

The ambiguity of pedagogical entrepreneurship – the state of the art and its challenges

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Abstract

The implementation of pedagogical entrepreneurship in schools from the perspective of lifelong learning is of significant concern at policy levels, and research is an important source of information on this process. This review article focuses on the challenges revealed by research, examines the implementation of pedagogical entrepreneurship in teaching and learning, and considers the reasons for these challenges. Two main challenges are identified and discussed: the ambiguity of the pedagogical entrepreneurship concept and the tension between policy and practice. An increased emphasis on teacher learning processes and on the role of school leaders at the compulsory school level is suggested, and implications for teacher education programmes and further research on implementation of pedagogical entrepreneurship are proposed.

Keywords: pedagogical entrepreneurship, literature review, implementation, compulsory school, teacher education

Introduction

Pedagogical entrepreneurship is a relatively recent area of interest in schools and research on teaching and learning. Although entrepreneurship education and enterprise education have been well documented (European Commission 2004; OECD 2009), researchers have more recently begun to examine pedagogical entrepreneurship. For example, recent studies have investigated the implementation of entrepreneurial methods in primary and lower secondary schools (Lund et al. 2011; Moberg 2014; Sjøvoll and Pedersen 2014) and the emphasis on pedagogical entrepreneurship in teacher education programmes (Falk Lundqvist and Danell 2005; Røe Ødegård 2012, 2014). The implementation of pedagogical entrepreneurship in schools is of significant current concern, according to the OECD (2009, 2010), the European Union (European Commission 2010, 2011, 2013) and policy documents in several countries (Lund et al. 2011). An examination of research challenges in pedagogical

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entrepreneurship in teaching and learning will assist in addressing issues that arise from the impact of pedagogical entrepreneurship on the implementation of the school curriculum, both in school subjects and in the education system's general task of assisting the development of children into young citizens. Citizens are expected to contribute to the constant development of society according to their competences, beliefs, attitudes and aims.

In 2009–2010, the Nordic Council of Ministers conducted a comparative study of the integration of creativity, innovation and entrepreneurship into the Nordic educational systems between 2000 and 2011 (Lund *et al.* 2011). Entrepreneurship in general is described as a key competence that should be emphasised in education and lifelong learning (European Commission 2007). The study stresses the importance of individuals' ability to discover resources and opportunities in their surroundings and emphasises that this ability ought to be stimulated and developed in a way that encourages innovation in both work and social situations. Accordingly, educational systems are encouraged to develop qualifications that provide a foundation for the use of resources in a productive and meaningful manner. It is emphasised that students must learn how to face the consequences of their choices, persevere in their tasks, cooperate with others and learn to be responsible for both themselves and others in their community (European Commission 2013; KD, KRD and NHD 2006, 2009; Lund *et al.* 2011). Both Nordic and European forums maintain that entrepreneurship in education is more than just a relationship between school and business; it is also related to political awareness, cultural life and family and societal participation. When the concept of pedagogical entrepreneurship is cited in the context of lifelong learning, it is understood to be related to general education in a life cycle that has creative and active ways of learning at its core. This is referred to as 'entrepreneurial learning' in the study commissioned by the Nordic Council of Ministers (Lund *et al.* 2011).

As an emerging field of research, pedagogical entrepreneurship seems to focus directly on the implementation of entrepreneurial learning and/or to examine related constructs. However, a comprehensive review of the current empirical research in the area has not yet been conducted. This review aims to address this issue by bringing together and synthesising a diverse body of current research, emphasising research challenges and highlighting necessary areas for future research. Therefore, this article makes a valuable contribution to the field by complementing existing bodies of literature on pedagogical entrepreneurship research and entrepreneurial approaches to learning.

Given these conditions, we aim to present a systematic review of recent empirical studies, focusing on the following key questions:

1. How is pedagogical entrepreneurship conceptualised?
2. What methodologies have been used to examine pedagogical entrepreneurship?

3. What are the challenges for research on pedagogical entrepreneurship in teaching and learning, and what are the reasons for them?
4. What are the implications for teacher education programmes and for future research on pedagogical entrepreneurship?

Method

Review parameters

Pedagogical entrepreneurship is a concept that researchers find challenging to define. As early as 25 years ago, Stewart (1991: 73) referred to entrepreneurship as “a conceptual tower of Babel.” This uncertainty has been confirmed by scholars, including Mahieu (2006), Riese (2010), Skogen and Sjøvoll (2010), and Røe Ødegård (2012). International (European Commission 2013; OECD 2009) and national policy documents (e.g. KD, KRD and NHD 2009; Skolverket 2010) have argued that entrepreneurship should be interpreted as a pedagogical approach, not as a topic that primarily offers specific knowledge about starting up and running a business. Komulainen, Korhonen and Rätty (2009) also emphasised this point, using the concepts of external and internal entrepreneurship. External entrepreneurship is promoted as the knowledge and skills required for establishing businesses. Internal entrepreneurship is recognised in personal features and attitudes and in the value of entrepreneurial methods and learning strategies. Therefore, attempts to clarify the concept of entrepreneurship are confusing because the concept is attached to various domains, with emphasis on either internal or external aspects. Nevertheless, it was necessary for us to consider the concept of pedagogical entrepreneurship in the established literature in identifying the appropriate keywords. We explored researchers’ definitions of the concept according to content related to internal or external entrepreneurship (Backström-Widjeskog 2008; Erkillä 2000; Leffler 2006; Røe Ødegård 2012; Skogen and Sjøvoll 2010) and in relation to a general education perspective.

The process of selecting the relevant literature consisted of three phases. In the first phase, we searched for keywords related to pedagogical entrepreneurship in domestic and international policy documents (e.g. European Commission 2010, 2013; KD, KRD and NHD 2009; Lund et al. 2011; Spilling, Johansen and Støren 2015), the *Handbook on Research in Entrepreneurship Education* (Fayolle 2007), doctoral theses (Backström-Widjeskog 2008; Eide 2013; Leffler 2006; Mahieu 2006; Otterborg 2011; Riese 2010; Røe Ødegård 2012; Svedberg 2007) and books or anthologies focusing on entrepreneurship and pedagogical entrepreneurship (e.g. Skogen and Sjøvoll 2010). In the second phase, we searched education databases (ERIC, Science Direct) and the Web of Science citation database. The searches were limited to publications in English from the year 1998 onwards, using the key terms ‘pedagogical entrepreneurship’, ‘entrepreneurship’ and ‘school’, and

‘entrepreneurship’ and ‘teacher education’. Because of the recent nature of this topic, terms identified in the first phase, such as ‘pedagogic entrepreneurship’, ‘enterprise education’, ‘entrepreneurship education’, ‘entrepreneurship’, ‘innovation’, ‘creativity’, ‘education’, ‘problem solving’, ‘school subject’ and ‘self-regulation’, were also used to emphasise the implementation of pedagogical entrepreneurship-based policy and teaching. In the third phase, we removed duplicate articles, articles that were not empirical studies, articles focusing on higher education (apart from teacher education), articles focusing on the upper-secondary school level and articles that were not published in peer-reviewed journals. Although the review was aimed at peer-reviewed journal articles, doctoral theses were included when they incorporated empirical studies and focused on the implementation of pedagogical entrepreneurship in compulsory school or teacher education. The resulting 32 publications form the basis of this review (see Appendix A).

Analysis

We began the process of analysis by dividing the articles (including the selected theses) between two of the authors. Both authors used a summary table for each of the articles, outlining each article’s focus of attention, setting (type of school or teacher education), number of participants, methods and data sources and identifying challenges revealed in the reported research and the reasons for these challenges. A third author then combined these details into a single table and checked for inconsistencies or missing information. A brief summary of each article is shown in Appendix A. The conceptualisation of ‘pedagogical entrepreneurship’ in each article was identified and summarised. Factors that were considered as challenges to research on the implementation of pedagogical entrepreneurship in teaching and learning were identified and categorised, as were the explanations offered for these challenges. The main findings are outlined in the Results section.

