002: 28), representations are "reproductions of what is real by means of a point of view… similarly to a term which is depicted through theatre and painting[1]". Interestingly, Pesqueux (2002: 29) claims that representing "is about thinking of an element by means of the idea". Thus, representations would have a metonymic nature that can be found in language.

Representations may circulate among people (e.g., students), conform cognitive frameworks or prototypes (Baron & Ensley, 2006) and sometimes take the form of taken-for-granted beliefs (*doxa*, in terms of Bourdieu), myths and common metaphoric associations. Shane (2008: 121 - 124), for example, analysed the myths about entrepreneurship and built the image of a typical entrepreneur in United States. The author revealed that there is a conventional wisdom (prototypes, in terms of Baron and Ensely, 2006) that entrepreneurs are very "special people that are heroes who stand alone and overcome great odds to build companies through superhuman efforts"[2], and that "only a handful of super-successful entrepreneurs get described in the media, giving us a distorted view of what entrepreneurs are like".

There is also research exploring the common beliefs shared by graduates within a socioeconomic environment. Agapitou, Tampuri, Bouchoris, Georgopoulos & Kakouris (2010), for example, showed that start-up entrepreneurs mostly relate entrepreneurship to self-confidence, learning from failure, communication abilities and network participation while latent entrepreneurs (those participating in entrepreneurial courses) mostly relate entrepreneurship with big companies and seminar trainings. This type of common beliefs about entrepreneurship may affect how students approach specific aspects of I&E, such as technology transfer, start-up creation or lobbying. In this regard, we have defined the following hypothesis concerning the construction of common prior knowledge among students:

> *Hypothesis 1. Conceptual representations about Innovation and Entrepreneurship tend to be stable among students of different cohorts across time (2018-2020)*

We assume that it is possible to find common representations or common knowledge about I&E concepts that tend to be maintained by students regardless of time. If this is true, identifying such

[1] Our translation from French to English.
[2] For narratives regarding the construction of the "hero", see Muniesa et al., 2017)

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representations would allow instructors and content designers to pre-elaborate material that will complement students' prior knowledge regardless of their academic background, location, or age.

2.3 Common Beliefs versus Scientific Knowledge

As discussed earlier, blended learning activities incorporating online resources usually include pre-recorded material to help students learn I&E concepts. These concepts are provided by different expert sources, often from academy ('knowledge-based experts') and mostly industry ('experienced-based experts'). Since students acquire most concepts from non-academic sources when working with the online material, once they get onsite, they need to upgrade their knowledge with academic concepts provided by their teachers. Students are involved in a complex process of knowledge recontextualization in which instructors play a key role. In this sense, based on the distinction between theoretical (scientific) knowledge and action knowledge (i.e., put into practice) (Barbier, 1996), Terral and Colinet (2007) claim that scientific knowledge undergoes a major transformation process as it is appropriated and mobilised by teachers. This transformation can lead to a difference in the representations of I&E concepts between the students in our study, and the scientific knowledge. We assume that although receiving training on I&E, it is possible to find partial epistemic alignment between students and expert literature. If this is true, instructors and content designers can pre-elaborate material by considering the disciplinary knowledge as a common base to further learning. This is synthesised in our second hypothesis:

> *Hypothesis 2. Conceptual representations about Innovation and Entrepreneurship tend to differ between students and scientific literature*

3. Methodology

In this section, we describe the methodology to test our two hypotheses about the representations of key I&E concepts.

3.1 Participants

Our research consisted of two observations corresponding to 2018 and 2020. The observations included 29 and 17 first-year Master students, respectively, who were part of the Minor in Innovation and Entrepreneurship at the University of Rennes 1, in France.

3.2 Data collection

For four weeks, both observation groups had to watch four online Entrepreneurial Cases (EC). Implicitly introduced in these videos, participants of both experiments were invited to define seven academic concepts related to I&E to elicit representations: 1) *technology chain*, 2) *technology transfer*, 3) *start-up*, 4) *spin-off*, 5) *niche market*, 6) *minimum viable product*, and 7) *lobbying*. Given their reference in the videos, these seven concepts are not only central to the entrepreneurial process but a reliable source to explore students' representations about specific aspects of the innovation practice.

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3.3 Analysis of representations through concept definitions

In this subsection, we present the method we used, on one hand, to compare students' representations between the two observations and, on the other, to compare epistemic alignment between students and expert literature.

3.3.1 Analysis of representations provided by students ('common prior knowledge')

After receiving cognitive stimulus from the EC activities, students had to elaborate their own definitions for the seven I&E concepts. Definitions were disaggregated into qualitative units resembling a conventional grammar structure, which allowed us to identify the 'components' of a representation and, thus, obtain units of comparisons. As shown in Table 1, representations were disaggregated into five components: *thing* (what is it?), *features* (attributes), *actions* (what it does), *finality* (purpose) and *circumstances* (under what conditions?). For example, a person can think of a "start-up" either as an *organization*, a *group of professionals* or a *set of efforts* (nature), *founded by tech enthusiasts* (feature), *that performs a series of socio-technical tasks* (action), *to positively impact society* (finality), *with the collaboration of venture-capitalists* (circumstance).

Table 1. Qualitative content analysis of representation components.

Representation elements	Thing	Feature	Action	Finality	Circumstances
Leading questions	What is it?	Is there any attribute?	What does it do?	For what purpose?	Under what conditions?

It is worth noting that a grammar-approach to representations may pose certain identification challenges, specially, when sentences are embedded in some categories, as in "A niche market is the subset of the market [[on which a specific product is developed by a company]] to satisfy clients' needs". In this case, we could identify a "representation within a representation", however, we have opted for skipping this analytical step and consider the most general layer (i.e., the "thing", in the example above).

