Self-directed Experiential Learning to Meet Ever-changing Entrepreneurship Demands

Thomas Howard Morris[1] and Pascal D. König[2]

[1]Bath Spa University, School of Education, England

[2]University of Kaiserslautern, Faculty of Social Sciences, Germany

Abstract

Purpose – Policy makers have called for more entrepreneurship throughout societies as a response to the digital transformation. This paper argues that the rapidly changing conditions of the digital age indeed mark a change in the bases of entrepreneurship. Specifically, as adaptivity becomes key, a learning capacity and general ability to adapt becomes a critical factor in entrepreneurial activity. The paper identifies *self-directed learning* as a fundamental competence in this regard and examines its role for entrepreneurship and entrepreneurial competence.

Design/methodology/approach – The paper develops a theoretical framework for the role of self-directed learning in entrepreneurship through a process of systematic review of previous studies that have linked self-directed learning to entrepreneurship.

Findings – The formulated theoretical framework shows how self-directed learning competence combines with experiential learning in supporting the kind of adaptivity needed for entrepreneurial competence, especially under more rapidly changing conditions. Self-directed learning competence also gains wider importance through enabling individuals to meet the demands of organizational changes in our highly volatile world.

Practical implications – Self-directed learning competence prepares individuals for entrepreneurship and resilience in face of rapid changes as well as for being more entrepreneurial in the conduct of their lives more generally. Fostering self-directed learning competence can thus be regarded as an important objective of entrepreneurship education.

Originality/value – The described Self-directed Experiential Learning Cycle offers a novel perspective that clarifies how both self-directed and experiential learning competences are integral for understanding the basis of adaptiveness in entrepreneurial activity.

Keywords

Self-directed learning (SDL), Kolb's Experiential Learning Cycle, adaptivity, meta-competence, entrepreneurial orientation, digital age

1. Introduction

Education for entrepreneurship has received particular attention against the backdrop of a globalizing world marked by a growing fluidity, complexity, and uncertainty (Lackéus, 2015; Liguori *et al.*, 2018). Entrepreneurial skills, it is held, can prepare individuals to prevail and succeed under these conditions; and policy makers have stressed the importance of entrepreneurship and an entrepreneurial culture throughout society (e.g. Lee *et al.*, 2011; Olson and Wood, 2018). The kind of mentality or culture that policy makers envision with the diffusion of entrepreneurship concerns an attitudinal dimension that has commonly been dealt with under the heading of "entrepreneurial orientation" (Kreiser, 2011; Miller, 2011; Wang, 2008). In this regard, a large part of entrepreneurship education has been directed at how to foster not just specific entrepreneurial skills but also an entrepreneurial attitude (for an overview see Mwasalwiba, 2010).

However, common diagnoses of rapidly changing conditions emphasize a need for adaptivity and learning competence that goes beyond an entrepreneurial attitude and a set of entrepreneurship skills. Indeed, the importance of an ability to adapt arguably becomes especially palpable in times of sudden change and crisis that demand novel responses – exampled by the current COVID-19 pandemic. It is not surprising therefore that adaptivity, defined as "the ability to employ multiple ways to succeed and the capacity to move seamlessly among them" (Hofman *et al.*, 2014, pp. 51–52), has recently been labelled as the conditio sine qua non of professional expertise and business success (Ward *et al.*, 2018). Thus, in short, adaptivity – and the resilience that it fosters – is fundamental for short- and long-term professional and business success.

In this respect, the business literature has emphasized that increasingly volatile, uncertain, complex, and ambiguous conditions require businesses to not just adapt to new circumstances but to more generally develop an ability to adapt in face of constantly changing circumstances

and, importantly, to capitalize on a vastly increased number of entrepreneurial opportunities (Westerman *et al.*, 2014; Finkle and Olsen, 2019; Lambin, 2014). It therefore seems necessary to consider that what is key to fostering entrepreneurial competence, especially under these rapidly changing conditions, is more than merely certain skills and expertise to deal with a fixed set of tasks. Rather, the need for adaptivity in entrepreneurship points to the importance of an ability to acquire and develop new knowledge and skills, to proactively identify a need to change and adapt, and to do things differently than before (Byrne *et al.*, 2014). Furthermore, it is important to highlight key limitations in entrepreneurial literature that have not been fully addressed to date concern (1) a lack of attention toward the necessity and advantage gained for entrepreneurs when they hold the necessary learning competence to enable a proactive and competent process of acquiring and developing new knowledge and skills to meet the demands of their changing professional and/or business conditions and (2) a lack of clear understanding of the nature of this learning process – that leads to adaptivity to the changing conditions.

The present paper deals with these concerns through addressing the question what kind of learning competence lies at the foundation of an entrepreneurial ability to cope with continuously and rapidly changing conditions and what benefits this competence may afford an entrepreneur. Specifically, given the importance of adaptivity outlined above, we argue below that a competence of self-directed learning (SDL) is key to a more comprehensive entrepreneurial competence. SDL has been defined as a "major, highly deliberate effort to gain certain knowledge and skill (or to change in some other way)" (Tough, 1971, p. 1; cf. also Knowles, 1975). Specifically, adult learning literature has highlighted SDL competence as fundamental to enabling a person to adapt to rapidly changing conditions: especially through providing the person with the competence to upskill proactively in order to meet the demands of changing situations (cf. Morris, 2019a). SDL thus can be viewed as a meta-competence: enabling the person to successfully and efficiently learn new knowledge and other skills that

are necessary to meet their demands within their entrepreneurial context (see also Pluskwik *et al.*, 2018).

As Ustav and Venesaar (2018) have remarked on a more general note, meta-competencies are essential for dealing with ambiguity and coping with changing situations in entrepreneurship. It has also been stated that an entrepreneurial orientation has to be combined with a learning orientation in order to foster entrepreneurship and ultimately business performance (Wang, 2008). In a similar vein, some scholars have noted that a metacognitive ability and capability to learn from experience is an important basis for individuals' adaptability (De Meuse *et al.*, 2010; Haynie *et al.*, 2012). Yet, despite the relevance of a learning competence that undergirds individuals' adaptability, it does not feature prominently in entrepreneurship education.

By discussing and stressing the role of learning competence in the context of entrepreneurship the present paper advances the existing literature in several regards. First, starting from a description of SDL and its general relevance for adaptivity, we review research that has drawn a connection between SDL and entrepreneurship. Second, we make a theoretical contribution by synthesizing relevant insights from that literature and formulate an analytical framework to systematically connect learning competence with adaptivity in entrepreneurship. In doing so, we spell out why SDL competence is a fundamental component of entrepreneurial competence. Finally, we discuss how learning competence gains particular importance in view of the far-reaching organizational changes in economy and society that mark the digital age. Specifically, we argue that it equips individuals for meeting the demands of organizational changes under highly volatile conditions. Based on this approach, the paper offers relevant insights on how to foster entrepreneurship that is marked by a high degree of adaptivity. This knowledge can help to inform the objectives and instruments that entrepreneurship policy makers need to prioritize.

2. Self-directed learning as a fundamental competence for dealing with changing conditions

In the literature on entrepreneurship and learning, "learning skills" are usually classified or counted as just one skill among others that are necessary for entrepreneurial competence. For instance, and significantly, an OECD report (Lackéus, 2015) lists 16 dimensions (each dimension is classified as knowledge, skill, or attitude) that comprise and contribute to cognitive and/or non-cognitive competence of an entrepreneur. The report views "learning skills" as of equal footing in comparison to other skills required for successful entrepreneurship (namely, marketing skills, resource skills, opportunity skills, interpersonal skills, and strategic skills). Importantly, and reflecting on the current entrepreneurial literature, in this regard, learning skills are not presently conceded a formidable role in comparison to the five skills that are outlined in the report as necessary for a competent entrepreneur (cf. Lackéus, 2015, p. 13).

This perspective stands in stark contrast to adult learning literature that highlights that when an individual develops learning skills and becomes a competent self-directed learner then this affords them with the ability to successfully and effectively learn *additional* (and/or refine presently held) skills, knowledge, and attitudes that the individual learner deems necessary to meet the demands of their given social, economic, and contextual conditions (cf. Morris, 2019a, c). In other words, SDL competence could be viewed as a "meta-competence" that is important for, and is indeed fundamental for, proactively upskilling with an effective and efficient mannerism the necessary skills, knowledge, and attitudes to meet the changing challenges and demands they face. Consequently, SDL can be seen as a fundamental and higher-order competence for entrepreneurs to meet the demands of their ever-changing business world (see also Ustav and Venesaar, 2018).

What makes SDL especially relevant for entrepreneurship is that it can sustain the kind of adaptability needed by entrepreneurs to competently deal with and react to problems that occur

and also, importantly, to competently make the most of opportunities that arise. Studies from adult learning literature have summarized that the benefits that can be gained from undertaking competent SDL are multiple, including providing the ability (1) to adapt proactively to changing social, economic, and contextual conditions and therefore enabling a person to avoid knowledge and skill obsolescence (e.g. Morrison and Premkumar, 2014) (2) to grow and develop in accordance to their specific conditions, providing a person with the adaptivity required under the conditions of rapid change and (3) providing an individual with the capability to take appropriate actions to upskill accordingly (e.g. Morris, 2019c).

Remarkably, to our knowledge, little attention has been given to the construct of SDL in entrepreneurial research to date. Rather, entrepreneurial research has strongly emphasized and focused on the importance of learning-by-doing – or "learning through entrepreneurship" – for the fostering of entrepreneurial competence (e.g. Cope, 2005). Learning through entrepreneurship can be classified as "experiential learning"; and indeed the literature in this regard often employs Kolb's (1984, 2015) Experiential Learning Cycle as a guiding framework for understanding the learning process involved in entrepreneurship. In this regard, it has been argued that practical hands-on real-world entrepreneurial experience fosters the development of attitudes, such as self-efficacy and proactiveness, that characterize an entrepreneurial mindset and orientation likely to actuate successful entrepreneurship (see e.g. Schoonmaker *et al.*, 2019).