Results

Conceptualisation of pedagogical entrepreneurship

In the description of the parameters of this review, it was noted that pedagogical entrepreneurship is a concept that researchers themselves find challenging to define. This entailed challenges in the process of keyword selection in the search for articles. The collection of articles and theses in this review show a similar problem. Pedagogical entrepreneurship is a relatively recent concept, and only some of the articles in the literature reviewed actually applied the concept. Entrepreneurship research has developed into a multidisciplinary research area with contributions from different areas such as business administration, sociology and psychology (Røe Ødegård 2012). On the one hand, the concept seems to be vague (Cardow and Kirkley 2011; Seikkula-Leino *et al.* 2015). On the other hand, several articles describe how

entrepreneurship is recognised (e.g. Fagan 2006; Garnett 2013; Huber, Sloof and Van Praag 2014) and the ways in which the concept is understood and treated in compulsory school and in teacher education. Furthermore, several articles point to a divergence between the concepts of entrepreneurship and enterprise (e.g. Fagan 2006; Garnett 2013; Seikkula-Leino 2011), whereby entrepreneurship involves the acquisition of the specific skills needed to start and develop a small business. The concept of enterprise is concerned with the personal skills, behaviours and attributes that characterise entrepreneurs. A corresponding divergence is identified in some articles in the concepts of internal and external entrepreneurship (e.g. Backström-Widjeskog 2008; Leffler 2006; Komulainen et al. 2011; Korhonen, Komulainen and Rätty 2012). These publications distinguish between the two concepts by emphasising that internal entrepreneurship is a precondition for external entrepreneurship success. In addition, Huber, Sloof and Van Praag (2014) distinguish the three concepts of non-cognitive entrepreneurial skills, entrepreneurship knowledge and intention to become an entrepreneur. Their study measured nine non-cognitive entrepreneurial skills: risk-taking, creativity, need for achievement, self-efficacy, social orientation, proactivity, persistence, analytical mindset and motivation. These skills coincide quite closely with the personal features that comprise the concept of pedagogical entrepreneurship described by other publications in this review (e.g. do Paço and Palinhas 2011; Leffler 2009; Mahieu 2006; Røe Ødegård 2012; Sjøvoll and Pedersen 2014).

Overview of research methods

As stated in the Introduction, one question of interest in this article relates to the methodologies used to examine pedagogical entrepreneurship. To answer this question, the selected texts, both articles and doctoral theses, were categorised according to the countries where the different studies were conducted, their methodological approach, the nature and size of the sample and the source of data.

Eight European countries contributed studies of pedagogical entrepreneurship. In addition, studies were reported from Pakistan, Israel, Namibia, New Zealand and the United States. The strong representation of OECD and/or EU member countries may have been influenced by the explicit attention given to pedagogical entrepreneurship in these countries over the past 20 years (OECD 2010). As Table 1 indicates, the largest group of studies were conducted in Finland, with 10 studies (31% of the total number of studies in this review). We note that six of the Finnish articles were written by Elena Ruskovaara and Jaana Seikkula-Leino, who are based at the Centre for Training and Development, Lappeeranta University of Technology, individually or in cooperation with others. The doctoral theses were prepared in Finland (1), Norway (2) and Sweden (2).

There seems to be a mix of qualitative, quantitative and mixed methods, but the majority of studies were based on qualitative approaches (see Table 2). Studies categorised as mixed methods used both qualitative and quantitative sources of

Table 1. Countries studying pedagogical entrepreneurship.

Country	Number of studies
Finland	10
Sweden	5
Norway	3
Israel	2
Slovenia	2
Netherlands	2
United Kingdom	2
Portugal	1
Turkey	1
Namibia ^a	1
New Zealand	1
Pakistan	1
United States	1
Total	32

^aOne study was carried out in both Norway and Namibia.

data. In the studies that used data collected from informants, the sample sizes varied from 2 to 2,413. The informants included teachers, students and prospective teachers. Policy documents on pedagogical entrepreneurship, especially those on the treatment of the entrepreneurship concept, seem to be the main data sources for content analysis or discourse analysis studies. In addition, some of the studies are referred to as ‘curriculum analyses’.

In summary, the studies applied qualitative, quantitative and mixed methods using a variety of approaches (see Table 3). The vast majority of studies used surveys/questionnaires, interviews and document analyses. Only three studies used interventions or action research to collect data. The majority of informants were students and teachers/educators. Only a few studies focused on school leadership, the principal’s role or function related to pedagogical entrepreneurship, or on the implementation of entrepreneurial strategies in schools (Eyal and Yosef-Hassidim 2012; Leffler 2006; Mahieu 2006; Sjøvoll and Pedersen 2014).

Table 2. Methodological approach and sample size.

Sample size	Actual range	Qualitative	Quantitative	Mixed methods	Number of studies
Not specified		6	0	1	7
Fewer than 49	2–38	10	1 ^a	1 ^b	12
50–199	71–146	3	3	0	6
More than 200	516–2,413	1	4	2	7
Total		20	8	4	32

^aIncludes a survey performed in 43 municipalities. The exact number of participants was not available.

^bAlso includes a study carried out in three different schools; the number of participants was not reported.

Table 3. Sources of data.

Type of data source	Number of studies
Survey/questionnaires	11
Interviews	13
Case studies	1
Diaries/narratives	3
Knowledge tests	2
Focus groups	1
Documents	10
Classroom observations	3
Interventions	3

Research challenges in pedagogical entrepreneurship

Research both discovers and provides information, and research on pedagogical entrepreneurship is no exception. The publications reviewed show that research has discovered positive impacts of relevance. First, several studies reported that students learn from entrepreneurial approaches and that they develop knowledge and skills in areas that are challenging to measure (do Paço and Palinhas 2011; Halilovic, Cankar and Tominc 2014; Huber, Sloof and Van Praag 2014; Korhonen, Komulainen and Rätty 2012; Leffler 2009; Røe Ødegård 2012). Such areas may be recognised in the keywords that define pedagogical entrepreneurship, such as ‘social talent’, ‘extroversion’, ‘creativity’, ‘self-confidence’, ‘independence’, ‘risk-taking’, ‘unconventionality’, ‘humour’, ‘participation’ and ‘innovation’. In other words, innovation and entrepreneurial skills can be learned.

However, several studies reported confusion about the concept of entrepreneurship among representatives at several levels of the school systems. On several occasions, entrepreneurial and traditional schools were interpreted in terms of a dichotomy (Dahlstedt and Hertzberg 2012; Eyal and Yosef-Hassidim 2012; Leffler 2006), and it was reported that the introduction of an entrepreneurial approach requires fundamental change and development. Therefore, statements of requirements were often supported by referring to societal and economic challenges manifested in policy documents. Some confusion and criticism of entrepreneurship in schools seems to have been identified among school representatives. Identification of those who seem confused – students (Bacanak 2013), teachers (Bacanak 2013; Dahlstedt and Hertzberg 2012; Seikkula-Leino et al. 2010) or school leaders (Eyal and Yosef-Hassidim 2012; Sjøvoll and Pedersen 2014) – was mentioned. The description of such uncertainty in schools concerning a key ingredient in the implementation of an entrepreneurial approach to teaching and learning is revealed through research (Leffler 2009; Leffler and Svedberg 2005; Seikkula-Leino 2011). Furthermore, this uncertainty makes it more challenging for research to implement entrepreneurial ideas and approaches in schools through action research projects, intervention-based

projects and observations of best practice (e.g. Komulainen, Korhonen and Rätty 2009; Komulainen *et al.* 2011; Leffler 2006; Røe Ødegård 2012; Sjøvoll and Pedersen 2014). Hence, there seem to be a gap, or rather some tension, between policy and practice at several levels. This tension influences the approaches that researchers take in studies on pedagogical entrepreneurship in school and teacher education. The overview of research methods shows that researchers almost exclusively applied research tools such as questionnaires, literature studies and interviews. These tools do not interfere with the state-of-the-art teaching and learning environment. Much attention was given to descriptive data, or to data based on students' and teachers' implementations of the pedagogical entrepreneurship concept. Research tools such as participative observation, intervention or action research methodology were rarely chosen. The impact of three sources of tension between policy and practice might be the reasons for such a pattern.