The discursive approach to representations allowed us to cover at least two of the three basic elements of a definition according to Schwartz and Raphael (1985): the "general class" to which the concept belongs, as it is the case of the thing; and the "primary properties" of the concept which distinguish it from other members of the class, as it is the case of *features, actions, finality* and *circumstances*. The "Example", which corresponds to the third element suggested by Schwartz and Raphael (1985), was not considered since we treated it as non-mandatory element of the definition.

Components comprising the definitions were tagged through a coding process, which allowed us to generalize the descriptions (e.g., all references to purposes were tagged with the 'purpose' label) provided by students in the 2018 and 2020 observations.

3.3.2 Comparison between students' and experts' representations

As for students', experts' representations were identified and analysed using the same coding process. To compare student's and experts' representations, we first selected students' definitions which shared at least one component with the expert literature, regardless of the observation wave. Secondly, we selected 'experts' definitions' in two stages: a) a carefully literature review, using keywords such as 'Innovation' AND 'start-up', was carried out to identify the most pertinent definitions from articles published in scientific journals; and b) the selected definitions were ranked according to their number of citations in Google Scholar (Annex 1) up to February 2021. This last stage allowed us to identify the *epistemic authorities* for each disciplinary concept. For academic concepts for which scientific consensus was found, we relied on the highest-cited author(s).

4. Discussion and results

In this section, we present and discuss the results corresponding to our first hypothesis: "Conceptual representations about Innovation and Entrepreneurship tend to be stable among students of the two cohorts (2018-2020)". For this, we follow two steps: a) first, we identify representations' structure, i.e., we observe how students defined the concepts, by paying attention on the structure of their definition: nature/thing, features, action, purpose/finality, and circumstances); and then b) we analyse the distribution of representations according to their frequency, in the two observations. Based on this distribution, we determine how established the representation is among students (i.e., fragmented, partially integrated, and assimilated), which allows us to understand the complexity of the representations shared by the students. Table 2 summarizes the main results regarding the representation' structure (discursive focus), stability across time and level of distribution among participants.

Table 2. Representations of I&E concepts shared by the students of the two experiments according to their discursive focus, frequency of distribution, and stability.

Concepts	Discursive focus	Representations	Fragmented (<25%)		Partially integrated (25<x<50%)		Assimilated (>50%)	
		Level of distribution / Stability across the two cohorts	Exp 1	Exp 2	Exp 1	Exp 2	Exp 1	Exp 2
Technology Chain	Finality	To connect research and business field	x	x				
	Thing^Finality	Combination of technologies for achieving a purpose			x	x		
	Thing^Finality	Components of modules/components for create product	x	x				
Technology Transfer	Thing	Transfer of the technology from one place to another		x	x			
	Thing	Transfer of scientific research results to the market			x			x
	Thing	Transfer of the patent from one organization to another	x	x				
	Thing^Finality	Technologies to solve problem	x	x				
Start-up	Thing	Creation of a company around a business idea	x	x				
	Feature	Starting with little means	x	x				
	Feature	Focused on innovation	x	x				
	Feature	Independent company not created within another entity			x	x		
	Finality	To exploit high-potential market niches	x	x				
Spin-off	Thing	Company within another entity (company, research institute)					x	x
Niche market	Thing	Sub-market				x	x	
	Thing^Feature	Sub-market ^ focused on a specific product/specific field					x	x
	Thing^Feature	Sub-market ^ without many competitor	x			x		
MVP	Thing	Prototype	x	x				
	Thing^Action	Prototype^that allows to obtain customers to improve it	x					x
	Thing^Finality	prototype ^ to test your future product and validate the business opportunity		x			x	
	Thing^Finality	Minimum effort ^ to validate the business concept	x	x				
Lobbying	Thing^Finality	attempt ^ to influence (actions/official/stakeholder/government/business) in one's own interest			x			x

Legend: The table shows students' shared representations and their distribution frequencies in the two experiments. Representations' frequency of distribution is analysed in three categories: "fragmented", "partially integrated" and "assimilated". When the frequency of distribution of a given representation is, for both cohorts, in the same category, then the representation is considered stable. When the frequency of distribution differs between the two cohorts, then the representation is considered unstable.

4.1 Representation structure of definitions

Generally, students mostly build representations through definitions following two strategies: on one hand, by referring to the thing and, on the other, by referring to the thing as well as the finality (linked by the symbol ^).

Regarding *technology chain*, for example, the concept was built as a combination of technologies, modules, and components while its finality was built around the general idea of "achieving a purpose", "creating a product" and "connecting research and business field", which accounts from very a very general notion to a more ecosystemic thinking. The concept of *technology transfer*, students tended to build representations only about the thing being transferred, this is, "transfer of the technology from one place to another", "transfer of scientific research results to the market", and "Transfer of the patent from one organization to another", which accounts not only for different entities being transferred (technology, scientific research, and patent) but also for some (general) institutions involved in the process (organizations, market). Interestingly, the finality of technology transfer is practically missing from definitions, and, if present, it is built very generically ("technologies to solve problem"). The concept of *start-up* is perceived by students mostly according to its features, this is, "starting with little means", "not created within another entity", and "focused on innovation", which accounts for general "common ideas" on the concept, not totally in agreement with expert definitions as we will see in the next section. S*pin-off is* mostly built on its nature ("company within another entity"), excluding features or purposes although it is certainly a well-known concept among people. Concerning *niche market*, students poorly define it as "sub-market", and mostly referring to exclusivity features, this is, "without many competitors" and "focused on a specific product". *Lobbying*, unlike the other concepts, is mostly defined in terms of purpose ("to influence actions/ official/ stakeholder/ government/ business in one's own interest"). Finally, *MVP*, unlike the rest of the terms, is defined in several dimensions, according to either its "nature" only ("prototype), its nature^action ("it allows customers to obtain feedback to improve it"), and, mostly, according to is nature^finality ("to validate the business concept")

