

The Entrepreneurial Mindset in Entrepreneurship Education: What Can We Learn from S-O-R Models?

Abstract

Purpose

The aim of this paper is to examine the usefulness of the Stimulus-Organism-Response (S-O-R) model for systematizing and further exploring our knowledge of the role of entrepreneurship education in fostering students’ entrepreneurial mindset. Current research studying the entrepreneurial mindset in an educational setting often fails to conceptualize this mindset and its attributes rigorously and to include epistemological considerations regarding how we can know whether a person has developed an entrepreneurial mindset or not.

Approach

We test the Stimulus-Organism-Response (S-O-R) model by combining it with a critical realist approach to develop a conceptual model for understanding the entrepreneurial mindset and its development in an educational setting.

Findings

We identify eight psychological constructs that represent markers of the entrepreneurial mindset. We further surface the multi-causal characteristic of learning in EE. Our model cannot be applied to detect causal relationships, but it is useful in exploring potential causal tendencies and plausible explanations of the mechanisms and circumstances of entrepreneurship education, which may, in concert, potentially foster the psychological attributes associated with an entrepreneurial mindset.

Originality

The paper addresses the often-overlooked epistemological considerations related to how we can know anything about psychological and theoretical constructs, such as the entrepreneurial mindset. A conscious discussion about how we can develop knowledge and insight about the entrepreneurial mindset and how individuals develop it is critical to justify a continued focus on the entrepreneurial mindset in entrepreneurship education.

Key Words: entrepreneurial mindset, affect, conation, cognition, S-O-R model, entrepreneurship education, critical realism

Introduction

Traditionally, entrepreneurship education (EE) has emphasized teaching entrepreneurial knowledge and skills to encourage higher education students to engage in entrepreneurial behavior (Galloway *et al.*, 2015, Yamakawa *et al.*, 2016). Today, however, scholars acknowledge that what goes on in the students' minds is of equal importance in teaching entrepreneurship and encouraging entrepreneurial behavior (Fayolle *et al.*, 2006, Nabi *et al.*, 2017, Neck and Greene, 2011). **However**, despite the increased attention, the field requires more rigor in understanding the role of EE in addressing psychological learning outcomes. This can be achieved by drawing on theories from psychology and education to understand the process of changing students' minds **toward** entrepreneurial behavior (Fayolle, 2018).

The current interest in EE's potential to develop student minds in a way that supports entrepreneurial behavior is perhaps most clearly manifested in the increase in programs aiming to foster students' entrepreneurial mindset (EM). **The concept of the EM has been widely discussed and studied in academic research, but to date, no standard definition of the EM exists, nor is there agreement about which attributes or dimensions combine to form the EM (Daspit *et al.*, 2023, Naumann, 2017). The existing fragmentation can be explained by the numerous different understandings of what a mindset is (Krohn *et al.*, 2021, Larsen, 2022). Drawing on the earliest mindset conceptualization from cognitive psychology (French II, 2016, Gollwitzer, 1990), the understanding of mindset as a set of cognitive strategies applied when dealing with a task is visible in the work by Haynie *et al.* (2010) and Mathisen and Arnulf (2013), among others. Krueger (2007) and Pidduck *et al.* (2021), on their part, conceptualize the EM as beliefs and thereby draw inspiration from Dweck's (1999, 2006) seminal mindset theory that frames a mindset as individual beliefs, in particular, beliefs about the malleability of human attributes. With a basis in the recent, but much-cited, contribution by Kuratko *et al.* (2021), a certain degree of convergence is arising as the EM becomes conceptualized as a multivariable construct consisting of affective, cognitive, and conative components. This research stream is based on social psychology and more specifically on the trilogy of the human mind from attitude theory (Hilgard, 1980, Larsen, 2022). In this approach, EM can be understood as a frame of mind that draws somebody toward entrepreneurial activities (Larsen, 2022). This paper adopts this last approach in our conceptualization of the EM.**

Setting aside the heterogeneity in EM conceptualizations, a significant challenge exists in operationalizing the EM. Whether EM is considered a set of cognitive strategies, deep beliefs, or a combination of affective, cognitive, and conative dimensions, the EM remains an **unobservable theoretical construct**, disregarding an ontological belief that mindsets exist in reality. Thus, if we wish to know whether and how EE can play a role in developing **students' EM, we must also** address the epistemological question of how we can *know of the EM and its development*.

