Understanding teacher entrepreneurial behavior in schools: Conceptualization and empirical investigation

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Abstract

The quasi-market condition of education intensified the need to seek ongoing school improvements, manage uncertainty, and innovate school-wide pedagogy and curricula. Sequentially, interest in teachers' entrepreneurial behavior (TEB) has grown rapidly in recent years, which established the importance of entrepreneurial behavior as an effective response to the changing, uncertain, and increasing demanding context in the education system. However, the notion of TEB has not been clearly conceptualized or operationalized. This study attempted to offer a clear definition of TEB and identify its conceptual components. We first offered a semi-systematic literature review of entrepreneurial behavior, and then conducted a multiple-site case study at three schools in Hong Kong. We identified three competency components and three attribute components of TEB, from which we established a conceptual definition of TEB. This clarification of TEB and its components enabled the linkage to prior literature and future research.

Introduction

Schools face increasing expectations from the government and parents in a quasi-market condition of education, characteristic of rising competition and accountability among schools (Allen and Burgess 2010; Deming and Figlio 2016; Woessmann 2007). These social expectations intensify the need to seek ongoing school improvements, manage uncertainty, and innovate school-wide pedagogy and curricula (OECD 2011; Seals et al. 2017). Meanwhile, teachers' own desire to improve the quality of learning motivates them to develop in-school or in-classroom innovations (Chand 2014). Both extrinsic and intrinsic factors can motivate teachers to be more

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innovative. These challenges are not unique to the education sector, as business sector employees also need to adapt to increasingly uncertain and independent working contexts (Kuratko et al. 2005). Business research shows that in well-established firms entrepreneurial employees have a strong sense of identifying opportunities in an uncertain environment and making calculated decisions (Barbosa et al. 2007; Boyd et al. 1994; Kirkham and Binks 2011; Zhao et al. 2005). They generate innovative ideas to enhance their operational processes and the quality of their products or services (Hamel et al. 1994; Grant 1996). They also closely monitor the processes of implementation to ensure that these innovative ideas are realized (Dess et al. 2005; Bosma et al. 2010). These findings indicate that entrepreneurial behavior can be an effective response to changing contexts (Maguire 2004; Koene 2006; Zahra 1991) and constitutes a necessary form of human capital for organizational growth (Alpkan et al. 2010; Branunerhjelm et al. 2018). The significance of employee entrepreneurial behavior (EEB) in changing contexts is increasingly recognized, and studies of entrepreneurial behavior have been extended to educational organizations (Grohs et al. 2015 Lumpkin et al. 1996; Lurtz et al. 2017).

Interest in teachers' entrepreneurial behavior (TEB) has grown rapidly in recent years (Chand et al. 2006; Ehrlin et al. 2016; Van Dam et al. 2010; Kurniawan et al. 2017). Eyal et al. (2003) identified the significance of entrepreneurial behavior in the education system, particularly among teachers, and highlighted the importance of understanding and measuring the entrepreneurial inventory in the school context. Other researchers have investigated the effects of TEB, which include enhancing teaching performance (Chand et al. 2006; Hietanen 2015; Neto et al. 2017), strengthening schools' competitive advantages (Martin et al. 2017), promoting job satisfaction (Hietanen 2015; Martin et al. 2017; Neto et al. 2017), and facilitating organizational learning (Chand et al. 2006; Hietanen 2015; Martin et al. 2017). However, due to the lack of clear conceptualization and operationalization of TEB, researchers have generally applied the conceptual ideas and measures developed in the business literature when examining its effects. Even the two most recent studies of TEB by Neto et al. (2018) and Van Dam et al. (2010) applied the EEB measurement to study the predictors and outcomes of TEB. We suggest that the conceptualization and operationalization of TEB should be distinguished from those of EEB, because teachers' working contexts, processes, and products are very different from those of employees working in commercial organizations. Indeed, EEB and TEB differ in that the former creates economic value and the latter creates social value. Whilst economic value is defined in terms of profit making, social value is defined in terms of student development, community health, more efficient public service delivery, etc. (Chand 2014).

Thus, the aim of this study was to investigate the components of TEB and consequently develop a conceptual definition. The following research questions are addressed:

RQ1 What is the conceptual definition of TEB?

RQ2 What are the components of entrepreneurial behavior in a school context?

The conceptual definition of TEB

Research into conceptualizing TEB is rare (Keddie 2018), so we conducted a broader review of mainly business literature as a conceptual foundation for exploring entrepreneurial behavior in the school context. We searched the concept in the business sector using the terms entrepreneurial behavior, innovation, employee entrepreneurship, entrepreneurial teachers, teacher intrapreneurship, teacher entrepreneurial spirit, teacher entrepreneurial intention, and "EduPreneur" with both British and American English spellings. We also searched for definitions of entrepreneurial behavior and entrepreneurship from previous decades to establish how these definitions have developed over time.

Establishing a conceptual definition of TEB is difficult as there is no agreement on what entrepreneurial behavior actually means. Initially it described the character of the entrepreneur in terms of self-realization (Cuervo et al. 2007; Lundström et al. 2010; Wadhwani 2010), but over the past 40 years it has been extended to the employee level and developed into EEB, in which innovation is embraced and risks are assertively taken to turn an idea into new products, services, or businesses (Antoncic et al. 2001; Block et al. 1993; Brazeal 1993; Neessen et al. 2018; Rigtering et al. 2013; Wakkee et al. 2010).