4.2 Stability in cohorts across time

In general, the data analysis of the two experiments shows that, on average, students' representations in the two cohorts are stable at a collective level. On average, students produce 9 representations for the 7 academic concepts. Among them, on average, 3 were shared by the students in the two experiments. Although these shared representations count for only one-third of the representations made by students, these shared constructions were formulated by most of the participants. Students in the first and second experiments also built representations that were not shared among students of the counterpart experiment. On average, students in the first experiment reported 5 representations of academic concepts which were not reported by students in the second experiment. Conversely, students in the second experiment reported an average 1 representation of academic concepts that were not reported by students in the first experiment (average: 1.85). However, these different representations of the academic concepts are, on average, made by only two students in the first experiment (average: 2), as well as by two students in the second experiment (average: 2.42). This difference between the two experiments can be explained by the size of the sample, which is larger in the first experiment (n=29) than in the second (n=17).

Although some representations were not shared by the students in the two experiments, this may be because only a small number of students was involved.

Considering the results above, we can see that, at a collective level, representations are stable over time. The term 'stable' is used here to refer to representation patterns that maintain a frequency over time. In other words, stable representations correspond to those found in both the first experiment (2018) and the second one (2020), i.e., 'common prior knowledge'. We found that students' representations in the first experiment (2018) were shared by most of the students of the second experiment (2020). To explore the relation between the number of students and the number of times in which students shared a representation, we cross-referenced the representations shared by the students of the two experiments with their frequency. In Table 2, we can observe the representations of academic concepts shared by the students of the two experiments according to their frequency of distribution and their stability. This frequency of representation distribution is exploited in three categories: 'fragmented', 'partially integrated' and 'assimilated'. The 'fragmented' category includes representations mentioned by less than 25% of the students. The 'partially integrated' category includes representations shared by 25%-50% of the students. Finally, the 'assimilated' category includes representations formulated by more than 50% of the participants. Moreover, we consider as 'stable' a representation shared by the students of both experiments, in the same frequency category. Thus, we consider as 'unstable' a representation shared by the students of both experiments, but not in the same categories of frequency of distribution. In the following subsection, we describe the second step of the analysis, corresponding to the distribution frequency of representations.

4.3 Representations' distribution frequency

In relation to the 'fragmentation of representations', the analysis showed that representations shared by the students in the two experiments tend to be stable but fragmented (47.6%). This means that both groups of students share representations with the same low frequency (<25%). More specifically, only two representations of academic concepts were stable and assimilated (9.5%), i.e., shared by the students of the two experiments at a frequency of more than 50%: one representation of *Spin-off* ("Creation within another entity") and one of *Niche market* ("Sub-market focused on a specific field/product"). There were two stable and partially integrated representations, i.e., shared by the students of the two experiments at a frequency between 25% and 50%: one related to *Technology Chain* ("Combination of technologies for achieving a purpose") and one related to *Start-up* ("Not created within another entity"). All other stable representations were fragmented.

Seven representations of academic concepts (33.3%), shared in the two experiments, were unstable, i.e., they were shared through different frequency categories between the two groups of students. In the first experimentation, most of the unstable representations are partially integrated (42.8%), i.e., evoked at a frequency of between 25% and 50%. Conversely, most if the unstable representations, in the second experiment, are assimilated (42.8%), i.e., mentioned more than 50% of the students. This higher consensus among students in the second experiment can be explained by the size of the sample (it was lower than in the first experiment).

To sum up, firstly, our first hypothesis (i.e., representations of academic concepts are stable over time) is confirmed at a collective level as the students in both experiments share the same representations. Secondly, these shared representations are mostly shared at the same frequency for both groups, and this frequency is often less than 25%. In other words, most of the representations common to the two experiments are stable and fragmented. Finally, the unstable representations (i.e., those that are shared by the students of the two experiments at a different frequency) are mostly assimilated (>50%) among the students of the second experiment, and "partially integrated" (25%<x<50%) in the first experiment.

4.4 I&E Knowledge: Students versus Scientific Literature

In the following section, we focus on the second hypothesis corresponding to: Conceptual representations about I&E tend to differ between students and scientific literature. Table 3 synthetises the main results regarding the representations on I&E concepts between both actors. Results have been organized according to the seven concepts.

Table 3. Representations of I&E concepts by the literature and those shared by students in both experiences.