Nonetheless, in terms of adult learning theory, experiential learning is viewed as just one dimension of the adult learning process and, importantly, SDL is another key dimension of adult learning (cf. Merriam *et al.*, 2020). The construct of SDL differs from other constructs and forms of learning in that it represents a learning process in which a learner takes responsibility to *proactively* direct their learning means and objectives in order to meet the specific demands determined by the conditions of their personal context (cf. Boyer *et al.*, 2014,

Kranzow and Hyland, 2016). It is important to consider that the SDL construct has four key dimensions that are commonly emphasized by scholars and are commonly found within theoretical models of SDL: (1) the process/management of learning tasks (2) personality characteristics of persons likely to pursue SDL (3) factors within the persons context that might influence the likelihood of whether SDL is carried out and (4) the cognitive aspect of SDL: considering the process of how meaning is made during SDL (e.g. Beckers *et al.*, 2018; Sawatsky *et al.*, 2017).

Empirical studies have highlighted the importance of personality characteristics in influencing a person's tendency and propensity towards undertaking SDL (e.g. Alharbi, 2018; Kirwan *et al.*, 2014; Slater *et al.*, 2017). Also, it should be considered that contextual factors are likely to have a powerful influence on whether SDL is likely to be carried out (e.g. Merriam, 2018) and therefore it is important to point out that SDL does not occur in a societal vacuum. Indeed, what may seem somewhat paradoxical is that the process of SDL often does not involve the person learning in isolation. Quite to the contrary, empirical studies have highlighted how successful SDL often involves working with others, often in small working groups (e.g. Soares *et al.*, 2018; Verzat *et al.*, 2017).

In sum, SDL is a complex construct and the ability to competently engage in SDL can be seen as fundamental to successful entrepreneurship as it affords a person with the ability to adapt to changing situations and demands. Having outlined major assumptions and insights from research on SDL we thus turn to the question how a link between entrepreneurship and SDL has been drawn in previous contributions.

3. Review of literature on self-directed learning and entrepreneurship

What is the role of SDL for entrepreneurs and, specifically, how is it related to the learning that entrepreneurs may undergo and the adaptivity they need to succeed under rapidly changing

conditions? Existing research that has dealt specifically with this question and has explicitly linked SDL to entrepreneurship is rather limited. For a systematic review of such contributions we conducted a targeted search of publications. We used the broad search terms "'self-directed learning' AND 'entreprene*'" within the title, abstract, or keywords of traditional journal indexes (namely Web of Science and Scopus). The search was not limited to a given timeframe for the fact that, even given that the search terms used in the literature search were broad and were applied to all search fields within the advance search tools, at the time that the literature search was conducted (July, 2019) the search only retrieved 62 records. This low retrieval reflects upon the dearth of research to date that has been conducted in this very important scientific field of investigation. Inclusion criteria were that the record was (1) at least in part, focused on entrepreneurship *and* SDL and (2) that the work was published in the English language.[1] An overview of the selection process can be seen in Annex I. In total 17 studies were identified as primarily relevant (for a complete and annotated list of the reviewed contributions see Annex II).

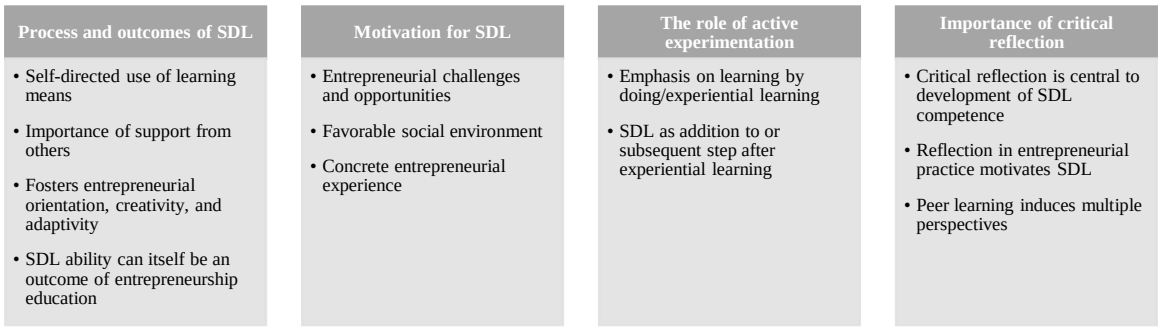
In line with the guiding question formulated above, this set of contributions was screened for common themes concerning the role that SDL plays for entrepreneurship as well as adaptivity more generally. To provide a systematic overview of the reviewed research, the selected contributions were processed along the lines of a structured qualitative content analysis: identifying and coding relevant text segments in order to arrive at salient themes by following the approach outlined by Braun and Clarke (2006), where initial categories were gradually grouped and aggregated into larger themes.[2]

[1] From 62 records 13 duplicates were removed. A further 11 records were excluded during the initial screening where (a) nine records were excluded because the title indicated that the record was not related to entrepreneurship or SDL (b) one record was excluded on the basis that it was not written in the English language and (c) one further paper was not accessible to the investigators and was therefore not included in the present review. The remaining 38 articles were screened for eligibility by abstract, 33 of which were also examined in full-text, to assess whether the record, at least in part, focused on entrepreneurship *and* SDL.

[2] The coding was done using the MAXQDA10 software and can be obtained upon request from the authors.

As a result of this process, we arrived at four themes: (1) The process and outcomes of undertaking SDL (2) motivation for SDL (3) the role of pragmatic active experimentation in enabling contextually rich concrete experiences – learning through entrepreneurship and (4) the importance of critical reflective observation in forming contextual specific abstract conceptualizations. Figure 1 provides an overview and summary of the key insights derived from the literature review under those four themes. We elaborate on them in the following subsections.

Figure 1. Overview of key themes in studies on SDL in entrepreneurship



3.1. The process and outcomes of undertaking self-directed learning

Looking at how SDL is taken up in the reviewed studies, it should be noted first that despite our narrow focus on studies that make reference to SDL in the context of entrepreneurship, they overall only rather marginally draw on the SDL construct. Sometimes, the term self-directed learning is used very loosely and with little to no theoretical foundation. Nonetheless, where the reviewed studies do elaborate on SDL, its role and outcomes in entrepreneurship education are described rather similarly. In several of the reviewed studies, the process of SDL is linked to entrepreneurial challenges or opportunities: SDL commonly represents a process of learners self-directing their learning means in order to meet the learning objectives identified (specific

to a problem or opportunity) in an entrepreneurial context. And, many of the studies reviewed are interested in how formal education can be designed to practice and facilitate SDL.

In this regard, Lee *et al.* (2017) discuss that project-based learning is a popular pedagogical strategy that encourages students to engage in SDL. Täks *et al.* (2014) identify that students valued knowledge gained through self-directed and group learning activities involving reflection. However, the authors discuss that for students who are accustomed to a traditional teaching model, the transformation to SDL might cause considerable difficulties. While Young (2007) highlights the point that SDL can be accomplished either completely alone or with the cooperation of others, many of the reviewed studies point to a collaborative learning process (e.g. Lindberg *et al.*, 2017; Pluskwik *et al.*, 2018; Rasiah *et al.*, 2019; Sze-yeng and Hussain, 2012; Witt *et al.*, 2006). Van Gelderen (2010) argues that students need their teachers to help them become self-directed (see also Sze-yeng and Hussain, 2012). In reference to the works of Grolnick and Ryan (1987) and Loyens *et al.* (2008), the author points out that allowing learners autonomy is not about undirected, unguided, learning. In addition, van Gelderen (2010) highlights that the educator, friends and other learners might be important learning resources in what may be described as a community of learning.

An important distinction that can be made with respect to the reviewed studies is whether they are concerned with the consequences of SDL, e.g. for an entrepreneurial mindset, or with SDL forming a part of entrepreneurship. Belonging to the first group, several studies see SDL as an important way of generating a proactive or entrepreneurial attitude. In this regard, Witt *et al.* (2006) document an example of a new educational programme in which student teams grow from leader-directed teams in their first academic year to self-directed empowered teams in the fifth year of the curriculum. They argue that the more a student controls their change process from the initial goal-setting stage the higher the likelihood is that they will eventually take on personal responsibility to achieve their learning goals. Moreover, Lindberg *et al.* (2017)

highlight the point that students' creativity can also be developed through SDL: as SDL involves students' experimentation. They discussed that students became active, enhancing learners' self-efficacy, experimentation, risk taking, innovation, and creativity. In addition, Verzat *et al.* (2017) describe how an SDL approach leads to positive emotions and development of a proactive attitude. Moreover, Rasiah *et al.* (2019) discuss how SDL can cultivate an entrepreneurial mindset. Likewise, even in the context of homeschooling it has been shown – based on participant interviews, surveys, and document analysis – that SDL can foster the desire to become an entrepreneur (Pannone, 2017).

While this strand of studies refers to self-direction as a part of learning *for* entrepreneurship, they do not expressly cover SDL competence as *a part of* entrepreneurship and entrepreneurial competence, nor do they link SDL explicitly with adaptivity. Only a few studies go in this direction. The contribution by Tseng (2013) most clearly sees SDL as a component of successful entrepreneurship and hints at its importance for dealing with constant change. Tseng discusses that SDL is often broadly conceived as self-learning in which entrepreneurs have the primary responsibility for planning, performing, and evaluating their learning experiences and identifies that SDL is an approach in which entrepreneurs carry personal responsibility and collaboratively control cognitive (self-monitoring) and contextual (self-management) processes in constructing and confirming meaningful and worthwhile learning outcomes.

Placing greater weight on the notion of adaptivity under rapidly changing conditions, Soares *et al.* (2018) suggest that creativity, initiative, self-directedness, and problem solving are important skills for all students and that non-cognitive skills, such as teamwork and SDL, are key dimensions for a successful professional. Similarly, the studies by Sze-yeng and Hussain (2012) and by Rasiah *et al.* (2019) emphasize the importance of equipping students with a multitude of work-ready skills, including enhancing their innovative and self-directed capabilities in order to prepare them for their future workplace and for effectively dealing with

ill-structured life and work conditions. The contribution by Pluskwik *et al*. (2018) is arguably the one that stresses most clearly the importance of a learning capacity as a core component of entrepreneurial competence. In the author's account, an ability of performing SDL emerges as a meta-competence that allows for developing and refining other competences and skills, and that is thus crucial for individuals' adaptivity. In a similar vein, other contributions frame SDL as an ability of learning how to learn (Tseng, 2013; Young, 2017; Soares *et al.*, 2018) and they thus, too, see it as a meta-competence that is crucial for individuals' adaptivity.