Conceptual definitions of EEB in the business literature differ greatly. Antonic et al. (2003) conducted a systematic review of 23 empirical entrepreneurship and intrapreneurship studies, and found that entrepreneurship has a very broad meaning. It can refer to establishing a business or to the personality of an entrepreneur/employee in an organization. Thus, Antonic et al. (2003) defined intrapreneurship as entrepreneurship within an existing organization, referring to emergent behavioral intentions and behavior within an organization. Kobia et al. (2010) conducted a literature review of 98 entrepreneurship articles, and attempted to categorize entrepreneurship into traits, behaviors, and opportunities. However, they concluded that there is no common definition of entrepreneurial behavior in the literature. Gündoğdu (2012) reviewed 44 articles and scholarly books about entrepreneurship, intrapreneurship, and innovation, and proposed the term "innopreneur" to describe a person who can seize opportunities through innovation and persistence. Landström and Benner (2010) suggested that the inconsistency and confusion in conceptually defining EEB and entrepreneurial behavior should be addressed directly by the researcher rather than through a set of numerous "right" problematizations.

The conceptual elements of TEB

The study of Eyal et al. (2003) first summarized previous qualitative studies on the entrepreneurship of principals and can be regarded as a milestone in the study of the conceptual elements of TEB. Chand (2014) argued that EEB (in the business sector) and TEB (in education; ostensibly a public or quasi-public good) differ in the source of incentives for entrepreneurial behaviour. For instance, Chand (2014) located 'the incentive for innovation in the social value that socio-educationally entrepreneurial

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and innovative behaviour of teachers creates'. Many related studies have since been conducted, and thus our search covered literature published between 2003 and 2019. Kuratko et al. (2005) first summarized previous studies in the field of business and developed the conceptual model of employee entrepreneurial behavior (EEB) within an organization. To further assess research into innovation in education, some articles after the year 2000 were also reviewed to clarify the concept. Thus, we review the business studies literature from 2000 to 2019. We present our findings regarding recent theoretical assessments of TEB in terms of innovative teachers in Table 2. There is generally a consensus in the literature that the following elements are relevant to entrepreneurial behavior: initiating innovation, risk-taking, managerial skill, autonomy with a positive attitude, and seeking external resources (Table 1).

Initiating innovation seems to be an element of entrepreneurial endeavours. Most business studies have included innovativeness as a component of entrepreneurship-related orientation or behaviour (Kropp et al. 2008; Morris 2015; Mustafa et al. 2016). In the context of higher education, Hayet et al. (2015) adapted a scale of entrepreneurial orientation to include innovativeness as the first of three dimensions of teacher entrepreneurial orientation. To address difficulties in teaching and learning, teachers gather further information (Rherrad et al. 2008; Wiklund et al. 2003) and generate new teaching and learning pedagogies (Hayat et al. 2015; Oplatka 2014). These educational innovations frequently offer new ways of doing both old and new tasks, and can provide a basis for school reform through idea promotion (Hayat et al. 2015). Taking an in-depth qualitative approach, Eyal and Yosef-Hassidim (2012) used the notion of 'innovation champions' to describe the innovation achievements of entrepreneurial teachers. Although entrepreneurial strategies vary between schools, entrepreneurial teachers often generate creative ideas. However, recent research has suggested that entrepreneurial teachers do not necessarily author innovative ideas; instead, they may identify opportunities within and beyond schools that are overlooked by others (Neneh 2019) and/or create knowledge communities to establish a domain consensus that actualises innovation for a school-wide impact (Chand 2014). Given these inconsistent findings, we pay special attention to the source of innovative ideas in our research.

Risk-taking drives innovation in an organization (Bosma et al. 2010; Davis et al. 2016). In general, risk-taking can be defined as an orientation to explore something new, even if a positive outcome is not guaranteed (Dess et al. 2005; Sayeed et al. 2003). This interpretation scares most teachers, as they have a negative perception of risk-taking as threatening, dangerous, and uncertain (Erikson 2001). The TEB and EEB literature has thus attempted to clarify this misunderstanding about the meaning of risk-taking (Jain et al. 2013; Neto et al. 2017; Rekha et al. 2014; Weber et al. 2013). Teachers' risk-taking orientation has been found to play a pivotal role in their innovative behavior (Neto et al. 2017). They may acquire information about events occurring inside and outside their organizations, so they can stay abreast of competitive trends and future changes to the educational environment (Anderson et al. 2000; Weber et al. 2013). They then calculate the potential loss and balance the risk and return, to assess whether the calculated risk is an opportunity (Hayat et al. 2015; Martin et al. 2017; Neto et al. 2017). Once this is confirmed, they seize this opportunity and frame it within a possible innovation that may enhance educational

Table 1 Summary of literature on the attributes of teacher entrepreneurial behavior

Elements of TEB	Literature synthesis	Difference from EEB	References
Innovation	Readiness of innovation: Teachers are willing to implement new teaching and learning strategies Examining the difficulties in teaching: Teachers recognise the problems with traditional teaching practices in schools Process of innovation (Idea generation and idea promotion): Teachers generate ideas by themselves or by learning from others and/or package these ideas and promote them among colleagues	Recognize similar findings as in the business sector, especially the process of generating idea	Anderson et al. (2000), Eyal et al. (2003), Sayeed et al. (2003), Howell et al. (2004), Dess et al. (2005), Rherrad et al. (2008), Webber et al. (2008), Borasi et al. (2010), Bosma et al. (2010), Eyal et al. (2012), Jain et al. (2013), Weber et al. (2013), Oplatka (2014), Rekha et al. (2014), Hayat et al. (2015), Martin et al. (2017), Neessen et al. (2018)
Risk-taking	Scanning internal and external environment: Teachers gather information from within and outside the school to support innovative ideas Analyzing opportunities: Teachers recognise opportunities to develop innovative ideas Taking action: Teachers have the self-efficiency they need to take risks to try out innovative ideas	Unclear meaning of educational risk: Education studies have not clarified what type(s) of risk teachers should expect to bear	Anderson et al. (2000), Sayeed et al. (2003), Dess et al. (2005), Borasi et al. (2010), Bosma et al. (2010), Jain et al. (2013), Weber et al. (2013), Rekha et al. (2014), Hayat et al. (2015), Davis et al. (2016), Martin et al. (2017), Neto et al. (2018), Neessen et al. (2018)
Autonomy with positive attitude	Taking initiative to promote change: Teachers are proactive in deploying innovative strategies and advocating change at schools Practicing optimistic thinking even when facing adversity: Teachers are optimistic even when they encounter internal resistance from others	Promote various attitude toward degree of freedom: Business studies have emphasised the connection between degree of freedom and autonomy. The degree of freedom serves as an external intrinsic factor promoting autonomy. Education studies have implied that autonomy is a matter of teachers' belief Accomplish objective on their own: Education studies have found that teacher can actualise their innovative ideas alone	