Expert definitions		**Concepts**	**Student definition**	
Discursive focus	**Definition**		**Discursive focus**	**Definition**
Thing^Feature	the activities of the technology chain "can be divided broadly into those involved in the ongoing production, marketing, delivery, and servicing of the product (primary activities)	**Technology Chain**	Finality	To connect research and business field
Thing^Action	"and those providing purchased inputs, technology, human resources, or overall infrastructure functions to support the other activities (support activities)" (Porter, 2011 : 9)			
Thing^finality	"the full range of activities that firms and workers perform^ to bring a product from its conception to end use and beyond" (Gereffi & Fernandez-Stark, 2011 : 4)		Thing^Finality	Combination of technologies ^ for achieving a purpose
Thing^finality	"collection of activities that are performed^to design, produce, market, deliver, and support its product" (Porter, 1985 : 36)		Thing^Finality	Components of modules/components ^ for creating a product
Thing	"the process by which ideas and concepts are moved from the laboratory to marketplace" (Philipps, 2002; Williams and Gibson, 1990; cited by Wahab et al., 2012)	**Technology Transfer**	Thing	Transfer of the **technology** from one place to another
Thing	"the movement of know-how, technical knowledge, or technology from one organizational setting to another" (Roessner, 2000, as cited in Bozeman, 2000).			
Thing	"transfer of inventive activities to secondary users" (Van Gich, cited in Wahab, 2012).		Thing	Transfer of **scientific research results** to the market
Thing^Feature	"a socio-technical process^implying the transfer of cultural skills accompanying the movement of machinery, equipment and tools"^"the physical movement of artifacts and also, at the same time^transfer of the embedded cultural skills" (Levin, 1993; as cited in Wahab et al, 2012).			
Thing	a transfer of knowledge from developed to less developed countries (Derakhsani, 1983; Putranto et al., 2003)		Thing	Transfer of the patent from one organization to another
Thing^Finality	"the transmission of know-how^to suit local conditions^with effective absorption and diffusion both within and across countries" (Chung, 2001; Kanyak, 1985; as cited in Wahab et al., 2012).			
Thing^Action	"transmission of know-how (knowledge)^which enables the recipient enterprise to manufacture a particular product or provide a specific service" (Baranson, 1970; as cited in Wahab et al., 2012).		Thing^Finality	Technologies ^ to solve problem
Thing^Finality^ Circumstance	"a human institution designed^to create a new product or service^under conditions of extreme uncertainty" (Ries, 2011 : 12-13)	**Start-up**	Thing	Creation of a company around a business idea
			Feature	Starting with little means
			Feature	Focused on innovation
			Thing^Feature	Independent company ^ not created within another entity
			Finality	To exploit high-potential market niches
Thing	"can result from a technology transfer" (Malkin, 1990; as cited in Bessière & al., 2017)	**Spin-off**	Thing	Company within another entity (company, research institute)
Thing^Finality	"a business that is created by one or several members of a public research laboratory^to commercialize an innovation" (Biligardi, Galati & Verbano, 2013;			

	McQueen & Wallmark, 1982; cited in Bessière & al., 2017).			
Thing^Feature	"high-tech companies^whose core business is based on the commercial valorisation of results of a scientific and technological research" (Shane, 2004; cited in Bigliardi, Galati & Verbano, 2013).			
Thing^Feature	"companies^that germinate from a University where a group of researchers compose the entrepreneurial unit aiming at the exploitation of skills and results from the research developed within the University" (Conti et al. 2011; cited in Bigliardi, Galati & Verbano, 2013)			
Thing	"a mechanism [in which governments seek to generate economic impact from their R&D laboratory by transferring technology from the R&D function to a commercial organization]" (Roberts & Malonet, 1996; as cited in Bigliardi, Galati & Verbano, 2013).			
Thing^Action^ Circumstance	"new businesses^that commercialize innovations from university *research^without the inventor necessarily being a part of the project*" (Nicolaou and Birley, 2003)			
Thing	"small, specialized markets for good or services" (McCorkle and Anderson, 2009)	**Niche market**	Thing	Sub-market
Action	"a niche market starts from the needs of a few customers and then gradually builds up in to large markets or customer base, called as bottom up approach" (Shani and Chalasani, 1992 : 45)		Thing^Feature	Sub-market ^ focused on a specific product/specific field
Thing^Feature	"a small market^consisting of an individual customer or a small group of customers with similar characteristics or needs" (Dalgix & Leeuw, 1994 : 40).		Thing^Feature	Sub-market ^ without many competitor
Thing^Action	"a version of a new product^which allows a team to collect the maximum amount of validated learning about customers^with the least effort" (Ries, 2011; as cited in Lenarduzzi & Taibi, 2016 : 1).	**MVP**	Thing	Prototype
			Thing^Action	Prototype ^ that allows to obtain customers to improve it
			Thing^Finality	prototype ^ to test your future product and validate the business opportunity
			Thing^Finality	Minimum effort ^ to validate the business concept
Thing^ Feature	"the attempted or successful influence of legislative-administrative decisions^by public authorities through interested representatives." (Koeppl, 2001 : 71).	**Lobbying**	Thing^Finality	attempt ^ to influence (actions / official / stakeholder / government / business) in one's own interest
Thing^Feature	"The influence^is intended, implies the use of communication and is targeted on legislative or executive bodies" (Koeppl, 2001 : 71).			

4.4.1 Technology chain

The mainstream literature on 'technology chain' mainly defines this concept according to nature^finality. For Porter (1985), this concept is a "collection of activities" (nature) "…to design, produce, market, deliver, and support its product" (finality) (Porter, 1985: 36). It also extends the nature by adding a feature ["…divided broadly into those involved in the ongoing production, marketing, delivery, and servicing of the product (primary activities)"] and an action ["…providing purchased inputs, technology, human resources, or overall infrastructure functions to support the other activities (support activities)"] (Porter, 2011: 9). Gereffi and Fernandez-Stark (2011: 4) also define *technology chain* according to its nature^finality ("full range of activities that firms and workers perform" ^ "to bring a product from its conception to end use and beyond"). Interestingly, in experts' representations is possible to identify the diverse "stages" in the technology chain, e.g., production, marketing, delivery, and servicing of the product (in Porter's terms), which go from the conception to the end user (in Gereffi and Fernandez-Stark's terms).

Students, by contrast, represent the nature of technology chain as a "process of combining different technologies", "a combination of modules/components", and "a group of modules". Finality is built in broad terms, e.g., "to connect research world and the company", "to achieve a purpose", and "to reach a common objective".
From these results, it is possible to observe that literature representations are more complex than those given by the students. Although both actors refer to technology chain as a set of activities, the main difference relies probably on the end of the chain: while experts refer to the final user (as

the final actor affected in the chain) and client's service, students completely skip this dimension of the chain, which is critical to understand its purpose. In view of these results, our hypothesis is confirmed.