3.2. Motivation for self-directed learning

What becomes clear from the review of the existing literature is that motivation for SDL is often stimulated through either problems that may occur through the entrepreneurial process (reactive) or consequentially from opportunities identified through interacting with an entrepreneurial experience (proactive). In particular, Young (2007) discusses that SDL typically occurs as entrepreneurs search for solutions to the problems they face and points out that most motives for entrepreneurs to engage in SDL will be reactive in nature, which might include reacting to environmental changes, self-development, organizational change, etc. Moreover, van Gelderen (2010) discusses the importance of considering self-determination theory and the notion that humans are innately motivated to learn and to develop as long as the social environment provides for the person's basic psychological needs: autonomy, competence, and relatedness.

Furthermore, Lindberg *et al.* (2017) point out that SDL, in the context of the supervision, was possible through feedback, and that reflection on success and failure was important in the process of identifying ways to improve. Thus, interactions with real-world entrepreneurial concrete experiences are potentially very important for providing a salient motive for commencement of entrepreneurs undertaking the process of SDL.

3.3. Pragmatic active experimentation enabling contextually rich concrete experiences

While the reviewed contributions were selected for their reference to SDL, it is striking that most of them place considerable emphasis on Kolb's (1984, 2015) experiential learning theory, upon which many of the courses of entrepreneurship education were also based. A common theme is that specific challenges or opportunities are identified through interaction with concrete and contextually rich entrepreneurial real-world experiences.

All in all, proactively testing ideas (abstract conceptualizations, as per the Kolb model) in real-world concrete entrepreneurial experience emerges as a vital part of entrepreneurial learning and entrepreneurial education. Many of the reviewed studies highlight that authentic experiential learning opportunities enable entrepreneurs to test their ideas against the real-world context, in an active, experiential, "learning by doing" process (e.g. Lindberg *et al.*, 2017; Pluskwik *et al.*, 2018; Rasiah *et al.*, 2019).

For instance, in the study by Lindberg *et al.* (2017), the authors describe a process-oriented pedagogical approach that resembles the experiential learning cycle by Kolb (1984). In this context, SDL is altogether mainly an additional element of learning besides experiential learning (cf. Wikoff and Carriere, 2012). Seikkula-Leino *et al.* (2015) furthermore identify that teachers may use a variety of pedagogical models and methods in entrepreneurship education, such as problem-based learning, experiential learning, and practical descriptions of situations. The study by Täks *et al.* (2014), in turn, sees entrepreneurship studies based on doing and experiencing as a first step for students toward performing SDL.

3.4. The importance of critical reflective observation in forming abstract conceptualizations

A fourth theme regards the importance of critical reflection in the process of entrepreneurial learning. For instance, Kakouris *et al.* (2014) state that reflection is the key-process for meaning-making and that entrepreneurial courses are usually driven by business plan tasks which mimic the way that entrepreneurs run their own firms. Similarly, the study by Gerhart *et al.* (2014) emphasizes that critical reflection forms an important component of entrepreneurial competence and exemplifies how it can be integrated into education for entrepreneurship. Täks *et al.* (2014) furthermore discuss that reflection and raised self-awareness in education for entrepreneurship seem to be necessary for moving toward SDL competence.

Finally, Pluskwik *et al.* (2018) come to an important overarching conclusion: that educational programmes designed to foster entrepreneurship should be based on continuous improvement through SDL; the motives for which might be stimulated by a critical reflective process upon problems or opportunities identified within real-world based entrepreneurial experiences. Following Kakouris *et al.* (2014), they suggest that undergoing such a process of critical reflection should not be seen as a solitary task. Rather, the authors highlight that peer-learning is very important in the reflection process in that, ideally, the discussion within the learners' group facilitates Socratic dialogue, enabling multiple points of views and opinions to be critically examined.

4. Linking self-directed and experiential learning in entrepreneurship

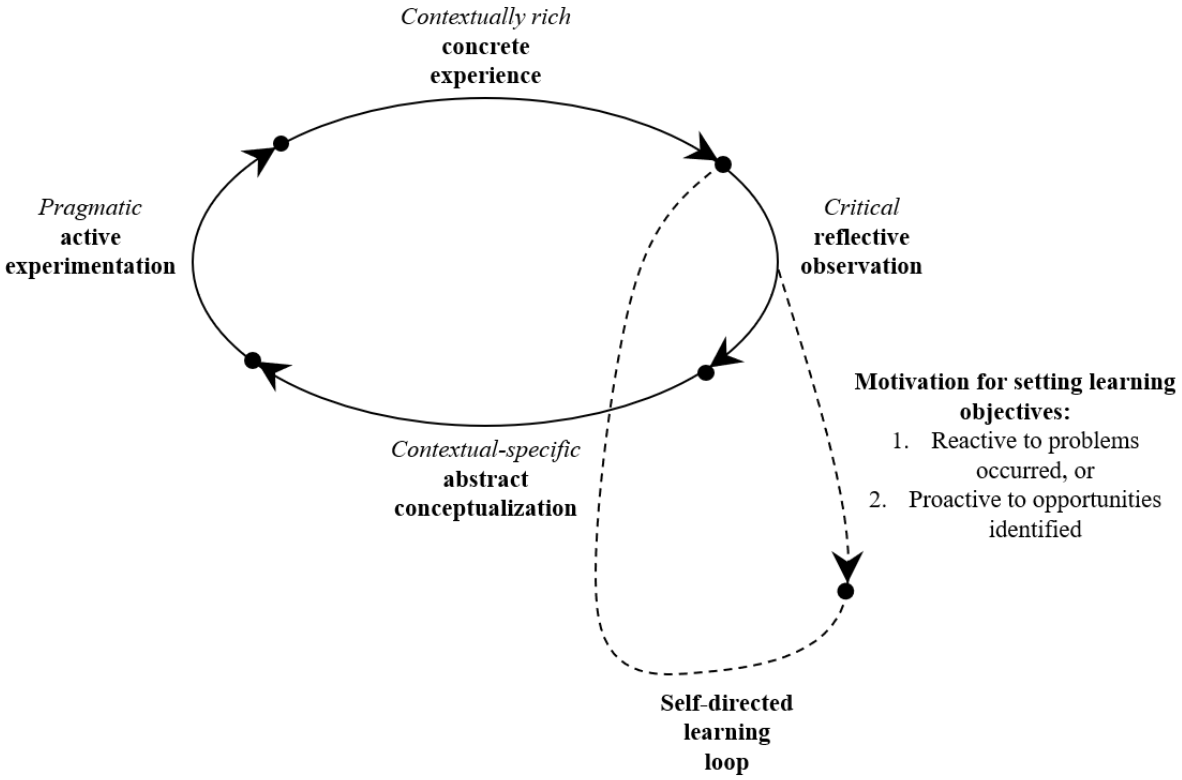
4.1 Self-directed and experiential learning as an interlocking process

A major lesson to be drawn from the preceding section is that the role of SDL in entrepreneurship has to be seen in conjunction with learning-by-doing. From the reviewed literature, it altogether transpires that even in contributions that have been selected for referring

to SDL, experiential learning takes center stage. Moreover, some studies have, on the one hand, pointed to the importance of SDL not just in learning *for* entrepreneurship, but rather see it as an essential part of entrepreneurial competence besides technical knowledge and skills – especially for becoming more adaptive. On the other hand, existing research has not spelled out how SDL combines with experiential learning specifically to foster the kind of adaptivity demanded of entrepreneurship, particularly under rapidly changing conditions.

In the following, we thus extend the existing literature by systematically linking SDL to experiential learning as a core element of entrepreneurship and entrepreneurial competence. Building on and integrating recent theoretical developments in self-directed and experiential learning literature (e.g. Bergsteiner and Avery, 2014; Miettinen, 2000; Morris, 2019b), the framework presented in Figure 2 establishes a connection between these two concepts that evinces the fundamental role of SDL for sustaining adaptivity in entrepreneurial activity.

Figure 2. Self-directed Experiential Learning Cycle



The larger cycle in the figure represents the experiential learning cycle in the form of an update (Morris, 2019b) of the Kolb model (1984, 2015). In this regard, pragmatic active experimentation involves "*testing* the fittingness of abstract conceptualizations formulated against new concrete experiences" (Morris, 2019b, p. 9, emphasis in original). For entrepreneurs, this may take the form of devising plans and strategies or decision taking. What is crucial for further learning from such experience is critical reflection: as the consideration of the specific present moment context conditions is necessary in order to formulate new fitting abstract conceptualizations (Morris, 2019b). It is at this stage of critical reflection where an important connection to SDL can be established. As we will argue in the following, this link follows two directions, with experiential learning catalyzing SDL, and SDL enhancing experiential learning in a way that fosters adaptivity.

With regard to the first connection, the process of critical reflection targeted in many of the entrepreneurial education programmes found in the reviewed contributions (e.g. Gerhart *et al.*, 2014; Kakouris *et al.*, 2014) can induce a motive for engaging in SDL. More specifically, as

discussed by Young (2007), the motive for SDL typically occurs as entrepreneurs search for solutions to the problems they face or to make plans for the opportunities they identify. Thus, the process of critical reflection may lead to identification of problems or opportunities (reactive or proactive, respectively). A likely outcome of this process – as per the self-determination theory of motivation – is "volitional, high-quality motivation" which is "energized directly by […] needs, values, and interest" (Rigby and Ryan, 2018, p. 136). In sum, through critical reflection on concrete entrepreneurial experiences, the process of identification of problems or opportunities is very likely to be a potent driver of SDL – to the degree that entrepreneurs are capable of doing so.

This SDL loop in Figure 2, in turn, is connected in a further second important way to the experiential learning process as it orients this process towards adaptiveness. Engaging in the SDL loop serves to take a reflective stance toward the overall learning process and to potentially re-orient its direction. Before devising new plans for action (abstract conceptualization) and engaging in active experimentation, SDL serves to identify and address a possible need for further information, knowledge or skill development. In doing so, it contributes to opening up new paths for development.