Table 1 (continued)

Elements of TEB	Literature synthesis	Difference from EEB	References
Managerial skill	Managing resources: Teachers gather and prepare resources to execute innovative ideas Planning for action: Teachers play the leading role, as change agents with vision, in developing an implementation plan Practising communication skills: Teachers use their emotions and behaviour to persuade other teachers to form a network for actualising the planned innovation	Education studies have addressed multiple managerial tasks and skills (such as managing resources, planning, and communicating) separately and piecemeal, without providing a consolidated account	Anderson et al. (2000), Sayeed et al. (2003), Webber et al. (2008), Borasi et al. (2010), Mitchelmore et al. (2010), Van Dam et al. (2010), Weber et al. (2013)
Seeking external resources	Exploring financial support: Both business and education studies have found that teachers/employees are not constrained by resources. They commonly seek external financial support for implementing innovative ideas	Seek financial resources only: Whereas education studies have suggested that teachers seek financial support only, business studies have argued that employees also seek support in the form of human resources	Sayeed et al. (2003), Howell et al. (2004), Borasi et al. (2010), Van Dam et al. (2010), Jain et al. (2013), Neessen et al. (2018)

Table 2 Description of case schools and data structure

Cases	Innovation domains	Data collection channel	Sources of data	Description of the data
Case 1: 40 years, traditional school	Develop school-based curriculum for mathematics subject: Merge subject-based social media into teaching and learning	Interview	One entrepreneurial teacher	Mathematics subject coordinator for 20 years
			Principal	Serving as Principal in the schools for 10 years
			Vice-principal	Vice-principal for over 15 years
			Three core team teachers	Working with the entrepreneurial teacher for over 10 years
			Three mathematics subject teachers	Mathematics subject teachers with 3–5 years teaching experiences
		School's documents	Mathematics subject plan and report	State the rationale, design, and impact of the innovation
			Newsletter and publicity materials	Indicate the impact of the innovation
			Teaching Video and Subject-based textbook	Illustrate the integration of innovation into the curriculum
		Other	Students work and lesson observation	Indicate excellence in student learning performance
Case 2: 150 years, prestige school	Develop school-based curriculum for all subjects: Integrate "reading to learn" and "gifted and self-direct learning" into all subject curricula	Interview	One entrepreneurial teacher	Curriculum coordinator for 16 years
			Principal	Serving at the same school for 35 years and serving as Principal for 18 years
			Vice-principal	Vice-principal for over 8 years

Table 2 (continued)

Cases	Innovation domains	Data collection channel	Sources of data	Description of the data
			Four subject coordinators	Working with entrepreneurial teacher for over 16 years
		School's documents	School plan and report for the school-based curriculum	State the rationale, design, and impact of the innovation
			Compendium of the innovative curriculum	Indicate the whole development of the innovation from 2004 to 2014
			Subject-based textbook	Illustrate the integration of innovation into the curriculum
		Others	Students work and lesson observation	Indicate high, middle, and low student learning performance
Case 3: Special needs school (moderate mental disability)	Develop whole-school supporting scheme: Integrate musical and occupational therapy in teaching and learning for every subject	Interview	Two entrepreneurial teachers	Subject coordinator for 8 years IT coordinator for 6 years
			Principal	Serving as Principal in the schools for 25 years
			Three core team teachers	Working with entrepreneurial teachers over 3 years
			Social worker	A supporting member with 9 years' experiences
		School's documents	School plan and report for the supporting scheme	State the rationale, design, and impact of the innovation
			Newsletter	Indicate the teachers and student achievement
			YouTube videos, teaching notes, instruments, and teaching guides	Illustrate the integration of innovation into the curriculum

Table 2 (continued)

Cases	Innovation domains	Data collection channel	Sources of data	Description of the data
		Others	Students work and lesson observation	Indicate student learning performance

performance in schools (Borasi et al. 2010; Rekha et al. 2014; Weber et al. 2013). Although the risk-taking mechanism of TEB is similar to that of EEB, these education studies still do not clarify the meaning of risk in the education sector (Martin et al. 2017). This is a research area that should be addressed.

Autonomy with positive attitude is the third element of entrepreneurial behavior we identified from business and education studies. Business articles describe autonomy as a certain degree of freedom that is granted in businesses that are forward-looking, thus encouraging innovative ideas to gain advantages over the competition, create change, and shape the environment (Jain et al. 2013; Rekha et al. 2014). These objectives are achieved through actively promoting them and by supporting possible collaborators (Bosma et al. 2010; Dess et al. 2005; Howell et al. 2004) with a positive attitude (Davis et al. 2016). The studies indicated that autonomy in terms of EEB relies on the degree of freedom, and is also the main contributing factor in mobilizing cooperation with colleagues to accomplish goals. Thus, in the education context, autonomy with positive attitude refers to teachers' beliefs that they are capable of being pro-active in pursuing work objectives, rather than simply surviving in their work (Hayat et al. 2015; Weber et al. 2013). The study of Eyal et al. (2012) further clarifies that the scale of an innovative idea determines how entrepreneurial teachers apply their autonomy in schools rather than the degree of freedom embedded in schools. They have the courage to voice and conduct their ideas of change and become the initiators of change in schools (Eyal et al. 2003; Oplatka 2014). During the process of promoting their innovative ideas they may encounter resistance from other teachers, but entrepreneurial teachers will consider the positive impact an innovative idea may have and thus be eager to accomplish their goals, even if on their own (Oplatka 2014).