The first source of tension that research addressed is the lack of congruence between the intentions signalled by policymakers and the implementation by educators in schools (Cardow and Kirkley 2011; Dahlstedt and Hertzberg 2012; Eyal 2008; Fagan 2006; Komulainen *et al.* 2011; Korhonen, Komulainen and Rätty 2012; Leffler 2006; Leffler 2009; Leffler and Svedberg 2005; Mahieu 2006; Røe Ødegård 2012; Seikkula-Leino *et al.* 2010).

The second source of tension is that teachers stress the need for coordination between subjects to develop a more entrepreneurial working community (Seikkula-Leino *et al.* 2010) and that teachers find that the implementation of entrepreneurship may challenge older pedagogical and educational doctrines (Dahlstedt and Hertzberg 2012; Leffler 2006). The principal is responsible for the direction and structure of a school's activity, which may create tension between autonomy and control in the school regarding the teachers' teaching priorities if entrepreneurial approaches are to be applied (Eyal and Yosef-Hassidim 2012). Two challenges are revealed in this issue. First, a lack of continuity may arise in the commitment to teaching entrepreneurship (Eide 2013). Second, if teachers have a critical attitude towards teaching influenced by pedagogical entrepreneurship, implementation of such teaching may prove challenging (Sjøvoll and Pedersen 2014). Positive experiences with pedagogical entrepreneurship in themselves are not sufficient to ensure continuity. This also depends on how it is anchored within and outside schools (Eide 2013).

The third source of tension is that teachers have insufficient knowledge about entrepreneurship. This relates to the conceptual challenges of pedagogical entrepreneurship and the implementation of entrepreneurship education in teaching. These knowledge gaps allow for different understandings and teaching practice (Bacanak 2013; Leffler and Svedberg 2005; Seikkula-Leino 2011). This makes it challenging for studies to gain a holistic impression of how pedagogical entrepreneurship is implemented and sustained. In addition, if the teachers' attitudes and motivation are ambiguous regarding a pedagogical entrepreneurship approach and

they find that their beliefs regarding teaching, schoolwork and student learning are questioned, it is a challenge for research (Leffler 2006, 2009; Sjøvoll and Pedersen 2014). The teacher's practices need to be congruent with the beliefs and theories on which pedagogical entrepreneurship rests to allow the students to learn and share the underlying assumption of an entrepreneurial approach in their learning (Fagan 2006; Garnett 2013), which in turn may develop into a tension between students and teachers.

Discussion

Reasons for challenges reported in research on pedagogical entrepreneurship

As stated above, external entrepreneurship is to some extent considered to be in conflict with the aims of schooling. However, internal entrepreneurship is considered to be a universal educational aim (e.g. Komulainen et al. 2011; Korhonen, Komulainen and Rätty 2012; Leffler 2006), and it has been emphasised as an aspect of high priority in the core curriculum of compulsory schooling (e.g. Kunnskapsdepartementet 2006). Nevertheless, by far the most commonly reported reason for challenges in research on pedagogical entrepreneurship in primary and lower-secondary schools is teachers' lack of clarity about the concept of entrepreneurship (both internal and external) and the reluctance to introduce an alternative educational approach that challenges established teachers' beliefs and teaching methods. Although the inability of traditional pedagogy to develop creativity, initiative and beliefs is evident (Dahlstedt and Hertzberg 2012), Leffler (2006) reported that instead of maintaining content and approaches from the entrepreneurial perspective introduced through research projects, the well-established and current discourses in the schools were transferred to the 'new' discourse. Instead of transferring the new aspects that form the entrepreneurial perspective, which were expected to contribute to development of the current discourse, the 'old' and familiar aspects were transferred to the new discourse. Consequently, the projects did not result in a comprehensive change of the discourse in practice.

Furthermore, there is a contrast between teachers' focus on the activities that their students are offered at school and the fact that research points to a need for increased teacher attention to "the world out there" (Ruskovaara and Pihkala 2013; Seikkula-Leino et al. 2015). Participation in networks and cooperation with others offers a range of possibilities to organise teaching in novel ways and develop the operating culture of primary and lower-secondary schools. For entrepreneurship to become established and flourish, a supportive environment from school leadership and teachers and cooperation with the society outside school is valuable and important (Sjøvoll and Pedersen 2014).

Teachers who are confused about the concept of pedagogical entrepreneurship, and schools' lack of planned participation in local activities and cooperation with those in the local environment, are examples of entrepreneurship results that may be influenced by two aspects: school leadership and teacher learning. Eyal (2008) reports that well-connected schools are more likely to maintain entrepreneurial strategies as part of their activities than less-well-connected schools are. This situation calls for teachers who are aware of the requirement to take an entrepreneurial approach to teaching both within school subjects and across the curriculum (Cardow and Kirkley 2011). In addition, it has been reported that the dichotomies experienced between entrepreneurship and traditional school values, and between educational policy and practice, are challenges that need to be overcome (Komulainen *et al.* 2011). These challenges are based on the above-mentioned uncertainty about pedagogical entrepreneurship and the need for arrangements to educate teachers. This calls for a focus on teacher education. According to research, such learning processes must be anchored in teachers' personal needs (Day 1999); they must emphasise teacher participation (Swafford *et al.* 1999) and offer external facilitators (Ponte *et al.* 2004) to collaborate with teachers. Several studies support the view that effective competence development continues for a long time in communities of practice (Darling-Hammond 2013). However, the teacher learning and reflection approach in the context of entrepreneurship education has so far been an unexplored field of research (Seikkula-Leino *et al.* 2010), and this review article has failed to identify projects that contradict this observation. Bacanak (2013) reported that dissemination of good practices contributes to teachers' learning priorities, but he did not refer to any projects that contain such an approach. In addition, Eyal and Yosef-Hassidim (2012) noted the limited degree of freedom that the formal education system offers for teachers to choose entrepreneurial endeavours as part of their teaching.

Challenges and issues emerging from this review

There are three main challenges to report from the analysis of the publications chosen for this review.

First, the complications of reaching a common conceptualisation of pedagogical entrepreneurship seem to be overwhelming. This finding has consequences both for implementation processes in schools and for research on the topic.

Second, a lack of knowledge and skills leads to tension between policy and practice on several levels, and issues at both the school leader and teacher levels need to be addressed. School leaders have been found to have a key role in coordinating subjects in the school, challenging established pedagogical and educational doctrines, making binding agreements between the school and civil representatives, and in maintaining a commitment to prioritise entrepreneurial teaching and learning. However, there seems to be a lack of research on the role and position of school leaders who attempt

to implement pedagogical entrepreneurship, or on schools that manage to both implement and sustain the approach.

Cankar et al. (2013) found a lack of awareness among teachers regarding the importance of creating links between school activities and the reality of the labour market. Teachers who had actively promoted the development of creativity and innovation were more critical of their own schools than other teachers were. This finding is supported by Ali, Toppin and Tariq (2009), who found that the majority of prospective teachers were positive towards entrepreneurship. It is also supported by Bacanak (2013), who noted that teachers who had a common vision of student-centred teaching methods and techniques were effective in developing entrepreneurial skills. In other words, teachers who participate in courses that promote pedagogical entrepreneurship are positive in their interpretation and implementation of this teaching and learning perspective in their teaching.

Innovation and entrepreneurial skills can be taught (Halilovic, Cankar and Tominc 2014). Research findings also show that teacher training in entrepreneurship seems to be the main determinant of the observable entrepreneurship-based teaching provided by teachers and teacher educators (Backström-Widjeskog 2008; Ruskovaara and Pihkala 2015; Seikkula-Leino et al. 2015). Teachers with such training use pedagogical models and methods from entrepreneurship education, such as problem-based learning and experimental and practical descriptions of situations. They encourage students to analyse, be innovative, make decisions about necessary risk and reflect on the outcomes. However, they are uncertain about what is really expected and about how to implement it in school subjects (Leffler and Svedberg 2005). In fact, only one article in this review related an entrepreneurial approach to a specific school subject (Garnett 2013). To show how the personal features identified in the conceptualisation of pedagogical entrepreneurship may be developed and flourish in school subjects, more studies emphasising this relationship need to be conducted.