4.4.2 Technology transfer

The concept of 'technology transfer' is defined from different disciplines (Zhao & Reisman, 1992; Bozeman, 2000), specially, according to its nature (thing). For example, Philipps (2002) and Williams and Gibson (1990) consider the nature of this concept as "the process by which ideas and concepts are moved from the laboratory to marketplace" (Wahab, Rose & Osman, 2012). For Van Gich (1978), the nature of the concept is different, since it is not a transfer of knowledge but a "transfer of inventive activities to secondary users" (Wahab et al., 2012). Roessner (2000) defines this concept as "the movement of know-how, technical knowledge, or technology from one organizational setting to another" (nature) (Roessner, 2000, as cited in Bozeman, 2000). Derakhsani (1983), and Putranto et al. (2003) define the nature of *technology transfer* as "a transfer of knowledge from developed to less developed countries". Some experts go further, defining this concept by nature^feature [a,b,c], like Levin (1993) ["a socio-technical process"^"implying [a] the transfer of cultural skills accompanying the movement of machinery, equipment and tools"; and "[b]the physical movement of artifacts and also, at the same time,"^" [c] transfer of the embedded cultural skills"] (Levin, 1993; as cited in Wahab et al, 2012). Other experts define "technology transfer" as nature^finality, as "a transmission of know-how"^"to suit local conditions, with effective absorption and diffusion both within and across countries" (Chung, 2001; Kanyak, 1985; as cited in Wahab et al., 2012)]. Baranson (1970) considers this concept according to its nature^action, i.e as a "transmission of know-how (knowledge)^which enables the recipient enterprise to manufacture a particular product or provide a specific service" (Baranson, 1970; as cited in Wahab et al., 2012). From the analysis, we can observe that experts represent the concept mainly as a "transfer", a "movement" and a "transmission", where the object being transferred, moved, and transmitted corresponds mostly to intangible assets, i.e., inventive activities (Van Gich, 1978; Wahab et al., 2012), know-how (Roessner, 2000; Chung, 2001; Kanyak, 1985), knowledge (Derakhsani, 1983) and cultural skills (Levin, 1993).

Students, on the other hand, define the concept of 'technology transfer' also according to its movable nature, i.e., as something that is displaced from one place to another ("transfer of scientific research results to the market", "transfer of the technology from one place to another" "to license one of its patents to another organization, public or private". Interestingly, unlike experts who represent intangible assets as the transferred entities, students tend to think that the object of the transfer is something apparently more "concrete", such as scientific results, technology, and patents.

4.4.3 Start-up

One expert's definition seems to prevail on the concept of 'start-up'. Ries (2011: 12-13), with 5,794 citations, considers this concept according to three criteria: its nature ("a human institution), finality ("… to create a new product or service"), and circumstance ("under conditions of extreme uncertainty").

Students, on the other hand, consider the start-up by its nature, as an entity, more precisely as an "independent company", which is "not created within another entity". Students also share four other representations: one by its nature ("Creation of a company around a business idea"), two by its features ("Starting with little means", "Focused on innovation") and one by its finality ("to exploit high potential market niche").

The comparison between students' and experts' representations of the concept of "start-up" shows that the structure of the students' definitions is as complex as that of experts. However, there is one key difference that is highly relevant to highlight: while students refer to common-sense elements associated with a start-up, such as "independent", "created around a business", "starting with little money", Ries (2011) highlights probably the most important feature of the concept, this is, "risk" ("under conditions of extreme uncertainty"), which is totally ignored by students.

4.4.4 Spin-off

Experts represent 'spinoff' through several dimensions, i.e., nature, feature, action, and finality, although in a homogenous way. In terms of nature, for example, spinoff is represented as "a result from technology transfer" (Malkin, 1990 cited in Bessière & al., 2017), "a business" (Bigliardi, Galati and Verbano, 2013; McQueen and Wallmark, 1982; Nicolaou and Birley, 2003), "high-tech company" (Shane, 2004), "companies" (Conti et al., 2011) and a "mechanism" (Roberts and Malonet, 1996). In terms of the features, we found that a spinoff is represented as a thing "[which] is created by one or several members of a public research laboratory", "whose core business is based on the commercial valorisation of results of a scientific and technological research, "that germinate from a university where a group of researchers compose the entrepreneurial unit". Finality is built in terms of "to commercialize an innovation" (Bigliardi, Galati and Verbano, 2013; McQueen and Wallmark, 1982), "aiming at the exploitation of skills and results from the research developed within the University" (Conti et al., 2011), "to generate economic impact from their R&D laboratory" (Roberts and Malonet, 1996). Unlike Bessière et al. (2017), who suggested that "the literature shows no consensus on the definition of academic spin off", from experts' definitions it is possible to observe clear patterns of representations, of which the most evident is that "the commercialization of research" is at the core of the spin-off. This pattern can be found in terms of a feature, finality, and even as actions (as in "a new business that commercialize innovations from university research", in Nicolaou and Birley, 2003).

Students, on the other hand, tend to describe *spin-off* according to its nature ("company within another entity", "*The creation of a spinoff takes place within another organisation, which can be a firm, an academic institution or a research institute*, without evoking its objective or purpose", "*A spin-off is just a company created from a larger organization, university, corporation*". Thus, it is possible to observe that students represent "spin-offs" in a rather simplistic way, totally missing the core value claimed by the experts, i.e., selling research.

4.4.5 Minimum Viable Product

Disciplinary knowledge about the concept of 'Minimum Viable Product' (MVP) is plentiful, but "the most influencing one" is that of Ries (2011), according to Lenarduzzi and Taibi (2016), particularly, because Ries (2011) was the one who introduced the concept. Ries (2011) defines MVP according to its nature^action^circumstance ("a version of a new product" ^ "which allows a team to collect the maximum amount of validated learning about customers^with the least effort") (Ries, 2011; Lenarduzzi & Taibi, 2016: 1). Thus, three aspects are identified: MVP is a version of a product, this version allows a firm to learn about its customers, learning is achieved with the least effort.