Managerial skill

Discussions concerning managerial skill in terms of TEB are comparatively fewer than those focusing on innovation and risk-taking, and are thus insufficient for fully understanding TEB in terms of managerial behavior. The findings of business studies suggest that managerial behavior in terms of EEB is an integrated set of skills, knowledge, and attributes for organizing and motivating such as personal skills and leadership, which are the keys to innovative success (Anderson et al. 2000; Man and Lau 2002; Mitchelmore and Rowley 2010; Sayeed et al. 2003). TEB managerial skills are in general identified as leading, decision making, problem-solving, managing, networking, etc. (Borasi et al. 2010; Van Dam et al. 2010; Weber et al. 2013). To assess the diverse meaning of this behavior, and for the convenience of the study, we identify this TEB as managerial skill. Some entrepreneurial teachers, whether they hold positions of control or not, are also responsible for ensuring the quality of outcomes are as planned (Neto et al. 2017; Van Dam et al. 2010; Weber et al. 2013). The literature indicates that all entrepreneurial teachers manage and organize resources in preparation for their innovative objectives (van Dam et al. 2010; Webber 2008). They are responsible for or contribute to setting strategic plans and make decisions regarding teachers' work programs that aim to achieve innovative goals (Borasi et al. 2010). They also typically exercise communication skills and

networking strategies when working with other teachers, to transform their innovative pedagogy into practice through the process of actualizing the plan (Borasi et al. 2010; Weber et al. 2013). The above findings mainly illustrate the multiple applications of TEB in planning and managing innovative ideas, but they are not consolidated sufficiently to present the whole picture of the role of managerial skills in TEB.

Seeking external resources

Studies indicate that entrepreneurial teachers are not restricted by limited resources at school, such as monetary support (Borasi et al. 2010; Van Dam et al. 2010). Teachers who exhibit TEB were found to seek outside financial support for their innovative ideas. This is also found in the EEB of the business sector. However, the resources available to the business and education sectors are very different. EEB may encourage the gathering of diverse human and financial external resources from different sources to accomplish their task of increasing profits (Jain et al. 2013; Howell et al. 2004; Sayeed et al. 2003), while TEB will only be aimed at acquiring financial resources. The reasons for these limited findings are unclear and should be further explored, and they may be related to the research focus or to the context of education.

In summary, although TEB is similar to EEB, the contextual differences between the business and education sectors leads to distinctions between the conceptual meanings and components of TEB and EEB. The five conceptual elements of entrepreneurial behavior we drew from the business and education literature provide a useful theoretical foundation for addressing our two research questions.

Research methodology

The research site

This study focuses on Hong Kong, where schools have experienced social and educational transformations that share many characteristics with global changes. Faced with increasing accountability and a declining birth rate, competition in schools is prevalent (Ho and Lu 2019; Legislative Council 2003). To survive, they must provide high-quality education services, and engage in "trending" practices such as such as autonomous learning, e-learning, and catering to minority groups (Cheng 2009; Education Bureau 2018). Whether teachers can develop innovative teaching and other new learning experiences for students is thus critical in meeting societal expectations and attracting talented pupils.

Hong Kong's educational policy defines the goals and priorities of high-quality education services. The government encouraged schools to follow an open and flexible curriculum guides to develop their school-based curricula in designated learning areas (Education Commission 2000). Schools are expected to adapt the central curriculum by varying the organization of contents, offering optional studies, and readjusting learning, teaching, and assessment strategies. The implementation of

the school-based curriculum has been an endeavoring interplay of meeting the central curriculum and excising the professional autonomy of the schools and teachers. In 2019, the Hong Kong government now promotes the 'T-standard+' developed by the Committee on Professional Development of Teachers and Principals, which emphasises teaching professionals' role as 'edupreneurs'. Furthermore, the government has implemented various measures, such as training, financial incentives, and awards, to encourage and facilitate teachers' engagement in innovative-related initiatives. Various training and projects are available for teachers, through which they can acquire new competencies in promoting innovative teaching and learning. Teachers can also apply for the Quality Education Fund (QEF) to pilot and implement innovative ideas. The Chief Executive Award for teaching excellence (CEATE) organized by the government recognizes innovative teachers who demonstrate exemplary teaching practices. The policy and facilitative measures encourage teachers to be entrepreneurial in schools.

Methods

We used a multiple-site case study design (Best et al. 2006; Green et al. 2006; Miles et al. 2020) to examine how teachers enacted entrepreneurial behavior and to identify the pattern of their behavior at school. We used purposeful sampling (Creswell 2002) and set semi-structured selection criteria to identify entrepreneurial teachers from primary and secondary schools in Hong Kong. These criteria were (1) practicing radical innovation in a changing environment, and (2) demonstrating managerial skills when collaborating with colleagues. The term 'radical innovation' suggests that teachers must generate large-scale innovation with an impact on the whole school. 'Managerial skills' refers to the wide range of organisational and leadership skills that teachers must deploy to work effectively with other teachers. To narrow the scope of selection, we first identified innovative teachers from the list of CEATE awardees. This award is held annually by the Education Bureau to recognise teachers/teacher groups who have demonstrated exemplary teaching practices. Every awardee is required to produce a booklet describing his/her achievements, which must cover the design and scale of his/her innovation and his/her leadership activities. These booklets enabled us to assess the two above-mentioned criteria. To ensure the timeliness of the data, we selected a sample of awardees from a 3-year period (2014–2017). The awardees were drawn from a wide range of teaching domains, such as special education, moral education, and curriculum development. A professional judging panel composed of 2 former CEATE judging panel members (before 2014) and 3 researchers with expertise in educational leadership and innovation identified 15 awardees who had demonstrated clear accomplishments in terms of radical innovation. We then formed an external audit panel (comprising entrepreneurship scholars and experienced principals) to further rank the selected awardees using the above-mentioned two criteria. We started by approaching the entrepreneurial teachers/teacher groups ranked the highest by the audit team. Luckily, the three schools whose representatives ranked the highest all agreed to participate in the study. The awardees' focal entrepreneurial domains are reported in Table 2.