Third, the tensions between policy and practice influence the approaches chosen in studies on pedagogical entrepreneurship in school and teacher education. The lack of a common understanding of the concept of pedagogical entrepreneurship seems to limit the methodological repertoire in the research field. For instance, our review shows that the research field lacks studies that emphasise research tools such as intervention or action research methodology studies. Such approaches may open the field for new perspectives on implementing entrepreneurial strategies in teaching and learning.

Implications for teacher education programmes

The aim of teacher education programmes is to educate teachers who will work as teachers in primary and lower-secondary schools. Therefore, teacher education institutions need to be agents of both school traditions and innovative approaches

to classroom management and teaching in school. Teacher education students will qualify for the teaching profession through their study. However, it is through their practice as teachers that their professional development as teachers takes place. Therefore, teacher education students ought to encounter the entrepreneurship perspective during their teacher education and be allowed to interpret, experiment with and reflect on such an approach to teaching and learning. Van der Heijden *et al.* (2015) see teachers as change agents that should be distinguished by the way they practise, their innovations and eagerness to learn. With such a perspective, teacher education and schools may benefit from knowing what characterises teachers as change agents and what this implies for the prioritisation of pedagogical entrepreneurship as a learning strategy. This aligns with Borasi and Finnegan's (2010) call to expose both teacher education students and teachers in compulsory school to entrepreneurial practice in preparing them to become effective agents of change. This requires an emphasis on creative problem solving, which is a universally applicable skill as well as the heart of entrepreneurial thought and action (Cankar *et al.* 2013). It also entails an emphasis on pedagogical entrepreneurship as a learning strategy both across the school curriculum and in specific school subjects to operationalise the core curriculum (e.g. Kunnskapsdepartementet 2006). To achieve this, teacher education programmes need to include or even model pedagogical entrepreneurship in teacher education programmes, on both the theoretical and practical levels. Practical activities should operationalise entrepreneurial approaches in both teacher education and students' experiences with such approaches in their own practice periods in compulsory schooling. In addition to increased attention on pedagogical entrepreneurship in in-service training, and the implementation of this approach to teaching and learning in teacher education institutions, such a priority will increase the number of teachers in compulsory schools that both have a clear interpretation of the concept of pedagogical entrepreneurship and understand how to implement entrepreneurial approaches in their teaching. It is anticipated that this will make it easier to implement entrepreneurship as a learning strategy in school, as well as making it easier for researchers to run research projects in compulsory schools (and teacher education institutions) based on mutual understanding of a complex concept.

Conclusions and implications for further research

This review of research on implementation of pedagogical entrepreneurship in teaching and learning has revealed that this field of research faces some complex challenges. Lack of a common understanding of the concept of pedagogical entrepreneurship makes it difficult to establish what it is and what it is not. Uncertainty about the implications of entrepreneurial approaches and learning strategies makes it more challenging than necessary to gain valid and reliable knowledge.

Another issue emerging from the ambiguity surrounding the conceptualisation of pedagogical entrepreneurship is the lack of research on the implementation of

entrepreneurial approaches to teaching and learning in school subjects. In what ways is pedagogical entrepreneurship operationalised in English, home economics, science, physical education or mathematics? How can entrepreneurial teaching and learning approaches actually become part of the school content of such subjects, or across school subjects? Emphasis on pedagogical entrepreneurship, teacher learning and the role of school leaders is important to make progress on these matters. This review reveals that quite few research projects have been based on action research or intervention studies. Through such research perspectives, teachers will become deeply involved in both design and data collection. More such projects should be conducted in this field of research to meet teachers' need to learn how to apply entrepreneurial approaches in school subjects and across the school curriculum.

Finally, the review shows that little research has focused on the role of school leaders regarding the implementation and sustainability of pedagogical entrepreneurship as a core part of a school's activity and perspective on teaching and learning. Several tensions between policy and practice have been identified in this review, and a relevant question for future research would be what characterises the leadership of school leaders who succeed in operationalising pedagogical entrepreneurship at their schools.

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References

- Ali, A., Toppin, K.J. & Tariq, R.H. (2009). Entrepreneurial inclinations of prospective teachers. *New Horizons in Education*, 57(2), 1–16.
- Bacanak, A. (2013). Teachers' views about science and technology lesson effects on the development of students' entrepreneurship skills. *Educational Sciences: Theory and Practice*, 13(1), 622–629.
- Backström-Widjeskog, B. (2008). *Du kan om du vill. Lärares tankar om fostran till företagsamhet*. PhD thesis. Åbo, Finland: Åbo Akademiske Förlag.
- Borasi, R. & Finnegan, K. (2010). Entrepreneurial attitudes and behaviors that can help prepare successful change-agents in education. *New Educator*, 6(1), 1–29.
- Cankar, F., Deutsch, T., Zupan, B. & Cankar, S.S. (2013). Schools and promotion of innovation. *Croatian Journal of Education*, 15(2), 179–211.
- Cardow, A. & Kirkley, W.W. (2011). Are we there yet? Stagnation in entrepreneurship teaching practice 10 years on. *Curriculum Matters*, 7, 138–158.
- Dahlstedt, M. & Hertzberg, F. (2012). Schooling entrepreneurs: entrepreneurship, governmentality and education policy in Sweden at the turn of the millennium. *Journal of Pedagogy*, 3(2), 242–262.
- Darling-Hammond, L. (2013). Building a profession of teaching. In *Back to the future: legacies, continuities and changes in educational policy, practice and research*, M. Flores, A. Carvalho, F. Ferreira & M. Vilaca (eds.), pp. 3–27. Rotterdam: Sense.
- Day, C. (1999). *Developing teachers: the challenges of lifelong learning*. London: Falmer Press.
- do Paço, A. & Palinhas, M.J. (2011). Teaching entrepreneurship to children: a case study. *Journal of Vocational Education and Training*, 63(4), 593–608.
- Eide, O.S. (2013). *Pedagogisk entreprenørskap som virkemiddel for lokal og regional utvikling: Eksempler fra skoler og mindre kystsamfunn i Finnmark*. PhD thesis. Bergen, Norway: University of Bergen.
- Erkillä, K. (2000). *Entrepreneurial education*. New York: Garland.
- European Commission. (2004). *Helping to create an entrepreneurial culture. A guide on good practice in promoting entrepreneurial attitudes and skills through education*. Brussels: European Commission.
- European Commission. (2007). *Key competences for lifelong learning, European reference framework*. Luxembourg: Office for Official Publications of the European Communities.
- European Commission. (2010). *Towards greater cooperation and coherence in entrepreneurship education*. Brussels: European Commission.
- European Commission. (2011). *Entrepreneurship education: enabling teachers as a critical success factor*. Brussels: European Commission.
- European Commission. (2013). *Entrepreneurship 2020 Action plan—reigniting the entrepreneurial spirit in Europe*. Brussels: European Commission.
- Eyal, O. (2008). Caught in the Net: the network-entrepreneurship connection in public schools. *International Journal of Educational Management*, 22(5), 386–398.
- Eyal, O. & Yosef-Hassidim, D. (2012). Managing educational champions: entrepreneurship in schools. *Journal of School Leadership*, 22(1), 210–255.
- Fagan, C. (2006). Three Es for teachers: economics, enterprise and entrepreneurship. *Teacher Development*, 10(3), 275–291.
- Falk Lundqvist, Å. & Danell, T. (2005). *Företagsamt lärande i lärarutbildning. Att lära andra lära företagsamt*. Umeå: Landsstyrelsen Västerbotten.
- Fayolle, A., ed. (2007). *Handbook of Research in Entrepreneurship Education. Vol. 1, A General Perspective*. Cheltenham, UK: Edward Elgar.