Students, on the other hand, have quite similar representations about MVPs. In terms of nature, students claim that an MVP is a "prototype", a "simplified product" as well as a "minimum effort", which corresponds to a nominalization of the circumstance described by Ries (2011). Interestingly, students have a clearer representation of the purpose of MVPs: "to test", "to validate", "to get feedback from customers", where the practical finality is "to avoid wasting money". Thus, it is interesting that students are epistemically aligned with Ries (2011), with a very practical representation of an MVP.

4.4.6 Lobbying (as a process)

Literature around 'lobbying' represents this concept with a nature^feature structure. Koeppl (2001: 71), specifically, defines 'lobbying' as "the attempted or successful influence of legislative-administrative decisions" ^ "by public authorities through interested representatives". Students, similarly, define this concept according to its nature^finality, i.e., as an "attempt to influence (actions/official/stakeholder, government, business...)" ^ "in one's own interest".

The analysis demonstrates that both experts and students represent this process in similar terms, where the main difference is the level of technicality expressed in the expert definition: while Koeppl (2001) refers to "legislative and administrative decisions", students refer to "interests" as the object to be influenced.

4.4.7 Niche market

The literature around the concept of 'niche market' is varied, but it seems to be oriented around two expert definitions. McCorkle and Anderson (2009) describe *niche market in terms of its nature*, as a "small, specialized markets for good or services". Dalgic and Leeuw (1994: 40) define this concept according to its nature"^"feature, as "a small market"^"consisting of an individual customer or a small group of customers with similar characteristics or needs". Shani and Chalasani (1992: 45) define niche market only by its action ("a niche market starts from the needs of a few customers and then gradually builds up into large markets or customer base, called as bottom-up approach"). Thus, it is possible to observe that (a group of) customers play an important role at the core of the definition.

¿Students, on the other side, define the concept either according to its nature or according to its nature^feature. Indeed, most students consider this concept by its nature, i.e., as a sub-market ("*Niche market is a sub-market, inside a wider market*", "*A niche market is the subset of the market*", "a *subpart of huge market*"). Thus, it is possible to observe that the customer totally disappears from students' niche market representation. Indeed, students build their representation based on the market, but not on those who "inhabit" it.

To conclude this section, we can observe that in general there is a misalignment between experts' and students' representations. In the case of technology chain, we could observe that while experts refer to the final user (as the final actor affected in the chain), students completely skip this dimension of the chain, which is critical to understand its purpose. Regarding technology transfer, unlike experts who represent 'intangible assets' (e.g., know-how, knowledge) as the transferred entities, students tend to think that the object of the transfer is something apparently more ‘concrete’, such as scientific results, technology, and patents. In relation to start-up, while students refer to common-sense elements associated with a start-up, such as 'independent”, “created around a business”, “starting with little money”, Ries (2011) highlights probably the most important feature of the concept, this is, “risk” (“under conditions of extreme uncertainty”), which is totally ignored by students. Regarding spin-off, it was possible to observe that students represent ‘spin-offs’ in a rather simplistic way, totally missing the core value claimed by the experts, i.e., selling research. As for MVP, students, although partially aligned with Ries (2011), seem to have a representation including very concrete purposes of MVPs: “to test”, “to validate”, “to get feedback from customers”, where the practical finality is “to avoid wasting money”. As for Lobbying, experts and students represented this process in similar terms, where the main difference is the level of technicality expressed in the expert definition: while Koeppl (2001) refers to “legislative and administrative decisions”, students refer to “interests” as the object to be influenced. Finally, regarding niche market, it is possible to observe that the customer totally disappeared from students’ niche market representation.

4.5 Global Analysis

In this section we provide an integrated analysis of our results, specifically, about the elaboration of representations among students of both cohorts, the frequency of distribution, and the comparison between students’ and experts’ definitions.

First, students of both experiments have elaborated more representations for some academic concepts than others. Indeed, as mentioned above, the concepts of ‘Spin-off’, ‘Start-up’, ‘Technology Chain’ and ‘Technology transfer’ showed at least 10 different representations between the two observations. After analysing the definitions provided by the literature, we can observe that there is no consensus on the definitions of the concepts of ‘Technology transfer’ and ‘Spin-off’. It seems that for these two concepts the diversity of student representations is consistent with the fact that there is no scientific consensus on these two concepts. Conversely, the academic concepts of ‘Minimum viable product’, ‘Lobbying’ and ‘Niche market’ were concepts for which students had a lower number of representations. Consistently, the definition analysis showed that, as in the literature, there was consensus regarding these concepts. Thus, the analysis of our results allows us to make a link between the diversity of students' representations, of the two observations, and the consensus in the scientific literature on the academic concepts.

Second, the frequency of such representations might be associated to the emergence (and subsequently disciplinary incorporation) of the concepts. Thus, it would be possible to establish a link between the stability of the students' representations and the age of the concept. According to Google Books N-grams Viewer, the concept of ‘lobbying’ is the oldest, starting to appear in books in the 19th century (1860), while the concept of ‘minimum viable product’ seems to be more recent, starting to be mentioned in the 19th century (2001). The concepts of ‘technology transfer’, ‘start-up’ and ‘spin-off’ seem to be well established, appearing in books as early as the 1940s, as well as the concepts of ‘value chain’ and ‘niche market’, mentioned four decades later (1980).