Data collection

We used triangulation as a strategy to enhance the validity of our research. Three methods were used and act as checks on each other, to determine if methods with different strengths and limitations all support a conclusion (Maxwell 2012). We interviewed three groups of participants: entrepreneurial teachers, principals, and colleagues. We also collected other evidence including school documents (plans and reports), students' work, and class observations to triangulate interviewees' statements. Based on their responses, we approached the participants to provide additional evidence as visual data (Atkinson et al. 2005), to support their claims and facilitate an understanding of the TEB activities. The sources and types of data collected from the participating schools are reported in Table 2.

Data analysis

Data were analyzed by using three concurrent types of activity following the collection (Miles et al. 2020): data reduction; data display; and conclusions. This analysis is aimed at extracting and transforming the data to code, organize, and draw patterns and themes for conclusions and action, and verifying a conclusion by noting regularities, patterns, explanations, and causal flows. To enhance the validity and trustworthiness of data, the analysis was conducted in two stages.

The first stage took place at the research site to ensure the validity and trustworthiness of the data. Reflective memos were written after interviews as temporary data reduction to reflect the connection between theoretical, methodological, and substantive issues (Bogdan et al. 1992). The data display strategy was used to check the data sources and verify accuracy. Interim case summaries were also confirmed with the participants to ensure that the notes reflected their authentic views (Corbin et al. 2014).

In the second stage of analysis, we engage in critical self-reflection about potential biases and predispositions (Ashmore 1989), particularly in the coding process. We reviewed the literature review and the materials of the first stage of analysis to categorize codes for developing a codebook (Miles et al. 2020). The codebook was sequentially reviewed by our external audit to ensure the trustworthiness of the code and its description (Johnson et al. 2008). We reduced the data by identifying descriptive, interpretive, and pattern codes. We then used the analytic technique of pattern-matching to determine the theme of these patterns (Green et al. 2006) and the concept map to discover the interconnections among themes and patterns (Creswell 2017). In the conclusion process, temporary findings were established to answer the research questions on the meaning of TEB and its enactment. We could thus conceptually define the meaning of TEB with the support of the findings (the "dimension and reification" of TEB).

Based on the analysis, we then present the conceptual elements of TEB, which serve as the foundation of the conceptual understanding of TEB. A conceptual definition can be viewed as having "dimension" where there is multiple "reification" that makes up a single concept (Blackstone 2012). Dimensions involves the combination

of several reifications into a category of measures. Reification assumes that abstract concepts exist in some concrete, tangible way. To identify the dimension and reification, inductive and deductive approaches are required (Miles et al. 2020; Furman 1990). We used the literature review as the inductive approach to grasp an initial understanding of the conceptual meaning of TEB. Based on the review, we collected data and identified the pattern from the context. Second, we took a deductive approach (Glaser 2002) to identify the theme and patterns in the data. Third, the literature served as the theoretical element for us to re-conceptualize the meaning. We trained backward and forward along the literature, theme, and pattern to identify the reification and to categorize the dimension. Finally, we traced back to the context, such as time, place, and people, to enhance the definition of TEB within the appropriate context.

Findings

We found that entrepreneurial teachers demonstrated six conceptual elements of TEB when accomplishing radical innovations in their schools. These elements can be divided into two dimensions: the competencies and attributes of TEB. The "competency" perspective implies that teachers possess important skills that are necessary to execute their innovative ideas: coordinating efforts; seeking resources; and advocating innovation. The "attribute" perspective assumes that teachers demonstrate qualities or characteristics that lead to certain behaviors when actualizing the innovative idea: ownership-enthusiasm, risk-taking, and humility-confidence. These two subcategories offer an integrated picture of TEB in the education sector through our interpretation as researchers. Their respective definitions, pattern categories, and supporting quotes are summarized in Tables 3.

Competency: Coordinating efforts

The cases all show that entrepreneurial teachers are strategic coordinators, and promote innovative directions, cooperate with colleagues, recognize colleagues' concerns and strengths, and stimulate staff morale as leaders. These entrepreneurial teachers had a clear direction when developing the new curriculum and schemes. They were not only good at dealing with management issues through their well-organized behavior, but also advocated and tried new teaching and learning practices in their schools. From their viewpoint, equipping and mobilizing teachers to engage in the new curriculum is the critical issue. Thus, entrepreneurial teachers always consulted other teachers so they could understand their concerns in adopting new instructional strategies or modifying the curriculum. They then reflected on their strategies and consolidated the innovative ideas. Thus, an entrepreneurial teacher played the role of facilitator in addition to leader. Significantly, in terms of coordinating efforts, entrepreneurial teachers stimulated the reflection of other teachers during the process of coordinating the innovative idea. The reflective thinking process is a combination of problem formulation, the individual and collective analysis

Table 3 Summary of findings in coordinating efforts

Findings of TEB components	Pattern category	Representative quotes	Corroborating literature
Competencies—Coordinating efforts: Entrepreneurial teachers make decisions for their school, cooperate with teachers, recognize colleagues' performance, enhance staff morale, and stimulate reflection as leaders	Visionary in directional persistence	"We (Subject teachers) had a meeting with her. I found that she sticks to her beliefs and blueprint. That's clear and concrete for us. No one can change her mind." (Case 2 Chinese subject coordinator)	Managerial skill: Deal with management issues and lead the way in addressing management difficulties to achieve the goal
	Well-organized in managing a team	'We believe in our subject coordinator. She is a systematic person and every decision she makes is supported by rational thinking. She has a good reason for each decision' (Case 1 Mathematics subject teacher 2). 'He is caring; he understands your difficulties in making such changes. Therefore, he asks your opinion and decide a reasonable workload for you. Everyone performs in the right position' (Case 3 Core team teacher 1).	
	Piloting ideas to create successful experiences	"For the first year, we tried the school-based curriculum with our core members only. If it works, we promote it to other teachers." (Case 1 Mathematics subject teacher 1).	