- Fayolle, A. & Gailly, B. (2008). From craft to science: teaching models and learning processes in entrepreneurship education. *Journal of European Industrial Training*, 32(7), 569–593.
- Garnett, J. (2013). Enterprise pedagogy in music: an exploration of multiple pedagogies. *Music Education Research*, 15(1), 1–18.
- Halilovic, P., Cankar, F. & Tominc, P. (2014). Innovation and entrepreneurship can be learned and built on. *Croatian Journal of Education*, 16(3), 133–153.
- Huber, L.R., Sloof, R. & Van Praag, M. (2014). The effect of early entrepreneurship education: evidence from a field experiment. *European Economic Review*, 72, 76–97.
- KD, KRD and NHD (Kunnskapsdepartementet, Kommunal- og Regionaldepartementet, og Nærings- og Handelsdepartementet) [Ministry of Education and Research, Ministry of Local Government & Ministry of Trade and Industry] (2006). *Strategiplan for entreprenørskap i opplæringen 2004–2008, Se mulighetene og gjør noe med dem. [Strategy for entrepreneurship in education 2004–2008, See the opportunities and do something about them; in Norwegian]*. Oslo: KD, KRD, NHD.
- KD, KRD and NHD (Kunnskapsdepartementet, Kommunal- og Regionaldepartementet, og Nærings- og Handelsdepartementet) [Ministry of Education and Research, Ministry of Local Government & Ministry of Trade and Industry] (2009). *Entreprenørskap i utdanningen—fra grunnskole til høyere utdanning 2009–2014. [Entrepreneurship in education and training—from compulsory school to higher education, 2009–2014; in Norwegian]*. Oslo: Kunnskapsdepartementet [Ministry of Education and Research].
- Komulainen, K., Korhonen, M. & Rätty, H. (2009). Risk-taking abilities for everyone? Finnish entrepreneurship education and the enterprising selves imagined by pupils. *Gender and Education*, 21(6), 631–649.
- Komulainen, K., Naskali, P., Korhonen, M. & Keskitalo-Foley, S. (2011). Internal Entrepreneurship—a Trojan horse of the Neoliberal governance of education? Finnish pre- and in-service teachers' implementation of and resistance towards entrepreneurship education. *Journal for Critical Education Policy Studies*, 9(1), 341–374.
- Korhonen, M., Komulainen, K. & Rätty, H. (2012). “Not everyone is cut out to be the Entrepreneur Type”: how Finnish school teachers construct the meaning of entrepreneurship education and the related abilities of the pupils. *Scandinavian Journal of Educational Research*, 56(1), 1–19.
- Kunnskapsdepartementet [Ministry of Education]. (2006). *Læreplanverket for kunnskapsløftet [The National curriculum for knowledge promotion in primary and secondary school; in Norwegian]*. Oslo: Utdanningsdirektoratet.
- Leffler, E. (2006). *Företagsamma elever: Diskurser kring entreprenörskap och företagsamhet i skolan*. PhD thesis. Umeå, Sweden: University of Umeå.
- Leffler, E. (2009). The many faces of entrepreneurship: a discursive battle for the school Arena. *European Educational Research Journal*, 8(1), 104–116.
- Leffler, E. & Svedberg, G. (2005). Enterprise learning: a challenge to education? *European Educational Research Journal*, 4(3), 219–227.
- Lund, B. et al. (2011). *Kreativitet, innovasjon og entreprenørskap i utdanningssystemene I Norden. TemaNord 2011:517 [Creativity, innovation, and entrepreneurship in the educational systems on the Nordic venue. TemaNord 2011:517; in Norwegian]*. Copenhagen: Nordisk Ministerråd [Nordic Council of Ministers; in Norwegian].
- Mahieu, R. (2006). *Agents of change and policies of scale. A policy study of entrepreneurship and enterprise in education*. PhD thesis. Umeå, Sweden: Umeå University.
- Moberg, K. (2014). Two approaches to entrepreneurship education: the different effects of education for and through entrepreneurship at the lower secondary level. *The International Journal of Management Education*, 12(3), 512–528.
- OECD. (2009). *Evaluation of programmes concerning education for entrepreneurship*. Report by the OECD Working Party on SMEs and Entrepreneurship. Paris: OECD.

- OECD. (2010). Ministerial report on the OECD innovation strategy: key findings. Paris: OECD.
- Otterborg, A. (2011). *Entreprenöriellt lärande Gymnasieelevers skilda sätt att uppfatta entreprenöriellt lärande*. PhD thesis. Jönköping, Sweden: University of Jönköping.
- Ponte, P., Ax, J., Beijaard, D. & Wubbels, T. (2004). Teachers' development of professional knowledge through action research and the facilitation of this by teacher educators. *Teaching and Teacher Education*, 20(6), 571–588.
- Riese, H. (2010). *Friendship and learning. Entrepreneurship education through mini-enterprises*. PhD thesis. Bergen, Norway: University of Bergen.
- Røe Ødegård, I.K. (2012). *Entreprenørskap i lærerutdanningen i Norge og Namibia. En komparativ analyse av entreprenørielle tilnærminger i lærerkvalifisering*. PhD thesis. Oslo, Norway: University of Oslo.
- Røe Ødegård, I.K. (2014). *Pedagogisk entreprenørskap i lærerutdanning. En framtidrettet læringsstrategi*. Oslo: Cappelen Damm.
- Ruskovaara, E. & Pihkala, T. (2013). Teachers implementing entrepreneurship education: classroom practices. *Education and Training*, 55(2), 204–216.
- Ruskovaara, E. & Pihkala, T. (2015). Entrepreneurship education in schools: empirical evidence on the teacher's role. *Journal of Educational Research*, 108(3), 236–249.
- Seikkula-Leino, J. (2011). The implementation of entrepreneurship education through curriculum reform in Finnish comprehensive schools. *Journal of Curriculum Studies*, 43(1), 69–85.
- Seikkula-Leino, J., Ruskovaara, E., Hannula, H. & Saarivirta, T. (2012). Facing the changing demands of Europe: integrating entrepreneurship education in Finnish teacher training curricula. *European Educational Research Journal*, 11(3), 382–399.
- Seikkula-Leino, J., Ruskovaara, E., Ikavalko, M., Mattila, J. & Rytkola, T. (2010). Promoting entrepreneurship education: the role of the teacher? *Education and Training*, 52(2), 117–127.
- Seikkula-Leino, J., Satuvuori, T., Ruskovaara, E. & Hannula, H. (2015). How do Finish teacher educators implement entrepreneurship education? *Education and Training*, 57(4), 392–404.
- Sjøvoll, J. & Pedersen, O. (2014). Entrepreneurial mindsets in entrepreneurial schools. *European Scientific Journal*, 1, 18–29.
- Skogen, K. & Sjøvoll, J. (2010). *Creativity and innovation. Preconditions for entrepreneurial education*. Bergen: Fagbokforlaget.
- Skolverket. (2010). *Skapa och våga. Om entreprenörskap i skolan*. Stockholm: Skolverket.
- Spilling, O.R., Johansen, V. and Støren, L.A. (2015). *Entreprenørskapsutdanning i Norge—status og veien videre*. Sluttrapport fra følgeforskningsprosjektet om entreprenørskap i utdanningen. Rapport 2/2015 [*Entrepreneurship education in Norway—status and further development*. Final report from the formative dialogue research project on entrepreneurship in education; in Norwegian]. Oslo: NIFU.
- Stewart, A. (1991). A prospectus on the anthropology of entrepreneurship. *Entrepreneurship. Theory and Practice*, 16(2), 71–91.
- Svedberg, G. (2007). *Entreprenörskapets avtryck i klassrummets praxis: om villkor och lärande i gymnasieskolans entreprenörskapsprojekt*. PhD thesis. Umeå, Sweden: University of Umeå.
- Swafford, J.O., Jones, G.A., Thornton, C.A., Stump, S.L. & Miller, D.R. (1999). The impact on instructional practice of a teacher change model. *Journal of Research and Development in Education*, 32(2), 69–82.
- Van der Heijden, H.R.M.A., Geldens, J.J.M., Beijaard, D. & Popeijus, H.L. (2015). Characteristics of teachers as change agents. *Teachers and Teaching*, 21(6), 681–699.