This makes SDL competence a crucial asset in the context of entrepreneurship, which is held to require a reflection of the entrepreneur's strengths and limitations (Joiner, 2018) – and which is exactly what the process of SDL entails. More importantly even, adaptiveness in entrepreneurial activity has been stated to involve processes of envisioning new options and scenarios that allow for revisiting and possible diverging from current practices. This is expected to lead to greater resilience as it allows not only for avoiding forms of lock-in, i.e. sticking to inadequate strategies and practices (cf. Hülsmann *et al.*, 2017, p. 83), but also adapting to changes already through anticipation (Holbeche, 2018; Tsoukas, 2018).

Put simply, experiential learning running along the lines of established practices will often deliver inadequate results: without engaging in the SDL loop, experiential learning risks running in the wrong direction and entrepreneurs will not be able to plan effectively and make the most from opportunities that may present themselves. The kind of attentiveness that SDL fosters can generally enable entrepreneurs to detect relevant changes in the environment. This is central for the agility and adaptiveness needed in entrepreneurship as existing practices will hardly be suitable when environmental conditions change (Markides *et al.*, 2018).

All in all, the framework depicted in Figure 2 points to the importance of entrepreneurs competently undertaking SDL in order to enable adaptive solutions to problems, and to devise fitting plans for opportunities identified through the process of interacting with entrepreneurial experience (cf. Reeves *et al.*, 2019). This makes SDL competence crucial for entrepreneurs to proactively adapt to the environment and to deal with uncertainty and change. Moreover, as a need for adaptivity becomes more widely important throughout society, a competence to engage in SDL, we will argue in the following section, gains importance beyond the scope of business leaders and entrepreneurs in a narrow sense.

4.2 The importance of self-directed and experiential learning in the digital age

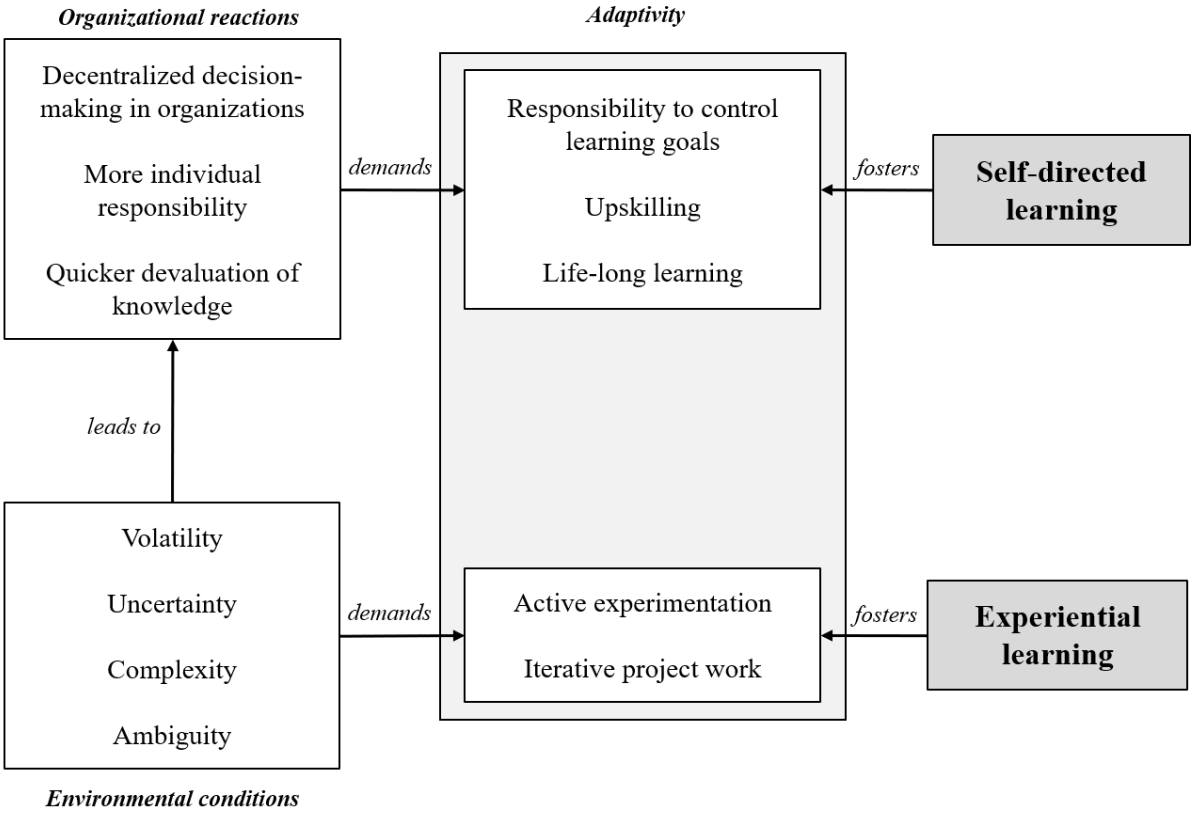
At the outset, we began with the diagnosis that in view of constantly and rapidly changing conditions entrepreneurship requires a fundamental learning competence and ability to adapt. The preceding section has argued that SDL competence lends direction to experiential learning and sustains a kind of adaptivity that is generally important for entrepreneurship. Based on these considerations, we can now turn to discussing why SDL in combination with experiential learning become especially important vis-à-vis the increasing volatility, uncertainty, complexity, and ambiguity characterizing information societies.

An important driver behind this broader trend are developments subsumed under the term digital transformation. Advances in digital technologies have increased the range of business models and raised the pace of innovation processes, often leading to disruptive changes in various markets and industries (Lambin, 2014; Teece, 2012). These developments engender far-reaching organizational changes as a reaction to increased adaptivity requirements. A lot of ink has been spilled on how the conditions of a business environment marked by high volatility, uncertainty, complexity, and ambiguity translate into a need for businesses to adapt in terms of their organizations as well as their culture (Mack, 2016). These conditions, it is held, imply that business strategies and projects have to be updated more frequently and quickly, which increases the importance of experimentation and learning quickly from own experiences through trial and error. An important imperative in that context is that of "failing fast and cheap" – a credo that lends additional weight to the notion that learning-by-doing is tightly associated with entrepreneurship and developing entrepreneurial competence (cf. Hägg and Kurczewska, 2019). Importantly, the ability to innovate and adapt is premised on the entire organization being imbued with a culture that emphasizes such an experiential learning. This means that greater scope for experimenting, taking risks, and learning-by-doing, concerns not only those in leading positions and entrepreneurs in a narrow sense, but also employees who similarly need to be able to engage in more agile, iterative, and flexible project work in order to meet the demands of higher uncertainty and complexity (Breu *et al.*, 2002).

Indeed, the idea of creating a learning culture in business organizations that emphasizes daring to make mistakes and learning from them has gained considerable traction in the management literature. However, such experiential learning by itself does not amount to an ability to regulate an ongoing learning process and remains insufficient to sustain the kind of adaptivity needed in agile organizations. Rather, SDL is additionally needed to meet increasing adaptivity

requirements. This important role of SDL is summed up in Figure 3 and will be elaborated upon in the following.

Figure 3. How self-directed learning complements experiential learning for entrepreneurs in an environment marked by rapidly changing conditions



A competence of engaging in SDL becomes more important, first, to the extent that there is a greater decentralization of responsibility in contributing to an overall learning organization. A common theme in the literature on business and entrepreneurship is that in the digital age companies need to not just adapt to new conditions but establish a capacity for constantly adapting (e.g. Holbeche, 2015; Westerman *et al*., 2014). In this respect, it is argued that business organizations need to become agile, which entails not just more readiness to change but also being able to identify and reflect on appropriate change, in party already through its anticipation (Prange and Heracleous, 2018). In order to achieve this, scholars and practitioners argue that businesses have to become more agile specifically through a greater decentralization of their organizations and decision processes (e.g. Diefenbach and Deelmann, 2016). In agile organizations teams are given more leeway to make their own decisions. As organizations become more horizontal and fluid and responsibility becomes more widely spread, employees

need to become more entrepreneurial themselves and to engage in proactive learning to reevaluate the way things are done.

At the same time, second, more rapidly changing conditions also affect the role of knowledge and skills as these become devaluated more quickly in the digital age. Consequently, employees and entrepreneurs alike need to more frequently engage in training and re-training as part of their job. In a larger perspective, they need to take more control over their own development in the long term and undertake learning for re- or upskilling in order to constantly meet changing demands in their organization and business environment. Indeed, political as much as economic elites have emphasized the importance of further education in the digital age. And various larger companies have made great efforts in establishing their own programmes for continuous education and upskilling of their employees. Beyond their current working contexts, individuals more generally are required to become more self-reliant in conducting lifelong learning: to re-train and re-orient themselves vis à vis changes or breaks in their career paths and in order to meet new demands in terms of skills and knowledge (Day, 2020).

Altogether, one can conclude that the organizational changes described above require individuals throughout business organizations to take more responsibility while becoming more proactive. They need to show a general ability to adapt to changing circumstances and regulate their own development as part of flexible and learning organizations. These conditions make SDL competence a crucial asset as it equips individuals with what they need to meet enhanced adaptivity requirements – and to accommodate organizational changes in reaction to a more volatile business environment.

5. Conclusion

Policy makers in various countries have called for fostering an entrepreneurial spirit in the digital age. They see it as a key to unlocking the opportunities that the digital transformation

holds but also as an important orientation in an economic environment that is marked by heightened volatility, uncertainty, complexity, and ambiguity. However, being able to accommodate rapidly-changing conditions is not merely a question of a certain entrepreneurial mindset, acquiring specific skills or engaging in more learning-by-doing. Rather, as these conditions require a general ability to constantly adapt, individuals need to count on a corresponding learning competence that enables them to autonomously and proactively engage and re-engage in learning processes.