Table 3 (continued)

Findings of TEB components	Pattern category	Representative quotes	Corroborating literature
	Leading by being role models to convince teachers	"You can see that all of us are hardworking. No one can be the lazy one. …. She is the reason. She remembers everything. For example, every subject has a memo for the special function. We need to report it. You won't forget it because she won't forget. We trust her. She never … nearly never forgets things. We want to work with her." (Case 1 Mathematics subject teacher 3).	
		'He knows the problems involved. He offers a good example that persuades colleagues to adopt the new pedagogical strategies' (Case 3 Social worker).	
	Facilitating and stimulating teachers' reflection	"She will remind you what the problems are. It is not a mistake. Some people may think that is a challenge, but she listens to your ideas and we come up with solutions together. We work closely together while we are developing materials. We agree and accept gratefully." (Case 2 English subject coordinator).	

Table 3 (continued)

Summary of findings in seeking resources

Findings of TEB components	Pattern category	Representative quotes	Corroborating literature
Competencies—Seeking resources: The capability of seeking, gathering, and utilizing the internal and external resources for developing innovative ideas.	Internal expertise and assistance	"At the beginning, I spent so much time on the production … We are so lucky that we got a teaching assistant. He has many ideas and is good at drawing. We find him and seek his assistance. … He is a good assistant, he makes things happen. Once we have an idea, he will handle all the technical stuff for us." (Case 1 Entrepreneurial teacher).	Seeking external resources: Expand network for gathering resources.
	External expertise and assistance	"In addressing the problem, we seek for expert assistance. Honestly, we only gain ideas from them. They may not be that relevant… It finally becomes our school-based material." (Case 2 Entrepreneurial teacher).	
	Other schools' materials	"She has some friends from other schools. When we think about how to teach a specific topic, she will collect other schools' material for us. … We will tailor-make subject-based materials after reviewing other schools' resources." (Case 1 Mathematics subject teacher 2).	
	Seeking external resources	"For the learning project, we applied to the QEF. To ensure the possibility of success, she approached the professor from the Education University of Hong Kong to guide the proposal." (Case 2 General studies subject coordinator).	

Table 3 (continued)

Summary of findings in advocating innovation

Findings of TEB components	Pattern category	Representative quotes	Corroborating literature
Competencies—Advocating innovation: Innovation is the process of identifying innovative ideas and integrating professional knowledge, resources, inspiration, and school context that leads entrepreneurial teachers to continuously shift away from the existing practices and formalize the curriculum until they have contextualized it for the students.	Learning from and contextualizing expertise ideas into the school context	"I don't know what curriculum planning is. That's fine. I decided to take courses and learn from curriculum experts. They are the professor from university or officer from education bureau. … I learn a lot, but I need to revise this knowledge to fit schools' needs." (Case 2 Entrepreneurial teacher).	Innovation: What was the outcome of new ways of doing the old or new task?
	Transferring professional knowledge in teaching	"He is an occupational therapist. He has new ideas to help students develop their living skills. He combined the ideas of occupational therapy with teaching." (Case 3 Social worker). 'I know that he is a musical therapist. He is skilled in managing students' misbehaviour through musical performance' (Case 3 entrepreneurial teachers, subject coordinator).	
	Continuously modifying the ideas	"We are able to voice our concerns that something may not work. …After we try it out, they will take our advice to revise their decision. We want to make things better." (Case 2 Mathematics subject coordinator)	

Table 3 (continued)

Findings of TEB components	Pattern category	Representative quotes	Corroborating literature
	Scaling innovation to promote cross-subject learning	"She organized cross-subject sharing. Each subject need to present their innovative pedagogies in the staff development days. We also gain inspiration from them." (Case 2 Principal).	

Summary of findings in ownership-enthusiasm

Findings of TEB components	Pattern category	Representative quotes	Corroborating literature
Attributes—Ownership-enthusiasm: Entrepreneurial teachers have an intention to actualize their education goals and instinctively engage in the innovative idea.	Motivated by education vision	"She is a visionary person. Somehow, her vision was even ahead of education trends. Every step she decided was far in front of other schools." (Case 2 Vice-principal). 'I believe that occupation therapy can be integrated into our school-based curriculum, helping students to learn some survival skills. That's my belief' (Case 3 Entrepreneurial teachers, subject coordinator).	Autonomy with positive attitude: Persistently take the initiative to complete an assigned task or personal goals.
	Instinctively trying new things as personal development	"We need to make sure that they understand the concept. I worry about seeing an unhappy face in my lesson. I want to bring something interesting to them. Let them taste the fun of mathematics. This is my direction. This is something worthy of me." (Case 3 Entrepreneurial teachers, subject coordinator).	

Table 3 (continued)

Findings of TEB components	Pattern category	Representative quotes	Corroborating literature
	Sacrificing personal time and resources to develop the new curriculum (enthusiasm)	"She does not care about herself. However tired she was or if time was limited… I chatted with her sometimes. I reminded her of the importance of taking care of her family. She focused on her duty alone." (Case 2 Vice-principal).	