Appendix A

Details of publications reviewed ($N = 32$)

Reference	Concept of pedagogical entrepreneurship	Focus of attention	Setting (type of school, teacher education), number of participants	Method, data sources	Identification of research challenges	Reasons for research challenges
Articles						
Ali, Toppin and Tariq (2009)	<p>Entrepreneurial mindset:</p> <ul style="list-style-type: none"> - Creative thinking. - Questioning behaviour. - Independence. - Self-reliance. 	Explored the entrepreneurial inclinations of prospective teachers in Pakistan.	<p>Total of 516 respondents completed the questionnaire.</p> <p>Multistage sampling to reflect the population accurately (700 master of education students and prospective teachers in seven universities).</p>	Survey, factor analysis. Three factors emerged: entrepreneurial intent and acceptability, entrepreneurial effort and entrepreneurial motivation.	The majority of prospective teachers were found to have positive views of entrepreneurship at all seven universities.	Some impact of demographic variables such as university and course attendance, parental level of education and gender. Females exhibited a higher entrepreneurial profile (in terms of working hard and entrepreneurial motivation).
Bacanak (2013)	<p>Refers to different perspectives.</p> <p>Basic skills of an individual entrepreneur:</p> <ul style="list-style-type: none"> - Open to innovation, takes on risks, has knowledge of and skills in risk management. - Is a leader in sustaining the process of entrepreneurship. <p>Entrepreneurship is project management, planned and based on research.</p>	To determine the views of science and technology teachers about the effects of sixth to eighth grade science and technology courses on entrepreneurship skills for students.	Five sixth to eighth grade teachers.	Phenomenographic method, semi-structured interviews. Analysed with NVIVO 9 software.	It was concluded that teachers did not have sufficient knowledge of entrepreneurship, so that they had different understandings and practices. However, the study found that teachers with a common vision of student-centred teaching methods and techniques were effective in developing entrepreneurial skills.	At the end of the study, it was recommended to the teachers that class meetings should be made more functional and more studies were required for the dissemination of good practices.

Appendix A (Continued)						
Reference	Concept of pedagogical entrepreneurship	Focus of attention	Setting (type of school, teacher education), number of participants	Method, data sources	Identification of research challenges	Reasons for research challenges
Borasi and Finnegan (2010)	Broadly defined as "transforming ideas into enterprises that generate economic, intellectual and/or social value."	Explored how the preparation of educators committed to improving education can capitalise on entrepreneurship, broadly defined as "transforming ideas into enterprises that generate economic, intellectual and/or social value."	Six educators who have been successful agents of change in a variety of fields and positions using entrepreneurial concepts as a basis of instruction.	Case studies of six educators. A cross-case analysis of these individual case studies.	Entrepreneurial attitudes: Driven by a vision, relentlessly engaging in innovations, being alert to and ready to seize opportunities, not constrained by resources, masters at networking, making quick and timely decisions, taking risks confidently, placing importance on being or finding a champion for each innovation, and capitalising on crises and dysfunction.	Implications for the preparation of educators, suggesting the value of exposing new educators, as well as educators already in the field, to practices identified as entrepreneurial to prepare them to become more effective agents of change.
Cankar et al. (2013)	Based on the classic concept of innovation and entrepreneurial development: <ul style="list-style-type: none"> - Problem definition, observation and acquisition of ideas. - Prototype production and implementation. 	Presented findings on the work of enterprise circles and the current state of Slovenian primary schools with respect to the promotion of creativity, innovation and entrepreneurship. It examined those factors within schools and the broader local environment that can promote or hinder the development of creativity, innovation and entrepreneurship among pupils.	Slovenian primary schools, pupils, teachers and head teachers. Questionnaire, $n = 153$ (head teachers). Survey, $n = 100$ (teachers/mentors). Control group, $n = 142$. Test groups, $n = 190$ (pupils). Enterprise circles.	An evaluation of enterprise circles. Five objectives of the evaluation. Mixed methods (diaries, online questionnaire, survey, tests).	The findings indicated a lack of awareness of the importance of creating links between the education system and the labour market. Teachers who had participated in activities to promote the development of creativity and innovation were more critical of their schools, whereas pupils still found it difficult to express themselves differently within the school system.	At the heart of new developments are approaches that emphasise creative problem-solving among young people. This is a universally applicable skill, as well as being the essence of entrepreneurial thought and action.

Appendix A (Continued)						
Reference	Concept of pedagogical entrepreneurship	Focus of attention	Setting (type of school, teacher education), number of participants	Method, data sources	Identification of research challenges	Reasons for research challenges
Cardow and Kirkley (2011)	Lack of common understanding and widely differing interpretations.	How the concept of entrepreneurship is understood by preservice teachers.	Preservice teachers ($n = 37$), instructors ($n = 2$).	Qualitative: Semi-structured interviews in a mixture of focus groups and individual interviews.	The lack of congruence between intent (policymakers) and implementation (educators).	Preservice teachers were unaware of the requirement to teach entrepreneurship across the curriculum.
Dahlstedt and Hertzberg (2012)	<ul style="list-style-type: none"> - Being flexible, creative, enterprising and independent. - Taking initiative. - Solving problems. - Making decisions. - Being self-reliant. 	How the concept of entrepreneurship is embodied in policy documents and the main arguments for introducing entrepreneurial education in Sweden.	Compulsory school.	Discourse analysis.	The implementation of entrepreneurship may challenge older pedagogical and educational doctrines.	In the name of entrepreneurship, the inability of traditional pedagogy to develop the creativity, initiative and belief in the future was emphasised, and the promise of emancipation from authoritarian teaching was connected to economic utility.
do Paço and Palinhas (2011)	<ul style="list-style-type: none"> - Creativity. - Willingness to take risks. - Withstanding failure. - Personal control. - Self-esteem. - Confidence. 	The characteristics and motivations that entrepreneurship teaching programmes attempt to instil in children.	Students in the first and second levels of primary school.	Mixed methods: analysis of an enterprise programme through observations ($n = 19$) and surveys ($n = 1131$).	Children's knowledge increased after their educational experience.	The programme instilled and developed important personal characteristics crucial for becoming an entrepreneur.
Eyal (2008)	Entrepreneurial strategies at the school level.	The association between public schools' networks and strategies of entrepreneurship.	Public school. $N = 140$.	Quantitative: questionnaire.	The importance of common ties for entrepreneurial action.	Well-connected schools are more likely to exhibit entrepreneurial strategies than less-well-connected schools.
Eyal and Yosef-Hassidim (2012)		The interaction between principals' management styles influences the sustainability of teachers' entrepreneurial endeavours.	Public school (grades 6–12). $N = 71$.	Qualitative: semi-structured interviews.	Tension between autonomy and control in schools.	Hierarchical formal education systems offer a limited degree of freedom to develop entrepreneurial endeavours. School culture.