The present paper has thus dealt with the question what kind of learning competence is needed to furnish entrepreneurship with the kind of adaptivity needed to cope with continuously and rapidly changing conditions. Based on a description of SDL competence as generally supporting adaptivity, we have examined the role that such a competence plays in entrepreneurship. Our review of the literature has shown that, even in contributions which refer to SDL in the context of entrepreneurship, experiential learning takes center-stage. At the same time, existing research has not systematically linked SDL to experiential learning in the context of entrepreneurship, nor does it encompass more recent knowledge about experiential learning. We have addressed this shortcoming by linking the state of the art in education research to the entrepreneurship literature and thereby discussed why SDL competence is central to entrepreneurship and entrepreneurial competence.

The framework formulated above shows how SDL complements experiential learning in entrepreneurship to support a high degree of adaptiveness in entrepreneurial activity. The key role of SDL lies in enabling individuals to regulate their learning process, re-orient themselves, and acquire new knowledge and skills as needed. Specifically, SDL competence enhances the ability to critically reflect on concrete experiences and thereby serves to modulate the direction of experiential learning as a part of entrepreneurship. SDL competence supports ongoing development of the entrepreneur through aiding in the identification of relevant changes in the

environment as well as the management of new demands in terms of knowledge and skills. Importantly, without SDL competence learning-by-doing lacks the orientation that can guide it to new strategies and practices, thereby anticipating failing strategies and avoiding lock-in. At the same time, experiential learning can provide the motivational basis for SDL: what drives this motivation is identification of problems or opportunities when entrepreneurs are exposed to real-world concrete entrepreneurial experiences.

All in all, SDL competence forms a fundamental element in entrepreneurship that is geared towards the kind of adaptivity needed particularly in times of change and uncertainty. It thus qualifies as an important source of resilience: preparing individuals to meet with the demands of sudden changes in their environment. The recent COVID-19 crisis has made palpable what it means if the parameters of peoples' existences are rapidly changed and familiar habits no longer serve their purpose. A strong ability to adapt based on SDL competence can prepare individuals to deal with such incisive changes and changing demands. And this goes particularly for entrepreneurs who may have to devise new ways to cope with changed circumstances after an exogenous shock – as are many who are using digital means to try to deal with the various challenges of the COVID-19 crisis.

Being able to engage in SDL as an element of an encompassing entrepreneurial competence also gains wider importance in the context of digital change due to organizational changes occurring in reaction to a more long-term development toward a more dynamic and rapidly changing environment. The increasing decentralization of responsibility in more horizontal and fluid organizations and a greater need for frequent re- and upskilling altogether imply that individuals throughout business organizations will in large part have to become more entrepreneurial. Under these conditions, SDL competence is important for properly equipping them to meet heightened adaptivity requirements in a more complex and volatile working life and business environments.

Through stressing this central role of SDL competence in entrepreneurship, the framework developed above has important practical implications. Specifically, it points to aspects which are critical for preparing future entrepreneurs for adaptivity and thus indicates what needs to be emphasized in entrepreneurial learning for that end. Trainees would need to learn how to regularly engage in SDL based on critical reflection on prevailing business practices by identifying and anticipating challenges and opportunities. This would then be followed by learning projects (cf. Tough, 1971), in which individuals proactively strive to close knowledge and/or skill gaps in order to meet the demands of challenges they face or in order to capitalize on novel opportunities, due to changing contextual conditions. With the ongoing digital transformation and rapid change in contextual conditions (e.g. the COVID-19 crisis), regularly undertaking SDL appears fundamental for entrepreneurs. Such occasions for change could be addressed in entrepreneurship education in ways expressly designed to foster SDL competence.

Taking the example of a farmer (experienced, inexperienced, or trainee entrepreneur; cf. also Figure 2), through *critical reflective observation* on the present context of declining business and profit (*contextual-specific concrete experience*), she or he may identify that digital media would allow for establishing more direct relations with customers in ways that can sustainably and profitably change distribution channels (formation of a *contextual-specific abstract conceptualization*). In order to capitalize on this opportunity, for example, the farmer may have to proactively learn how to effectively manage a new website. If the farmer is not competent to do so then she or he would seemingly benefit from undertaking a learning project (enter a *self-directed learning loop*) with the objective of learning how to effectively manage the new website. In the process, the entrepreneur may choose to undertake formal, non-formal or/and informal learning (cf. Council of Europe, 2020, for definitions) in order to fill this knowledge and skill gap before actively trying out (*pragmatic active experimentation*) their new distribution channels. Further critical reflective observation on the practical implementation of

the new distribution channels will enable the farmer to make a judgment on its relative success or failure: which may then or over time need refinement and change – as the entrepreneur enters another Self-directed Experiential Learning Cycle (Figure 2) – enabling a spiral in personal and business development. Similarly, other small businesses may find ways to partly reinvent themselves using new digital means – as necessitated in the COVID-19 crisis.

Importantly, changing the ways of doing business will demand an identification of learning needs and adequate resources as a part of SDL. In entrepreneurship education this process could be supported and eased through adequate mentoring. As performing SDL projects can be very demanding, it also seems essential to provide individuals with strong incentives to autonomously engage in this process. These incentives could result from educational opportunities, such as business games, which involve practical problem-solving and real stakes. Furthermore, the experience that SDL pays off in such a context can reward individuals and motivate them to re-engage in SDL projects in the future. In this way, individuals can be trained to navigate the interlocking processes of experiential and self-directed learning that together sustain adaptivity.

These insights gain special importance in view of current policy initiatives that aim at fostering re- and upskilling through further education and lifelong learning. Taking the importance of SDL for adaptivity and entrepreneurial competence seriously means going beyond merely adapting individuals to given skill requirements; and it means to employ SDL not just as a method to train them *for* entrepreneurship. Rather, individuals would need to be enabled to develop a competence of engaging in SDL. In other words, they would need to be equipped with a learning capacity that is crucial for adaptivity and dealing with uncertainty and changing demands. One cannot simply demand lifelong learning of individuals just as one cannot expect them to simply and competently put SDL into practice once it is needed. Rather, individuals must have developed this competence at some point.

The preceding considerations thus have important consequences for policy making and practical implications for entrepreneurship education. Strengthening further education and lifelong learning are without doubt important in view of a more rapid devaluation of skills and knowledge. Yet this would have to be complemented with a strengthening of an education – possibly already at an early age – that is designed to foster SDL competence. In any case, educational programmes aimed at fostering such a competence have to place greater emphasis on providing individuals with opportunities to take responsibility for their learning process and to critically reflect on learning needs and goals.

References

Alharbi, H.A. (2018), "Readiness for self-directed learning: how bridging and traditional nursing students differs?", *Nurse Education Today*, Vol. 61 No. 1, pp.231-234. https://doi.org/10.1016/j.nedt.2017.12.002

Beckers, J., Dolmans, D.H., Knapen, M.M. and van Merriënboer, J.J. (2018), "Walking the tightrope with an e-portfolio: imbalance between support and autonomy hampers self-directed learning", *Journal of Vocational Education & Training*, Vol. 71 No. 2, pp.260-288. https://doi.org/10.1080/13636820.2018.1481448

Bergsteiner, H. and Avery, G.C. (2014), "The twin-cycle experiential learning model: reconceptualising Kolb's theory", *Studies in Continuing Education*, Vol. 36 No. 3, pp.257-274. https://doi.org/10.1080/0158037X.2014.904782

Boyer, S.L., Edmondson, D.R., Artis, A.B. and Fleming, D. (2014), "Self-directed learning: a tool for lifelong learning", *Journal of Marketing Education*, Vol. 36 No. 1, pp.20-32. https://doi.org/10.1177/0273475313494010

Braun, V. and Clarke, V. (2006), "Using thematic analysis in psychology", *Qualitative Research in Psychology*, Vol. 3 No. 2, pp.77-101. https://doi.org/10.1191/1478088706qp063oa

Breu, K., Hemingway, C.J., Strathern, M. and Bridger, D. (2002), "Workforce agility: the new employee strategy for the knowledge economy", *Journal of Information Technology*, Vol. 17 No. 1, pp.21-31. https://doi.org/10.1080/02683960110132070

Brison, K.J. (2016), "Teaching neoliberal emotions through Christian pedagogies in Fijian kindergartens", *Ethos*, Vol. 44 No. 2, pp.133-149. https://doi.org/10.1111/etho.12115

Byrne, J., Fayolle, A. and Toutain, O. (2014), "Entrepreneurship education: what we know and what we need to know", in Chell, E., & Karataş-Özkan, M. (Ed.s), *Handbook of*

Research on Small Business and Entrepreneurship, Edward Elgar Publishing, Cheltenham, pp.261-288.

Cope, J. (2005), "Toward a dynamic learning perspective of entrepreneurship", *Entrepreneurship Theory and Practice*, Vol. 29 No. 4, pp.373-397. https://doi.org/10.1111/j.1540-6520.2005.00090.x

Council of Europe (2020), "*Key terms: formal, non-formal and informal learning*", available at https://www.coe.int/en/web/lang-migrants/formal-non-formal-and-informal-learning (accessed August 13, 2020).

Day, A. (2020), *Disruption, Change and Transformation in Organisations: A Human Relations Perspective*, Routledge, London.

De Meuse, K.P., Dai, G. and Hallenbeck, G.S. (2010), "Learning agility: a construct whose time has come", *Consulting Psychology Journal: Practice and Research*, Vol. 62 No. 2, pp.119-130. https://doi:10.1037/a0019988

Diefenbach, S. and Deelmann, T. (2016), "Organizational approaches to answer a VUCA world", in Mack, O., Khare, A., Krämer, A., & Burgartz, T. (Ed.s), *Managing in a VUCA World*, Springer International Publishing, Cham, pp.197-208. https://doi.org/10.1007/978-3-319-16889-0_13

Finkle, T.A. and Olsen, T. (2019), "Entrepreneurship in the digital era: creating your own online business", *Entrepreneurship Education and Pedagogy*, Vol. 2 No. 2, pp.133-150. https://doi.org/10.1177/2515127418820680

Gerhart, A.L., Carpenter, D.D., Fletcher, R.W. and Meyer, E.G. (2014), "Combining discipline-specific introduction to engineering courses into a single multi-discipline course to foster the entrepreneurial mindset with entrepreneurially minded learning", *ASEE Annual Conference and Exposition, Conference Proceedings*, American Society for

Engineering Education, Indianapolis, IN, pp.1-30. https://doi.org/10.13140/2.1.3486.4002

Hägg, G. and Kurczewska, A. (2019), "Toward a learning philosophy based on experience in entrepreneurship education", *Entrepreneurship Education and Pedagogy*. Advance online publication, available at https://doi.org/10.1177/2515127419840607 (accessed August 20, 2020).