Summary of findings in risk-taking

Findings of TEB components	Pattern category	Representative quotes	Corroborating literature
Attributes—Risk-taking: Entrepreneurial teachers experience the risk in pilot sampling, which motivates them to take the uncertainty risk to promote the innovative idea at school.	Realizing the potential risk	"We worry about the continuous assessment mark for students. The proportion of new curriculum assessment is a challenge for colleagues. We need to convince parents and the Principal." (Case 2 Principal) "I foresee that some colleagues will disagree with what I suggest. They will come up with negative feedback on our materials' (Case 3 entrepreneurial teachers, IT coordinator).	Risk-taking: Treat risk-taking as an act of seizing opportunities.
	Treating risk as an opportunity	"We don't need to worry about changing. This is something we should do. Change our habits and enhance teacher performance in teaching. This is a chance. If we can make it, colleagues will follow." (Case 1 Entrepreneurial teacher)	

Table 3 (continued)

Findings of TEB components	Pattern category	Representative quotes	Corroborating literature
	Conducting pilot sampling to test the risk	"Some colleagues are hardworking. They work too fast, we will cool them down, keep it slow. We are afraid this may affect other stakeholders. They need to understand that they are not the one being affected. … I must remind them. … Just like e-learning, some colleagues suggest providing training. We asked them do it step by step. It's not like … suddenly all bring an iPad. We need to conduct a trial in our class first' (Case 3 Entrepreneurial teacher, IT coordinator).	Not found in the literature.
Summary of findings in humility-confidence			
Attributes—Humility-confidence: Entrepreneurial teachers are confident in their professional judgment and have a humble manner.	Humbly appreciate teachers' contributions to the curriculum	"She is different now. Mature. I think it is about human relationships. She is sophisticated in managing colleagues as a humble person now." (Case 2 Principal) 'This is not my championship. It goes for all colleagues who contribute to the new curriculum. I always share this message with colleagues and parents' (Case 2 Entrepreneurial teacher).	
	Show genuine care for teachers' feelings	'They did not force colleagues to do the task. Generally, they invited colleagues to listen to them and share their experiences. They showed empathy during the implementation process' (Case 3 Principal).	

Table 3 (continued)

Findings of TEB components	Pattern category	Representative quotes	Corroborating literature
	Confidently convince other teachers to participate in the curriculum	"If you say she is humble … I partly agree. She is confident. Somehow she is not fully humble because she needs to defend what she believes." (Case 1 Principal)	

of experience, and various practical suggestions. Entrepreneurial teachers identified the most pressing problems they encountered in the implementation and conducted regular meetings with other teachers. This allowed for the exchange of individual experiences to address how the problem could be dealt with. Subsequently, entrepreneurial teachers consolidated the experience of the others and modified their ideas and implementation with teachers.

Competency: Seeking resources

Entrepreneurial teachers were found to seek, gather, and utilize internal and external resources to develop innovative ideas. We found that they strategically pulled together the resources to support innovative initiatives with colleagues. They understood how to implement these ideas and thus intentionally constructed internal and external networks to gather the resources, such as knowledge, monetary support, and technical skills (see Table 3). Our findings also show that entrepreneurial teachers were connected to professional network and were proactive in reaching out to professionals to gain new perspectives and generate creative ideas. In case three, the entrepreneurial teachers applied the QEFs and enrolled in the EDB support programs to implement their curricula. One entrepreneurial teacher asked the information technology staff to solve technical problems. These entrepreneurial teachers obviously gathered resources with a strategic purpose.

Competency: Advocating innovation

The research suggests that the innovation from TEB is not about an original teaching and learning pedagogy. However, the entrepreneurial teachers we sampled were sensitive to innovative ideas and actively seized opportunities to adapt such ideas to their teaching contexts. They were not only experts in their respective subject areas, but also fully aware of new policy initiatives and education trends, and possessed rich tacit knowledge of the school context. They innovated by integrating professional knowledge, resources, inspiration, and the school context, enabling them to move beyond existing practices to develop new curricula and school-wide pedagogies. They actively seek and acquire inspiration from new teaching and learning pedagogy, then they contextualize these new ideas in their teaching and learning strategies, thus fulfilling the needs of both students and the school (see Table 3). For example, in case one the school took ideas for their innovative subject-based curriculum from educational television. In case two, the school gained experience from EDB and expertise from the university. In case three, the school generated ideas from the perspectives of occupational and musical therapists. The entrepreneurial teachers are extremely willing to adopt these innovative ideas, and they learn from others and by trial and error. They use the experiences gained from learning to modify and contextualize the curriculum for their schools and students. Successful entrepreneurial teachers were also invited to share their experiences with other subject teachers, which in turn promoted innovative changes in other subjects.

Attribute: Ownership-enthusiasm

Entrepreneurial teachers exhibited high levels of ownership-enthusiasm when initiating innovative curricula and schemes and inspirational vision in terms of education. They were committed to actualizing their education goals in their careers and readily engaged in the innovative curriculum. Driven by these goals, entrepreneurial teachers are courageous and persistent in developing innovative curricula. As well as setting goals for students' self-education, they realised that learning diversity, and especially the gap in academic performance between elite and less able students, is a serious issue in every class, and that less able students have a weaker learning intention. Therefore, they were passionate about promoting the joy of learning to students and assisting them in overcoming learning diversity or difficulties.

In addition to taking the initiative, entrepreneurial teachers were willing to sacrifice their own time and resources to develop innovative curricula and schemes for the benefits of students. They also reported enjoyment and excitement when engaged in helping students. However, they face many obstacles in implementing the curriculum, and although there were always colleagues who resisted the changes to the teaching pedagogy, the entrepreneurial teachers overcame any difficulties through their endurance and enthusiasm. They faced the obstacles by continually modifying the curriculum with the help of trusted teachers. They had faith in their education goals and were encouraged by the results of small-scale piloting. The positive feedback from students also sustained their enthusiasm for promoting new curricula and schemes.

Attribute: Risk-taking

Risk-taking is essential for entrepreneurial teachers when promoting innovative ideas to colleagues. The finding revealed that teachers perceived the primary risk in promoting innovative curricula to be their colleagues' negative responses, rather than the potential negative impact on students' performance, as reported in the literature. Entrepreneurial teachers appeared to have confidence in the benefits of new curricula and schemes for students and believed that there were always remedies even if students' academic performances were negatively affected in the short run. They felt that they had prepared well to capitalise on opportunities with calculated risk. They thought that the greatest risks were uncertain and negative responses from their colleagues, which could undermine the effectiveness of the innovative curricula. However, they anticipated this resistance and thus prepared for it. To reduce the risk, we found that all entrepreneurial teachers implemented small-scale piloting to showcase the effectiveness of the innovative curriculum or scheme. This was conducted either in their own class or in a core team member's class. With the successful evidence from piloting, entrepreneurial teachers were able to convince some of the resistant teachers to participate in the implementation of the new curriculum or scheme.