Third, by cross-referencing our results with this information, we note that the concept of ‘lobbying’, which is the oldest, is one in which its unique representation is stable and ‘assimilated’, being shared by more than 50% of the students. Conversely, the concept of ‘MVP’ is the most recent concept. The representations of this concept are more nuanced, with half of them being stable and 'fragmented'. The other concepts, evoked between the 1940s and 1980s, also presented fragmented representations mostly, except for the concept of 'spin-off'. Thus, we can establish a potential link between the "disciplinary age" of the concept and the fragmentation of student representations on this subject. In other words, when the academic concept is old, students would tend to have fewer representations, and these would be shared by most of them. Conversely, when the academic concept is newer, student representations would be more diverse and shared by a small number of students. Furthermore, through the study of the content of the experts' definitions, we have found that the concepts of Technology Transfer and Spin-off are very complex. It is interesting to note that students defined these two concepts only according to their nature, without mentioning the other components (characteristics/action/finality/circumstances). The fact that students only mention these concepts according to its nature indicates that they do not refer to the 'distinctive elements' of the definition (Schwartz & Raphael, 1985).

Our results highlight various interesting elements. Firstly, we note a stability at the collective level of student representations over time (2018-2020) (h1). Secondly, among the representations shared between the two experiments, the majority is shared with the same frequency by students of both observations, with a frequency less than 25%. In other words, most of the representations shared by students is stable and fragmented. Thirdly, most students tend to express their representations according to the *nature* and *purpose* of the definitions, whereas experts elaborate more complex terms. Moreover, students define complex concepts (technology transfer, spin-off) only according to their *nature*, without relying on the distinctive elements of a definition (Schwartz & Raphael, 1985). Finally, regarding disciplinary content, students perceive certain concepts with similar elements to those of experts, but with a greater level of generality and less complexity (h2). Based on our results, in the next section we will describe two strategies to reach scalability in a blended learning activity.

5. Conclusion: towards the scalability of blended learning

The objective of our research was to identify the content and stability over time (2018-2020) of students' representations about disciplinary contents related to Innovation and Entrepreneurship (I&E). The results of our analysis led us to propose two strategies which may allow instructors to scale their blended activities. These strategies are built on both the analysis and deconstruction of students' representations of academic concepts and disciplinary alignment. The exploration of students' representations allows us to situate their learning, to understand how they construct a definition, and on which elements of the online teaching material they rely on to construct their representations. Students' representations are also an indicator of their construction of knowledge, which can be a useful resource for the teacher to adapt his or her teaching practices (Salamanca-Avila et al., 2013). The comparison of the latter's representations with those of the experts also makes it possible to better identify the knowledge acquired by the pupils, and the points on which the teaching material should be scaled, i.e., the possibility of developing reusable and transferable pedagogical material to blend on-line content. In this sense, we propose two different strategies to scale blended learning courses based on our results on the mapping of representations.

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5.1 First strategy: Understand students' knowledge

The first pedagogical strategy consists in an activity in which the instructor may ask students, after watching the videos online, for specific information to define concepts, according to the structural elements that make up a definition. The instructor should break down the concept with the students, asking them concrete questions that provide underlying information about the structure of the concept. Specifically, the instructor can ask students with following questions about the nature ("What is it?"), feature ("Is there any attribute?"), action ("What does it do?"), finality ("For what purpose?"), circumstances ("Under what conditions?") and actors ("Who is the actor doing the action? Who is the actor receiving the action?") of the concept. The instructor can also go further, by asking which actors are involved in the definition, who are the ones doing the action and who are the ones "receiving" that action. She can also ask questions such as "what do you know about these actors in relation to their involvement in innovation projects?" or "why do they play a key role in the definition?". This step of identifying the actors of the concept represents an important reflection process for the students. Indeed, students' representations are often 'actorless', impersonal and passive. Through this process of reflection, students will be able to identify the participants playing a role within the concept, thus constructing more precise, complete, and personal definitions.

The instructor can also ask students to identify which elements are not present in the definition and which should be. Following this identification, the instructor can ask for reasons for the presence and/or absence of certain elements (why is this action proposed and not another? Why is a certain actor described as a doer and not another? What is his or her importance in the world of innovation? What other actions have been left out of the definition and should be included to achieve a more complete definition?) This can also be applied to other elements of the definition, such as circumstances ("What circumstances should be described in the definition? Are there any sine qua non circumstances that should be included in the definition?"). This activity also allows for a reflexive analysis by the students of the construction of their own representation. Moreover, this pedagogical activity would allow both the teacher to obtain accurate information about the students' knowledge acquired through viewing the videos, and the students to critically evaluate the concepts learned online.

5.2 Second strategy: Understand Disciplinary Alignment

The second pedagogical strategy is an activity in which the instructor can ask the students to identify the components of the concepts of each definition provided by the experts (nature, feature, action, finality, circumstances, and actors). To do this, the instructor can ask the students the same questions as in the previous activity, which allow them to identify the above-mentioned components. The instructor can also ask the students to compare experts' definitions and identify their main differences. Subsequently, the instructor can ask students about the presence and/or absence of certain elements in the experts' definitions. If the teacher thinks necessary, he/she can ask students to give possible explanations for the possible differences in the reviewed literature. For this task, the teacher will have to choose the experts' definitions for each I&E concept. The aim is to choose a stable definition within the discipline. To choose a stable definition within the discipline, the selection can be made according to the number of citations in the literature providing the definitions. Then the instructor can ask the students to compare their own representations with those of the experts. This task again allows students to reflexively analyse how they construct a definition, and to see which elements are common or different with the experts' definitions. With this information, the teacher can highlight the differences between what the students know and what the experts propose. This activity allows students to both gain scientific knowledge about academic concepts and understand how a scientific definition is constructed.

These two activities are expected to allow instructors and content designers to scale up a blended learning activity out of online content, while keeping the quality of the pedagogical design as in a purely 'in-class' traditional approach.

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Appendix 1

Selection of pertinent authors according to the citation number in Google Scholar.