Haynie, J.M., Shepherd, D.A. and Patzelt, H. (2012), "Cognitive Adaptability and an Entrepreneurial Task: The Role of Metacognitive Ability and Feedback", *Entrepreneurship Theory and Practice*, Vol. 36 No. 2, pp.237-265. https://doi.org/10.1111/j.1540-6520.2010.00410.x

Hofman, R.R., Ward, P., Feltovich, P.J., DiBello, L., Fiore, S.M. and Andrews, D. (2014), *Accelerated Expertise: Training for High Proficiency in a Complex World*, Psychology Press, New York, NY.

Holbeche, L. (2018), *The Agile Organization: How to Build an Engaged, Innovative and Resilient Business, 2nd ed.*, Kogan Page Ltd., New York, NY.

Hülsmann, M., Tilebein, M., Cordes, P. and Stolarski, V. (2017), "Cognitive diversity of top management teams as a competence-based driver of innovation capability", in Pfeffermann, N., & Gould, J. (Ed.s), *Strategy and Communication for Innovation,* Springer International Publishing, Cham, pp.77-88.

Joiner, B. (2018), "Leadership agility for strategic agility", in Prange, C., & Heracleous, L. (Ed.s), *Agility X: How Organizations Thrive in Unpredictable Times*, Cambridge University Press, Cambridge, UK, pp.17-31.

Kakouris, A., Tampouri, S. and Moustakali, V. (2014), "Possibilities for peer, online learning in entrepreneurship: the case of TeleCC platform", in Galbraith, B. (Ed.), *Abstract of*

papers: Presenter at the 9th European Conference in Innovation and Entrepreneurship: ECIE 2014, Academic Conferences and Publishing International, Reading, pp.268-275.

Kirwan, J.R., Lounsbury, J.W. and Gibson, L.W. (2014), "An examination of learner self-direction in relation to the big five and narrow personality traits", *SAGE Open*, Vol. 4 No. 2, pp.1-14. https://doi.org/10.1177/2158244014534857

Knowles, M.S. (1975), *Self-directed Learning: A Guide for Learners and Teachers*, Follett, Chicago, IL.

Kolb, D.A. (1984), *Experiential Learning: Experience as the Source of Learning and Development*, Prentice-Hall, Englewood Cliffs, NJ.

Kolb, D.A. (2015), *Experiential Learning: Experience as the Source of Learning and Development*, Pearson, Upper Saddle River, NJ.

Kranzow, J. and Hyland, N. (2016), "Self-directed learning: developing readiness in graduate students", *International Journal of Self-Directed Learning*, Vol. 13 No. 2, pp.1-14.

Kreiser, P.M. (2011), "Entrepreneurial orientation and organizational learning: the impact of network range and network closure", *Entrepreneurship Theory and Practice*, Vol. 35 No. 5, pp.1025-1050. https://doi.org/10.1111/j.1540-6520.2011.00449.x

Lackéus, M. (2015), *Entrepreneurship in Education. What, Why, When, How*, OECD, Paris.

Lambin, J.-J. (2014), *Rethinking the Market Economy: New Challenges, New Ideas, New Opportunities*, Palgrave Macmillan, London.

Lee, S.M., Lim, S. and Pathak, R.D. (2011), "Culture and entrepreneurial orientation: a multi-country study", *International Entrepreneurship and Management Journal*, Vol. 7 No. 1, pp.1-15. https://doi.org/10.1007/s11365-009-0117-4

Lee, M.J.W., Nikolic, S. and Ritz, C.H. (2017), "Supporting the conceptualization of student innovation projects through peer and expert feedback on virtual pitches", in Ferris, S.P., & Wilder, H. (Ed.s), *Unplugging the Classroom,* Elsevier, New York, NY, pp.119-135. https://doi.org/10.1016/B978-0-08-102035-7.00009-6

Lindberg, E., Bohman, H., Hulten, P. and Wilson, T. (2017), "Enhancing students' entrepreneurial mindset: a Swedish experience", *Education + Training,* Vol. 59 No. 7/8, pp.768-779. https://doi.org/10.1108/ET-09-2016-0140

Liguori, E., Winkler, C., Winkel, D., Marvel, M.R., Keels, J.K., van Gelderen, M. and Noyes, E. (2018), "The entrepreneurship education imperative: introducing EE&P", *Entrepreneurship Education and Pedagogy,* Vol. 1 No. 1, pp.5-7. https://doi.org/10.1177/2515127417737290

Mack, O. (Ed.) (2016), *Managing in a VUCA World,* Springer International Publishing, Cham.

Markides, C., Oyon, D. and Schnegg, M. (2018), "Using management control systems to support agility", in Prange, C., & Heracleous, L. (Ed.s), *Agility X: How Organizations Thrive in Unpredictable Times*, Cambridge University Press, Cambridge, UK, pp.85-98.

Merriam, S.B., Caffarella, R.S. and Baumgartner, L.M. (2020), *Learning in Adulthood: A Comprehensive Guide,* Jossey-Bass, San Francisco, CA.

Merriam, S.B. (2018), "Adult learning theory: evolution and future directions", in Illeris, K. (Ed.), *Contemporary Theories of Learning,* Routledge, New York, NY, pp.83-96.

Miettinen, R. (2000), "The concept of experiential learning and John Dewey's theory of reflective thought and action", *International Journal of Lifelong Education,* Vol. 19 No. 1, pp.54-72. https://doi.org/10.1080/026013700293458

Miller, D. (2011), "Miller (1983) revisited: a reflection on EO research and some suggestions for the future", *Entrepreneurship Theory and Practice*, Vol. 35 No. 5, pp.873-894. https://doi.org/10.1111/j.1540-6520.2011.00457.x

Morris, T.H. (2019a), "Adaptivity through self-directed learning to meet the challenges of our ever-changing world", *Adult Learning*, Vol. 30 No. 2, pp.56-66. https://doi.org/10.1177/1045159518814486

Morris, T.H. (2019b), "Experiential learning – a systematic review and revision of Kolb's model", *Interactive Learning Environments.* Advance online publication, available at https://doi.org/10.1080/10494820.2019.1570279 (accessed August 20, 2020)

Morris, T.H. (2019c), "Self-directed learning: a fundamental competence in a rapidly changing world", *International Review of Education*, Vol. 65 No. 4, pp.633-653. https://doi.org/10.1007/s11159-019-09793-2

Morrison, D. and Premkumar, K. (2014), "Practical strategies to promote self-directed learning in the medical curriculum", *International Journal of Self-Directed Learning*, Vol. 11 No. 1, pp.1-12.

Olson, P., and Wood, A. (2018), "*France's big pivot*", available at https://www.forbes.com/feature/france-macron-station-f-entrepreneurship/#48a0a4d9573a (accessed August 20, 2020).

Pannone, S.J. (2017), "The influence of homeschooling on entrepreneurial activities: a collective case study", *Education + Training*, Vol. 59 No. 7/8, pp.706-719. https://doi.org/10.1108/ET-05-2016-0091

Pluskwik, E., Leung, E. and Lillesve, A. (2018), "Growing entrepreneurial mindset in interdisciplinary student engineers: experiences of a project-based engineering program

presented at multidisciplinary engineering programs", *2018 ASEE Annual Conference & Exposition*, ASEE, Salt Lake City, Utah, pp.1-19.

Prange, C. and Heracleous, L.T. (2018), "Introduction", in Prange, C., & Heracleous, L.T. (Ed.s), *Agility X: How Organizations Thrive in Unpredictable Times*, Cambridge University Press, Cambridge, UK, pp.1-16.

Rasiah, R., Somasundram, S. and Lee, K.P.L. (2019), "Entrepreneurship in education: innovations in higher education to promote experiential learning and develop future ready entrepreneurial graduates", *Journal of Engineering Science and Technology*, Vol. 14 No. 1, pp.99-110.

Reeves, P.M., Zappe, S.E. and Follmer, D.J. (2019), "A comparison of the types of problems encountered by entrepreneurial students and successful professional entrepreneurs", *Entrepreneurship Education and Pedagogy*, Vol. 2 No. 3, pp.214-244. https://doi.org/10.1177/2515127419829396

Rigby, C.S. and Ryan, R.M. (2018), "Self-determination theory in human resource development: new directions and practical considerations", *Advances in Developing Human Resources*, Vol. 20 No. 2, pp.133-147. https://doi.org/10.1177/1523422318756954

Samwel Mwasalwiba, E. (2010), "Entrepreneurship education: a review of its objectives, teaching methods and impact indicators", *Education + Training*, Vol. 52 No. 1, pp.20-47. https://doi.org/10.1108/00400911011017663

Sawatsky, A.P., Ratelle, J.T., Bonnes, S.L., Egginton, J.S. and Beckman, T.J. (2017), "A model of self-directed learning in internal medicine residency: a qualitative study using grounded theory", *BMC Medical Education*, Vol. 17 No. 31, pp.1-9. https://doi.org/10.1186/s12909-017-0869-4

Seikkula-Leino, J., Satuvuori, T., Ruskovaara, E. and Hannula, H. (2015), "How do Finnish teacher educators implement entrepreneurship education?", *Education + Training*, Vol. 57 No. 4, pp.392-404. https://doi.org/10.1108/ET-03-2013-0029

Schoonmaker, M., Gettens, R. and Vallee, G. (2019), "Building the entrepreneurial mind-set through cross-functional innovation teams", *Entrepreneurship Education and Pedagogy*, Vol. 3 No. 1, pp.41-59. https://doi.org/10.1177/2515127419866429

Sherehiy, B., Karwowski, W., and Layer, J.K. (2007), "A review of enterprise agility: concepts, frameworks and attributes", *International Journal of Industrial Ergonomics*, Vol. 37 No. 5, pp.445-460. https://doi.org/10.1016/j.ergon.2007.01.007

Slater, C.E., Cusick, A. and Louie, J.C. (2017), "Explaining variance in self-directed learning readiness of first year students in health professional programs", *BMC Medical Education*, Vol. 17 No. 1, pp.1-10. https://doi.org/10.1186/s12909-017-1043-8

Soares, L., Miranda, F., Hashimoto, and Ayres, M. (2018), "Disassembling computer engineering education", *International Symposium on Project Approaches in Engineering Education*, University of Brasília, Brasília, Brazil, pp.360-368.