Appendix A (Continued)						
Reference	Concept of pedagogical entrepreneurship	Focus of attention	Setting (type of school, teacher education), number of participants	Method, data sources	Identification of research challenges	Reasons for research challenges
Fagan (2006)	<ul style="list-style-type: none"> - Self-reliance. - Personal responsibility. - Boldness. - Willingness to take risks in the pursuit of goals. 	Teachers should be familiar with the aspects of economic awareness, enterprise and entrepreneurship before considering how to include them in pupils' learning.	Curriculum analysis.	Content analysis.	Shared understanding of what enterprise and entrepreneurship may mean. Teachers' knowledge.	Teachers' knowledge of the complexities of economic enterprises and entrepreneurship with different partners.
Fayolle and Gailly (2008)		Aimed to offer a conceptual framework for entrepreneurship education inspired by education sciences.	Education system.	Qualitative: literature review.	Provided a bridge between education sciences and the field of entrepreneurship.	The framework allowed for the combination of both the concept of teaching models and learning process in a general theory-driven framework and their applicability to specific entrepreneurship education situations.
Garnett (2013)	<ul style="list-style-type: none"> - Strong need for achievement. - Strong need for autonomy. - Internal locus of control. - Ability to take calculated risks. - Innovation. - Creativity. 	Investigated the nature of enterprise pedagogy in music.	Elementary school (11–14). N = 3 (schools).	Mixed methods. Quantitative and qualitative: action research questionnaire intervention.	Positive effect on the motivation of students and match of learning to the needs of students of different abilities. Teachers' practice needs to be congruent with the beliefs and theories on which it rests and students also need to share in these underlying assumptions through their learning.	

Appendix A (Continued)

Reference	Concept of pedagogical entrepreneurship	Focus of attention	Setting (type of school, teacher education), number of participants	Method, data sources	Identification of research challenges	Reasons for research challenges
Halilovic, Cankar and Tominc (2014)	<ul style="list-style-type: none"> - Creativity. - Innovation. 	Long-lasting innovation-entrepreneurial education effect on improving innovation and entrepreneurial skills.	Primary school pupils (14–15-year-old children). <i>N</i> = 146.	Workshop and quantitative questionnaire (for measuring innovative behaviour) and a knowledge test. The workshops lasted for 1 year.	Innovation and entrepreneurial skills can be taught.	Pupils develop their skills through practical tasks, experiments and experience.
Huber, Sloof and Van Praag (2014)	<ul style="list-style-type: none"> - Risk taking. - Creativity. - Need for achievement. - Self-efficacy. - Social orientation. - Pro-activity. - Persistence. - Analytical mindset. - Motivation. - Entrepreneurial knowledge (about running a business). 	The effect of early entrepreneurial education (through evaluating a leading entrepreneurship education programme).	Primary school (<i>N</i> = 118 classes and <i>N</i> = 2,413 pupils).	Quantitative (intervention programme): treatment group and control group.	Positive effect on non-cognitive entrepreneurial skills. No effect on (cognitive) knowledge.	Non-cognitive skills (risk-taking, creativity and self-efficacy – nine skills were measured) are best developed at an early age.
Komulainen, Korhonen and Rätty (2009)	<ul style="list-style-type: none"> - Initiative. - Independence. - Risk-taking. - Self-reliance. - Self-responsibility. 	The spread of neo-liberal educational policy in Finnish schools and entrepreneurship education.	Pupils in the ninth grade. Two samples (<i>n</i> = 1,999 + <i>n</i> = 210).	Data analysis of pupils' narratives written as contributions to the annual Good Enterprise writing competition. Narratives from <i>N</i> = 2,019.	Pupils' enterprising selves are in conflict with the educational policies of the EU.	The narratives of enterprising selves valued modest entrepreneurship with traditional virtues, which is in conflict with the educational policies of the EU, which calls for risk-taking abilities and competition.

Appendix A (Continued)						
Reference	Concept of pedagogical entrepreneurship	Focus of attention	Setting (type of school, teacher education), number of participants	Method, data sources	Identification of research challenges	Reasons for research challenges
Komulainen et al. (2011)	<ul style="list-style-type: none"> - Competitiveness. - Independence. - Need for achievement. - Willingness to take risks. - Seen in terms of masculine/feminine constructs. 	Examined how Finnish pre- and in-service teachers engage with the discourses of 'external' and 'internal entrepreneurship' and implement or challenge the aim of educating enterprising and entrepreneurial citizens.	Teacher students, $n = 82$. Comprehensive school teachers, $n = 16$ (seventh to ninth grade).	Qualitative: questionnaire (student teachers) and interviews (teachers).	External entrepreneurship was criticised as capitalist.	External entrepreneurship was observed to be in conflict with the aim of schooling. Internal entrepreneurship is considered a universal and natural educational aim.
Korhonen, Komulainen and Rätty (2012)	<ul style="list-style-type: none"> - Increase competitiveness. - Be innovative. - Cope with risks and uncertainty. - Be independent. 	How teachers construct the meaning of entrepreneurship education.	Comprehensive school teachers, $N = 16$ (seventh to ninth grade).	Qualitative: interviews.	Different abilities of pupils.	Potential for boys that are socially talented, creative, easy-going and risk-taking or competent at practical things. (Findings: The authors associated entrepreneurship with social talent, activity, extroversion, creativity, self-confidence, independence, risk-taking, ability to cope with economic uncertainty, boldness, openness, unconventionality, liveliness, humour, energy, hands-on skill).

Appendix A (Continued)

Reference	Concept of pedagogical entrepreneurship	Focus of attention	Setting (type of school, teacher education), number of participants	Method, data sources	Identification of research challenges	Reasons for research challenges
Leffler (2009)	<ul style="list-style-type: none"> - Energetic. - Creative. - Cooperative. - Innovative. - Look for opportunities. - Take risks. - Be a change agent. 	The concept of entrepreneurship.	Compulsory school.	Qualitative: discourse analysis.	Teachers' uncertainty about the concept of entrepreneurship and enterprise.	How should the concept be realised in practical activities? (Implications: active student, specific actions, participation, interdisciplinary and group-oriented work, relationship between teacher and pupils).
Leffler and Svedberg (2005)	<ul style="list-style-type: none"> - Ability to take initiatives. - Ability to turn words into action. - Self-confidence. - Self-knowledge. - Creativity. - Energy. - Ability to cooperate and communicate. 	The concept of entrepreneurship education as understood in Swedish schools.		Discourse analysis. Based on two projects that were conducted separately (one by each author). Both used mixed methods: classroom observations, interviews and a collection of written material.	Teachers' experiences of the concept of entrepreneurship and enterprise.	Teachers are often positive about their interpretation but uncertain about what is really expected.
Ruskovaara and Pihkala (2013)	<ul style="list-style-type: none"> - Teaching and working methods in entrepreneurship education. - Experiential learning approach. - Active student participation, interaction and social skills. - Problem-solving abilities. 	Aimed to highlight the entrepreneurship education practices teachers use in their work. Another aim was to analyse how these practices differ based on a number of background factors. The paper concentrated on teachers' roles and especially their practices in primary education.	Basic and upper secondary education. <i>N</i> = 521 teachers and other entrepreneurship education actors.	Quantitative analysis to examine the overall picture of entrepreneurship education practices. Factor analysis to sum measures of entrepreneurship education practices. Finally, the teachers' background information was studied to further analyse entrepreneurship education practices.	The authors considered their article to have special value in exploring and opening dialogue in this area (primary education).	One very clear need seemed to be the relationship between teachers and "the world out there." Moreover, internal networks and cooperation between teachers may offer a range of possibilities to organise teaching in novel ways and develop the school's operating culture.