Authors	Article title per topic	Citations
	Start-up	
Ries, E. 2011.	***The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses***. New York : Currency.	5794
Blank, S., & Dorf, B. 2020.	*The startup owner's manual: The step-by-step guide for building a great company*. John Wiley & Sons.	37
Adamczyk, M. 2016.	An attempt to define the concept of start-up company based on inductive research. *QUAERE 2016: reviewed proceedings of the interdisciplinary scientific international conference for PhD students and assistants* (pp. 67-74).	3
	Spin-off	
Shane, S. 2004.	***Academic entrepreneurship: University spin-offs and wealth creation***. Cheltenham: Edward Elgar.	2397
Roberts, E., Malone, D. E. 1996.	Policies and structures for spinning off new companies from research and development organizations. ***R&d Management***, *26*(1): 17-48.	661
Nicolaou, N., & Birley, S. 2003.	Academic networks in a trichotomous categorisation of university spinouts. ***Journal of business venturing***, 18(3): 333-359	535
Rogers, E. M., Takegami, S., Yin, J. 2001.	Lessons learned about technology transfer. *Technovation*, 21(4), 253–261.	459
Matkin, G. 1990.	***Technology Transfer and the University.*** New York: Macmillan.	346
McQueen, D. H. and Wallmark, J. T. 1982.	Spin-off companies from Chalmers University of Technology. ***Technovation***, 1(4): 305-315.	137
Bigliardi, B., Galati, F. and Verbano, C. 2013.	Evaluating performance of university spin-off companies: Lessons from Italy. ***Journal of technology management & innovation***, 8(2) : 29– 30.	86
Conti G., Granieri M., Piccaluga A. 2011.	***La gestione del trasferimento tecnologico: Strategie, modelli e strumenti.*** Berlin : Springer Science & Business Media.	53
Bessière, V., Gomez-Breysse, M., Messeghem, K., Ramaroson, A., & Sammut, S. 2017.	Drivers of growth: the case of French academic spin-off. ***International Journal of Entrepreneurship and Innovation Management***, 21(4-5): 318-342. https://doi.org/10.1504/IJEIM.2017.085684	2
	Technology Chain	
Porter, M. E. .1985, ed. 2011.	***Competitive advantage of nations: creating and sustaining superior performance*** (2nd ed.). New York: Free Press.	109175
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Pil, F. K., & Holweg, M. 2006.	Evolving from value chain to value grid. ***MIT Sloan management review***, 47(4): 72.	195
Holweg, M., & Helo, P. 2014.	Defining value chain architectures: Linking strategic value creation to operational supply chain design. ***International Journal of Production Economics***, 147: 230-238.	90
Frenzel, M., Kullik, J., Reuter, M. A., & Gutzmer, J. 2017.	Raw material 'criticality'—sense or nonsense? ***Journal of Physics D: Applied Physics***, 50(12).	80
	Technology Transfer	
Bozeman, B. 2000.	Technology transfer and public policy: A review of research and theory. ***Research policy***, 29(4-5): 627-655. https://doi.org/10.1016/S0048-7333(99)00093-1	2399
Van Gigch, J. P. 1978.	***Applied general systems theory***. New York: HarperCollins.	542
Autio, E. & Laamanen, T. 1995.	Measurement and evaluation of technology transfer: Review of technology transfer mechanisms and indicators. ***International Journal of Technology Transfer Management***, 10(6): 643-664.	387
Phillips, R. 2002.	Technology business incubators: How effective is technology transfer mechanisms? ***Technology in Society***, 24 (3): 299-316.	347
William, F., & Gibson, D. V. 1990.	***Technology Transfer: A Communication Perspective***. Beverly Hills, CA: Sage.	306
Zhao, L., & Reisman, A. 1992.	Toward meta research on technology transfer. ***IEEE Transactions on engineering management***, 39(1): 13-21.	248
Chung, W. 2001.	Identifying technology transfer in foreign direct investment: influence of industry conditions and investing firm motives. ***Journal of International Business Studies***, 32(2): 211-229.	237
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Baronson, J. 1970.	Technology Transfer through the International Firms. ***American Economic Review Papers and Proceedings***: 435-440.	198
Roessner, J.D. 2000.	Technology transfer. In: C. Hill (Ed.), ***Science and Technology Policy in the US, A Time of Change.*** London : Longman.	101
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Kanyak, E. 1985.	***Transfer of Technology from Developed Countries: Some Insights from Turkey***. CT: Quarum Books.	18
	Niche market	
Shani, D., & Chalasani, S. 1992.	Exploiting niches using relationship marketing. ***The Journal of Services Marketing***, 6 (4): 43-52.	936
Kara, A., & Kaynak, E. 1997.	Markets of a single customer: exploiting conceptual developments in market segmentation. ***European journal of marketing***, 31 (11/12): 873-896.	196

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McCorkle, D., & Anderson, D. P. 2009.	*Niche Marketing*. https://oaktrust.library.tamu.edu/bitstream/handle/1969.1/86937/pdf_1265.pdf?sequence=1&isAllowed=y.	1
Lobbying		
Koeppl, P. 2001.	The acceptance, relevance and dominance of lobbying the EU Commission—a first-time survey of the EU Commission's civil servants. ***Journal of Public Affairs: An International Journal***, 1(1): 69-80.	93
Zorack, J. L. 1990.	***The lobbying handbook.*** Washington, DC: Professional Lobbying and Consulting Center.	50
Van Schendelen, R. 1993.	***National Public and Private Lobbying***. Aldershot: Dartmouth.	2
MVP		
Ries, E. 2011.	***The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses***. New York : Currency.	5794
Lenarduzzi, V., & Taibi, D. 2016, August.	***Mvp explained: A systematic mapping study on the definitions of minimal viable product.*** Paper presented at the 42th Euromicro Conference on Software Engineering and Advanced Applications, Cyprus.	80
Duc, A. N., & Abrahamsson, P. 2016, May.	***Minimum viable product or multiple facet product? The role of MVP in software startups.*** Paper presented at the *International Conference on Agile Software Development*, Cologne.	74