Sze-yeng, F. and Hussain, R.M.R. (2012), "Graduate entrepreneur training by design (GET by Design): an innovative and self-directed approach to instructional design and development", in Baskan, G.A. (Ed.), *4th World Conference on Educational Sciences (WCES-2012)*, Elsevier Procedia, New York, NY, pp.3541-3545.

Täks, M., Tynjälä, P., Toding, M., Kukemelk, H. and Venesaar, U. (2014), "Engineering students' experiences in studying entrepreneurship: students' experiences in studying entrepreneurship", *Journal of Engineering Education*, Vol. 103 No. 4, pp.573-598. https://doi.org/10.1002/jee.20056

Teece, D.J. (2012), "Next-generation competition: new concepts for understanding how innovation shapes competition and policy in the digital economy", *Journal of Law, Economics and Policy*, Vol. 9 No. 1, pp.97-118.

Tough, A.M. (1971), *The Adults' Learning Projects: A Fresh Approach to Theory and Practice in Adult Education*, Ontario Institute for Studies in Education, Ontario.

Tseng, C. (2013), "Connecting self-directed learning with entrepreneurial learning to entrepreneurial performance", *International Journal of Entrepreneurial Behavior & Research*, Vol. 19 No. 4, pp.425-446. https://doi.org/10.1108/IJEBR-08-2011-0086

Tsoukas, H. (2018), "From agility to antifragility: coping with the unknowable", in Prange, C., & Heracleous, L. (Ed.s), *Agility X: How Organizations Thrive in Unpredictable Times*, Cambridge University Press, Cambridge, UK, pp.43-53.

Ustav, S. and Venesaar, U. (2018), "Bridging metacompetencies and entrepreneurship education", *Education + Training*, Vol. 60 No. 7/8, pp.674-695. https://doi.org/10.1108/ET-08-2017-0117

van Gelderen, M. (2010), "Autonomy as the guiding aim of entrepreneurship education", *Education + Training*, Vol. 52 No. 8/9, pp.710-721. https://doi.org/10.1108/00400911011089006

Verzat, C., O'Shea, N. and Jore, M. (2017), "Teaching proactivity in the entrepreneurial classroom", *Entrepreneurship & Regional Development*, Vol. 29 No. 9/10, pp.975-1013. https://doi.org/10.1080/08985626.2017.1376515

Wang, C.L. (2008), "Entrepreneurial orientation, learning orientation and firm performance", *Entrepreneurship Theory and Practice*, Vol. 32 No. 4, pp.635-657. https://doi.org/10.1111/j.1540-6520.2008.00246.x

Ward, P., Gore, J., Hutton, R., Conway, G.E. and Hofman, R.R. (2018), "Adaptive skill as the conditio sine qua non of expertise", *Journal of Applied Research in Memory and Cognition*, Vol. 7 No. 1, pp.35-50. https://doi.org/10.1016/j.jarmac.2018.01.009

WEF (2009), *Educating the next wave of entrepreneurs. Unlocking entrepreneurial capabilities to meet the global challenges of the 21st Century*, World Economic Forum, Geneva.

Westerman, G., Bonnet, D. and McAfee, A. (2014), *Leading Digital: Turning Technology into Business Transformation*, Harvard Business Review Press, Boston.

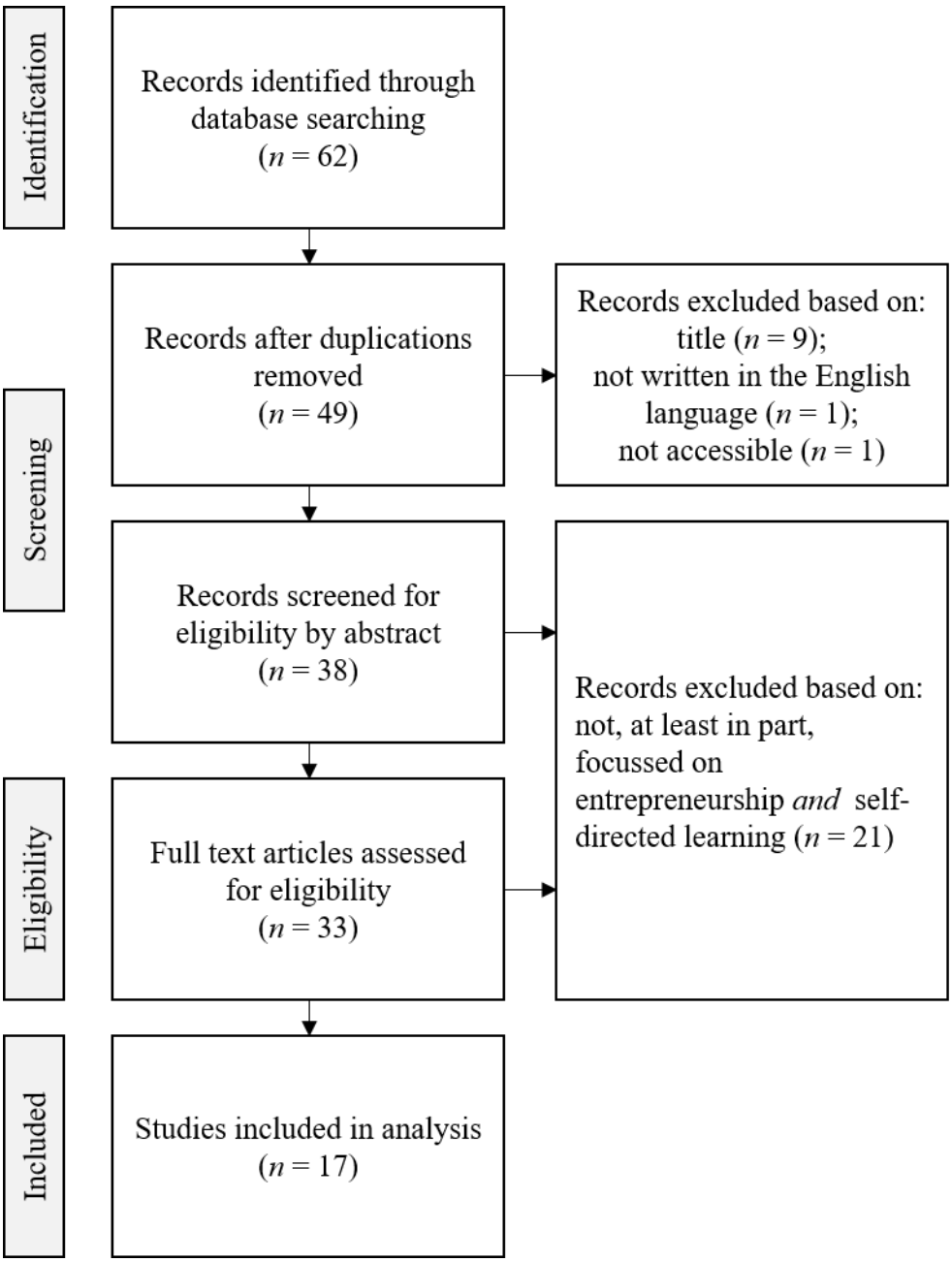
Wiklund, J., and Shepherd, D. (2005), "Entrepreneurial orientation and small business performance: a configurational approach", *Journal of Business Venturing*, Vol. 20 No. 1, pp.71-91. https://doi.org/10.1016/j.jbusvent.2004.01.001

Wikoff, K.H. and Carriere, M.H. (2012), "Integrating entrepreneurship and innovation into an engineering curriculum through service learning and the liberal arts", *ASEE Annual Conference and Exposition, Conference Proceedings*, American Society for Engineering Education, San Antonio, Texas, pp.1-14.

Witt, H.-J., Alabart, J.R., Giralt, F., Herrero, J., Vernis, L. and Medir, M. (2006), "A competency-based educational model in a chemical engineering school", *International Journal of Engineering Education*, Vol. 22 No. 2, pp.218-235.

Young, J.E. (2007), "Entrepreneurial learning and Deepak Chopra's seven spiritual laws of success", *Journal of Human Values*, Vol. 13 No. 1, pp.13-22. https://doi.org/10.1177/097168580601300103

Annex I: Selection of relevant articles for systematic review



Annex II: List of reviewed contributions

Contribution	Year	Journal/Book	Type of contribution	Role of Self-directed learning
Brison, K.J. (2016), "Teaching neoliberal emotions through Christian pedagogies in Fijian kindergartens", Ethos, Vol. 44 No. 2, pp.133-149. https://doi.org/10.1111/etho.12115	2016	*Ethos*	Case study of Fijian kindergarten using Accelerated Christian Education	Ability to reflect upon emotions is important for developing skills that allow individuals to be self-directed and risk-taking entrepreneurs.
Gerhart, A.L., Carpenter, D.D., Fletcher, R.W. and Meyer, E.G. (2014), "Combining discipline-specific introduction to engineering courses into a single multi-discipline course to foster the entrepreneurial mindset with entrepreneurially minded learning", ASEE Annual Conference and Exposition, Conference Proceedings, American Society for Engineering Education, Indianapolis, IN, pp.1-30. https://doi.org/10.13140/2.1.3486.4002	2014	*ASEE Annual Conference and Exposition, Conference Proceedings*	Evaluation of teaching concept	Achieving an ability of self-directed learning is one of the core objectives of the evaluated courses. Self-directed learning is seen as being strongly tied to an entrepreneurial mindset.
Kakouris, A., Tampouri, S. and Moustakali, V. (2014), "Possibilities for peer, online learning in entrepreneurship: the case of TeleCC platform", in Galbraith, B. (Ed.), Abstract of papers: Presenter at the 9th European Conference in Innovation and Entrepreneurship: ECIE 2014, Academic Conferences and Publishing International, Reading, pp.268-275.	2014	*Abstract of papers: Presenter at the 9th European Conference in Innovation and Entrepreneurship: ECIE 2014*	Presentation and evaluation of an online platform for career counseling designed to facilitate critical reflection in learning processes	Emphasis on informal learning settings in which individuals take responsibility for their learning objectives. The reflection involved in self-directed learning counts as crucial for autonomous learning about entrepreneurship. Self-directed learning is expected to foster an entrepreneurial attitude and to trigger higher-level learning. The social context is important in supporting the reflection process that marks self-directed learning.
Lee, M.J.W., Nikolic, S. and Ritz, C.H. (2017), "Supporting the conceptualization of student innovation projects through peer and expert feedback on virtual pitches", in Ferris, S.P., & Wilder, H. (Ed.s), Unplugging the Classroom, Elsevier, New York, NY, pp.119-135. https://doi.org/10.1016/B978-0-08-102035-7.00009-6	2017	*Unplugging the Classroom*	Presentation of a virtual environment designed to provide peer and expert advice/feedback for engineering students	Gathering peer and expert feedback to refine and to pitch student ideas under conditions of self-directed learning is deemed to foster important entrepreneurial skills.