Attribute: Humility-confidence

The finding of humility-confidence in the entrepreneurial teachers, as shown in Table 3, is a surprising result from this study. In all three cases, they consistently demonstrated this attribute in their endeavors. We found that humility is a common trait in entrepreneurial teachers when working with their colleagues. As leaders they seldom emphasized their own achievements in the development of the school-based curriculum, but appreciated their colleagues' contributions and valued their inputs. The entrepreneurial teachers showed respect and genuine care for colleagues and acknowledged their contributions as part of a team. They carried out activities quietly without arousing public attention, and intentionally behaved in a humble way, as they said that a stance of humility was the foundation for advocating reform in schools. When implementing and promoting the innovative new curricula or schemes they were always concerned with how other teachers felt about it.

We also found that this humble manner coexisted with a deep-seated confidence. All of the entrepreneurial teachers were highly confident in their innovative curricula, which was also recognized by their peers. They found that as role models the entrepreneurial teachers led their teams with humility and confidence. When the new curriculum or scheme was questioned or challenged by resistant teachers, the entrepreneurial teachers defended their curriculum humbly but firmly. They stated that although they were in charge, there were always some resistant teachers who did not initially follow or respect them. They may have been concerned about their teaching load and the difficulties of working with colleagues during the implementation of the new curriculum. To address these concerns, entrepreneurial teachers had to present their ideas humbly and confidently.

Conceptual definition of TEB

Based on the above analysis, we limited the standard sentence structure of the conceptual definition of TEB, recognizing that it should include the dimensions of TEB and a situated education context. The definition is thus a combination of those in other studies, an in-depth understanding of the educational context, and the relevant literature. Thus, we define TEB as teachers' *enactment of a series of competencies and attributes that enable them to seize innovation opportunities and scaling-up innovation in schools*.

Discussion

In this study, we clarified the notion of entrepreneurial behavior in the school context. We further reinforced the concept of TEB by identifying its attributes and competency components and by offering a clear definition. The findings contribute to the TEB literature on how entrepreneurial teachers perform TEB in developing the innovative curricula and schemes. The nature of TEB, as revealed by the data of this study, is close to earlier empirical studies regarding behaviors such as managerial

skill, risk-taking, innovation, autonomy with a positive attitude, and seeking external resources. Based on our findings, we refined and clarified these TEB competencies and attributes in a school context, ultimately defining them as coordinating efforts, seeking resources, advocating innovation, ownership-enthusiasm, risk-taking, and humility-confidence.

In addition, previous studies mainly discussed the competency of the entrepreneurial teacher in working with colleagues, but seldom distinguished competency from attribute components. This study indicates that in this context, 'competency' refers to entrepreneurial teachers' explicit ability to put innovative ideas into action, whilst attributes are implicit qualities enabling entrepreneurial teachers to perform tasks and work with colleagues. An attribute is an individual's belief in his/her competency to complete a specific set of tasks and do his/her job. Together, competency and attributes enable entrepreneurial teachers and their team members to reflect on and scale up what they have done. In particular, the new attribute of humility-confidence was identified in TEB. This served as an important and new concept when describing how TEB transcended the physical and mental barriers imposed by colleagues and could help accomplish the implementation of an innovative curriculum or scheme with colleagues.

Theoretical implications

The primary finding concerning TEB sheds light on the concept's definition, providing a useful conceptual foundation for future scholars interested in TEB and related topics (Keddie 2018). Even more importantly, this study contributes to the literature on teachers' innovative behaviour in at least three ways. First, our findings concerning teachers' competency in advocating innovation and the attributes of risk-taking and ownership-enthusiasm imply a strong connection and even potential overlap between TEB and teachers' innovative behaviour. Entrepreneurial teachers not only advocate innovation to create social value; they actively respond to policy initiatives (e.g., school-based curriculum, catering for learning diversity) and are intrinsically motivated to improve their teaching and learning (learning orientation). This result greatly echoes Chand's finding (2014) that teachers' innovative behaviour was driven by both their motivation to create social value and their learning orientation. Second, our findings concerning the TEB competencies of coordinating efforts and seeking resources offer insight into the differences between TEB and teachers' innovative behaviour (Chand 2014; Neneh 2019). Our findings specifically recognize that entrepreneurial teachers need not be the source of innovative ideas; instead, they are sensitive to useful, novel ideas emerging within and outside the school; they are apt to consolidate innovative ideas into new pedagogies for addressing teaching and learning difficulties (Hayat et al. 2015; Rherrad et al. 2008; Wiklund et al. 2003); they tend to minimise the risk associated with these ideas (Oplatka 2014) and actualize innovation in the school setting (Hayet et al. 2015); furthermore, entrepreneurial teachers are capable of mobilising other teachers to work closely as a team and helping them to scale up innovation in the wider school context. Third, the above findings suggest the status of research on TEB somewhat echoes that of research on

teachers' innovative behaviour; in short, numerous studies have been conducted on innovative behaviour in an organisational setting, but few have considered the education context. Therefore, teachers' innovative behaviour should be further explored in the education literature.

Practical implications

Our findings are also helpful in clarifying the professional standards related to teacher entrepreneurship in Hong Kong and beyond. The new Teacher Standard in Hong Kong provides a general description of teachers' duties at school. However, the term "Edupreneur" has not been explicitly clarified. This study defines TEB and identifies its components, which provides a solid knowledge basis for policy makers to generate a practical indicator of the meaning of being an "Edupreneur."

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