Appendix A (Continued)						
Reference	Concept of pedagogical entrepreneurship	Focus of attention	Setting (type of school, teacher education), number of participants	Method, data sources	Identification of research challenges	Reasons for research challenges
Ruskovaara and Pihkala (2015)	The policy of the European Commission (2012): entrepreneurship is a core factor in activating European people for competitiveness, growth and innovation.	Investigated what entrepreneurship education practices are used in schools and what roles schools and teachers play in determining entrepreneurship education practices.	From basic to upper-secondary education. $N = 1,359$.	Measurement tool for entrepreneurship education. Online survey, a full-scale questionnaire helping teachers to identify the operations of entrepreneurship education at a practical level.	The findings indicated that the training teachers receive in entrepreneurship seems to be the main factor determining the observable entrepreneurship education provided by the teachers.	Further studies on the antecedents of entrepreneurship education were encouraged.
Seikkula-Leino (2011)	Entrepreneurship subsumes a wide range of beliefs, risk-taking individuals or initiation of new ventures. 'Entrepreneurial' refers to the business context, and 'enterprise' refers to general education and learning processes.	Examined how entrepreneurship education has been implemented in Finnish comprehensive schools.	Comprehensive schools. $N = 43$ municipalities with different educational and socio-economic backgrounds.	Two-part survey, questionnaire sent to representatives of the education and business sectors.	The results indicated that an atmosphere of responsibility for implementing entrepreneurship education is developing, although teachers do not possess knowledge of how to implement entrepreneurship education in practice.	To develop such new curricular fields, such as entrepreneurship education, it is possible to develop partnership forms of curriculum reform to develop teachers' learning, school/work partnerships and local curriculum work.
Seikkula-Leino et al. (2012)	<ul style="list-style-type: none"> - Basis for developing the European Union. - Social and economic well-being. 	Described the ways in which entrepreneurship education was included in the curricula of Finnish teacher training.	The curricula of academic and vocational teacher education providers in September and October 2010.	Content analysis was used to interpret data.	The inclusion of entrepreneurship education has developed relatively effectively in the curricula of vocational teacher training units. The number of academic teacher education units has not really increased.	As an implication for practice, the authors proposed that there should be more support for curriculum design in higher education at both the national and EU levels.

Appendix A (Continued)

Reference	Concept of pedagogical entrepreneurship	Focus of attention	Setting (type of school, teacher education), number of participants	Method, data sources	Identification of research challenges	Reasons for research challenges
Seikkula-Leino et al. (2010)	The European Union highlights the importance of developing an entrepreneurial culture by fostering the right mindset, entrepreneurship skills and awareness of career opportunities.	Investigated how entrepreneurship education focuses on the teacher's learning and reflection.	29 teachers at the basic, upper secondary and vocational levels.	Qualitative approach: texts based on subjectivist ontology.	Teachers stress the need for coordination between subjects in developing a more entrepreneurially oriented working community. There appears to be confusion between the aims and practices of entrepreneurship education.	The approach taken to teacher learning and reflection in the context of entrepreneurship education has so far been an unexplored field of research.
Seikkula-Leino et al. (2015)	The concept of entrepreneurship is ambiguous and no consensus has been reached. Entrepreneurship education should be considered both as a method and content of learning.	To ascertain how the people who train Finnish teachers implement entrepreneurship education in the guidance they provide.	Teacher educators and training teachers ($N = 100$) for vocational and general education, to rectors and managers.	Quantitative survey, questionnaire.	The teacher educators used a relatively large number of pedagogical models and methods pursued in entrepreneurship education, such as problem-based learning, experiential and practical descriptions of situations. They also encouraged students to take responsibility and to be self-directed.	It would be appropriate in entrepreneurship education to take account of prospective teachers' authentic experiences of entrepreneurship. For example, in teacher training increased attention could be given to practical enterprises, cooperative operations, on-the-job learning and methods such as the Young Enterprises business incubator.
Sjøvoll and Pedersen (2014)	Entrepreneurship is a mindset and set of skills in terms of creativity and personal development.	Can the leader turn apparent problems into challenges and challenges into creative opportunities?	Interviews with six school leaders who had also been students at courses in pedagogical entrepreneurship.	Interviews and text analysis in two major steps. 'Grounded theories.'	The entrepreneurship course is regarded as a key factor in the implementation of pedagogic entrepreneurship.	For entrepreneurship to flourish, a supportive environment is needed.

Appendix A (Continued)						
Reference	Concept of pedagogical entrepreneurship	Focus of attention	Setting (type of school, teacher education), number of participants	Method, data sources	Identification of research challenges	Reasons for research challenges
			Primary and lower-secondary schools.		Teacher attitudes are regarded as a greater challenge than structural conditions, but the subjects nevertheless focus strongly on structure.	The strengthening of local education is of great importance.
Van der Heijden et al. (2015)	Teachers as change agents; personal characteristics.	Teachers play a key role in realising successful changes in education. The study aimed to obtain insights into the characteristics of these teachers.	Teachers in primary schools. Four external parts, four principals of four selected schools, and 12 teachers from these schools.	An exploratory study and interviews. Data were analysed qualitatively with the help of the MAXQDA computer programme.	Four general characteristics were derived from the literature: lifelong learning, mastery, entrepreneurship and collaboration appeared to be helpful for categorisation. Teachers as agents of change seem to be distinguished by the way in which they practise and by being innovative and eager to learn.	Teacher education and schools may benefit from knowing the characteristics of teachers as agents of change.
Theses						
Backström-Widjeskog (2008)	The teachers emphasised students' inherent capacity for individual enterprise and stressed that the task of school was to reinforce this capacity through support and encouragement while simultaneously promoting social and functional enterprise.	The study's research objective was to establish what teachers think and value about enterprise education and how they feel they can support students in their development of an enterprise initiative.	Compulsory school teachers ($N = 32$).	Qualitative: interviews.	The question of how teachers understand the phenomenon is of significance for how they value it.	The results showed that teachers' ability to reassess and change their manner is influenced by their knowledge/skills and the awareness they have of the interpretive possibilities that enterprise education manifests.

Appendix A (Continued)

Reference	Concept of pedagogical entrepreneurship	Focus of attention	Setting (type of school, teacher education), number of participants	Method, data sources	Identification of research challenges	Reasons for research challenges
Eide (2013)	To uncover defects and withstand failure, be initiative- and action-oriented and turn ideas into action.	Pedagogical entrepreneurship as an instrument for local and regional development.	Compulsory school teachers ($n = 30$), pupils ($n = 8$), leaders from the fishing industry ($n = 4$), municipal leaders ($n = 3$) and youth entrepreneurship ($n = 3$).	Qualitative: interviews.	The lack of continuity in the commitment to teaching entrepreneurship is a problem.	Positive experiences with pedagogical entrepreneurship in itself is not sufficient to ensure continuity, but is related to how it is anchored within and outside school.
Leffler (2006)	Ability to take action, initiative, risk-taking, creativity, innovativeness, cooperativeness.	What does the concept of entrepreneurship mean and how is it expressed in Swedish schools?	Compulsory schools ($n = 4$), principals ($n = 4$), teachers ($n = 12$), pupils ($n = 68$).	Qualitative: document analysis, observations, interviews.	Different degrees of teacher motivation; teachers fear losing control over their teaching and schoolwork.	Instead of transferring the 'new aspects', the project was expected to contribute to the current discourse, the 'old' and already well-known aspects were transferred to the new discourse. Consequently, the projects themselves did not result in a comprehensive change of the discourse.
Mahieu (2006)	To create, think differently, have new ideas, be active, see possibilities, start something, be self-employed.	Examined how the concept of entrepreneurship in education is justified and presented in policy documents at different levels.	National and regional levels. Subnational stakeholders (teachers, school leaders, lecturers, local authorities, etc.) who participated in the formation at the local and regional levels ($N = 9$).	Qualitative: document analysis, interview.	Entrepreneurship has gained acceptance across the political spectrum.	Both supranational and subnational agencies have had great influence on entrepreneurial policies and practice. The national level has had less direct influence.

Appendix A (Continued)						
Reference	Concept of pedagogical entrepreneurship	Focus of attention	Setting (type of school, teacher education), number of participants	Method, data sources	Identification of research challenges	Reasons for research challenges
Røe Ødegård (2012)	<ul style="list-style-type: none"> - Cooperation. - Problem-based. - Experiential. - Results-oriented. - Interdisciplinary. - Active. - Heuristic. - Creative. - Employable. 	<p>How the concept of entrepreneurship in education is justified and understood in teacher education in Norway and Namibia.</p> <p>How entrepreneurship is expressed in teacher education.</p>	<p>Teacher education: deans, lectures, students ($N = 20$).</p> <p>Documents.</p>	<p>Qualitative: interviews and document analysis.</p>	<p>Motivates students and increases learning outcomes.</p> <p>Resistance, stress, economy.</p>	<p>Entrepreneurial competence is considered crucial to facing the future in a constantly changing world.</p>