Pannone, S.J. (2017), "The influence of homeschooling on entrepreneurial activities: a collective case study", Education + Training, Vol. 59 No. 7/8, pp.706-719. https://doi.org/10.1108/ET-05-2016-0091	2017	*Education + Training*	Empirical study on homeschool education based on interviews with formerly homeschooled students	Home schooling in which self-directed learning takes a prominent role strengthens an internal locus of control, increases the propensity for self-motivated and independent learning, and fosters personality traits that sustain increased entrepreneurial activity.
Pluskwik, E., Leung, E. and Lillesve, A. (2018), "Growing entrepreneurial mindset in interdisciplinary student engineers: experiences of a project-based engineering program presented at multidisciplinary engineering programs", 2018 ASEE Annual Conference & Exposition, ASEE, Salt Lake City, Utah, pp.1-19.	2018	*ASEE Annual Conference & Exposition*	Presentation and evaluation of a project-based engineering program in engineering undergraduate education	The presented engineering course emphasizes student-centered learning that is focused on problems, makes use of facilitators, and is based on self-directed learning. The workshop is designed to foster a mentality of curiosity, making connections, and creating value that is ideally combined with an engineering skillset. Students are supposed to develop metacognitive abilities which enable self-directed learning.
Rasiah, R., Somasundram, S. and Lee, K.P.L. (2019), "Entrepreneurship in education: innovations in higher education to promote experiential learning and develop future ready entrepreneurial graduates", Journal of Engineering Science and Technology, Vol. 14 No. 1, pp.99-110.	2019	*Journal of Engineering Science and Technology*	Presentation and assessment of the Entrepreneurship Accelerator Project designed to equip students with entrepreneurial skills	The described course is a team-based, collaborative, experiential learning project that is supposed to develop students' entrepreneurial skills and to prepare them to engage in risk-taking and entrepreneurial activity. In this process, students are supposed to take responsibility for their own learning process. A major envisaged learning outcome is to foster an entrepreneurial mindset marked by self-directed and intrinsically motivated action and learning.
Seikkula-Leino, J., Satuvuori, T., Ruskovaara, E. and Hannula, H. (2015), "How do Finnish teacher educators implement entrepreneurship education?", Education + Training, Vol. 57 No. 4, pp.392-404. https://doi.org/10.1108/ET-03-2013-0029	2015	*Education + Training*	Empirical study that proves how entrepreneurship education shows itself in the teaching of Finnish teacher educators	The study finds that the Finnish teacher educators use entrepreneurial teaching quite regularly. This also includes encouraging students to take responsibility for their actions and to engage in self-directed learning. The study generally considers creativity, initiative, and self-directedness as important skills, particularly for entrepreneurs and for developing an enterprising attitude.
Soares, L., Miranda, F., Hashimoto, and Ayres, M. (2018), "Disassembling computer engineering education", International Symposium on Project Approaches in	2018	*International Symposium on Project Approaches in Engineering Education*	Empirical study probing the required core competences of computer engineers based on interviews with industry leaders;	The authors emphasize that self-directed learning, as an ability of learning to learn, forms a key competence for successful computer engineers. Creativity and learner

Engineering Education, University of Brasília, Brasília, Brazil, pp.360-368.			report on experience with Computer Engineering program.	autonomy are seen as essential in addition to the technical knowledge and skills of a computer engineer.
Sze-yeng, F. and Hussain, R.M.R. (2012), "Graduate entrepreneur training by design (GET by Design): an innovative and self-directed approach to instructional design and development", in Baskan, G.A. (Ed.), 4th World Conference on Educational Sciences (WCES-2012), Elsevier Procedia, New York, NY, pp.3541-3545.	2012	*4th World Conference on Educational Sciences*	Presentation of the Graduate Entrepreneurship Training by Design project adopted in Malaysia	At the core of the presented teaching program is project-based work in which students are required to engage in self-directed learning: They need to diagnose learning needs and goals and choose suitable learning resources and strategies in line with given project tasks. The authors posit that graduates need to develop self-directedness that allows them to competently perform life-long learning and to keep up with changing required skills. They also emphasize the importance of promoting self-directed learning in a collaborative setting.
Täks, M., Tynjälä, P., Toding, M., Kukemelk, H. and Venesaar, U. (2014), "Engineering students' experiences in studying entrepreneurship: students' experiences in studying entrepreneurship", Journal of Engineering Education, Vol. 103 No. 4, pp.573-598. https://doi.org/10.1002/jee.20056	2014	*Journal of Engineering Education*	Empirical study drawing on qualitative interviews to probe how engineering students experience the study of entrepreneurship	In an integrative pedagogy model for an entrepreneurship course, the authors see self-regulative knowledge as a result of reflection that forms a first step to self-directed learning. Students are enabled to engage in self-directed learning through learning tasks that require self-awareness and reflection. The self-regulative knowledge guides the regulation of the entrepreneurial process. The authors furthermore note that self-directed learning plays an important role in assisting students in becoming capable of dealing with uncertainty and to develop resilience, which are crucial dispositions in entrepreneurship. Yet students in the examined educational programme also found it difficult, at the beginning, to take responsibility for their learning process.
Tseng, C. (2013), "Connecting self-directed learning with entrepreneurial learning to entrepreneurial performance", International Journal of Entrepreneurial Behavior & Research, Vol. 19 No. 4, pp.425-446. https://doi.org/10.1108/IJEBR-08-2011-0086	2013	*International Journal of Entrepreneurial Behavior & Research*	Theoretical contribution that examines the relation between self-directed learning and entrepreneurial learning	Self-directed learning, specifically through self-management and self-monitoring, is said to contribute to entrepreneurial learning. It helps entrepreneurs in dealing with challenges through fostering reflection, critical thinking, and improving performance.

				Starting a business counts as the most important motivation for engaging in self-directed learning. In doing so, entrepreneurs learn how to learn about relevant aspects of their operations.
van Gelderen, M. (2010), "Autonomy as the guiding aim of entrepreneurship education", Education + Training, Vol. 52 No. 8/9, pp.710-721. https://doi.org/10.1108/00400911011089006	2010	*Education + Training*	Theoretical paper concerned with the role of a capacity for autonomous action in entrepreneurship and how it can be realized	A core aim of entrepreneurship education is to build a capacity for autonomous action. Self-directed learning is presented as one learning theory and pedagogical approach for fostering such a capacity. It involves autonomous setting of learning goals and activities and is supported by collaboration with others. The paper emphasizes that supportive others are a crucial learning resource in self-directed learning.
Verzat, C., O'Shea, N. and Jore, M. (2017), "Teaching proactivity in the entrepreneurial classroom", Entrepreneurship & Regional Development, Vol. 29 No. 9/10, pp.975-1013. https://doi.org/10.1080/08985626.2017.1376515	2017	*Entrepreneurship & Regional Development*	Empirical study on the effect of a teacher-directed vs. a self-directed learning approach on students' proactive attitude as part of an entrepreneurial mentality	The results suggest that self-directed learning fosters a proactive attitude. Qualitative evidence furthermore indicates that self-directed learning leads to positive emotions resulting from the freedom of and pride from excelling at self-directed learning.
Wikoff, K.H. and Carriere, M.H. (2012), "Integrating entrepreneurship and innovation into an engineering curriculum through service learning and the liberal arts", ASEE Annual Conference and Exposition, Conference Proceedings, American Society for Engineering Education, San Antonio, Texas, pp.1-14.	2012	*ASEE Annual Conference and Exposition, Conference Proceedings*	Description of how entrepreneurship has been integrated in an engineering curriculum	Students in the described engineering curriculum has to engage in projects that were marked by self-directed learning. In this regard, the authors emphasize the ability to ask the right questions when dealing with new problems and challenges.
Witt, H.-J., Alabart, J.R., Giralt, F., Herrero, J., Vernis, L. and Medir, M. (2006), "A competency-based educational model in a chemical engineering school", International Journal of Engineering Education, Vol. 22 No. 2, pp.218-235.	2006	*International Journal of Engineering Education*	Presentation of educational model in chemical engineering context	The presented educational model is based on project-based and collaborative learning. Students are supposed to grow into a level of competence on which they begin to take responsibility for their own learning and are empowered to operate in self-directed teams. It is presumed that the more students control their change process, including through critical reflection on their learning and progress, the more likely they are to take responsibility for and achieve their goals.

Young, J.E. (2007), "Entrepreneurial learning and Deepak Chopra's seven spiritual laws of success", Journal of Human Values, Vol. 13 No. 1, pp.13-22. https://doi.org/10.1177/097168580601300103	2007	*Journal of Human Values*	Theoretical contribution linking Entrepreneurial Learning and Deepak Chopra's Seven Spiritual Laws of Success	Self-directed learning seen as occurring when entrepreneurs face novel problems and recognize a gap between their knowledge and skills and what is demanded of them to deal with given challenges. While these entrepreneurial challenges motivate learning processes, they gain entrepreneurial knowledge through self-directed learning. Successful entrepreneurship under conditions of constantly changing environments is held to depend on mastering the practice of learning how to learn.