This question relates to how we can explore and understand the relationship between EE and the desired learning outcomes. Much research in EE has attempted to map and classify EE according to learning theories and teaching strategies. For example, the about/for/through framework describes three modes of EE that differ regarding learning objectives, teaching activities, and underlying philosophical paradigms (Gibb, 2002, Kakouris and Liargovas, 2021, Lackeus, 2015). The same is true for the classification of pedagogical methods of EE into the supply-demand-competence models (Bechard and Gregoire, 2005, Nabi *et al.*, 2017). Abundant research also exists around designing and evaluating action-based and experiential EE courses and programs (Hägg and Gabrielsson, 2019). Thus, a great deal of investigation takes place that aims to map and classify the input in the process of EE, but less attention has been given to exploring the process and understanding the complexity of how EE fosters specific learning outcomes (Neergard *et al.*, 2020). We take inspiration from the logic underlying Stimulus-Organism-Response (S-O-R) models to develop a conceptual model for

exploring this dynamic relationship. S-O-R models precisely serve to investigate the complex relationship between external stimuli, such as education, and responses, such as learning outcomes.

Accordingly, our conceptual model aims to portray, organize and help us further explore our knowledge of EM and associated psychological constructs in EE. This requires focusing on three aspects. The first relates to the “organization of knowledge” and concerns the construction of a *form* that allows us to systematically organize the relationship between EM and EE. This form draws on the logic underlying S-O-R models. The second aspect concerns the “portrayal of knowledge” and relates to our model’s *content*. In this paper, we focus on the response variable, the EM. To identify the central content features for this variable, we draw on knowledge about the affective, conative, and cognitive components of the human mind. The third aspect concerns understanding the relationship as a complex, dynamic *process*. To achieve this, we draw on a critical realist approach. We thus explore whether applying a well-known descriptive tool such as the S-O-R framework can establish an improved understanding of the fragmented and fuzzy research field, which addresses the EM in EE. In doing this, the paper addresses two interrelated questions: 1) How can an S-O-R logic help systematize the operationalization of EM as a theoretical construct in EE? 2) What affective, conative, and cognitive constructs are associated with an EM?

The paper contributes theoretically by developing a systematic approach to conceptualize, operationalize and measure EM. The framework illustrates that a way to understand the role of education in fostering EM, is to explore the underlying mechanisms that might allow a combination of EE activities to foster the psychological attributes of students’ EM. Moreover, identifying such attributes also means identifying the malleable components that reflect an underlying EM (Krueger, 2015). This clarification will help educators design educational activities that more specifically focus on developing these attributes.

For analytical reasons, we commence by separating the two questions to combine them towards the end of the paper. First, the paper addresses the question of *form*, where we propose the S-O-R logic with a critical realist perspective as a suitable structure for studying the mechanisms at play in EM development in EE. Subsequently, the question of *content* will be addressed by identifying potential psychological constructs associated with EM. In this, we are inspired by psychology, education science, and EE literature. The form and content will then be combined in a critical realist process model that depicts the potential role of EE in fostering the psychological attributes of EM. The paper concludes with a discussion of the strengths and weaknesses of our approach to systematizing how we can know about EM and its development in EE.

Conceptual background and preliminary modeling

The S-O-R model is useful because it represents an accepted frame of reference for understanding processes in complex social systems. In these systems, a series of external stimuli and internal individual factors combine to trigger individual responses, such as the development of attitudes, learning, or behavioral responses. S-O-R models have been applied extensively in various fields to understand and model the mechanisms involved in the development of e.g. consumer attitudes and behavior (Howard and Sheth, 1969, Webster Jr and Wind, 1972), academic performance (Fu *et al.*, 2021, Zhai *et al.*, 2020, Zhang *et al.*, 2021), and health care services (Chudhery *et al.*, 2021, Suess and Mody, 2018) but only few examples illustrate the use of S-O-R logic on entrepreneurship education (Duong, 2023). Drawing on a well-known and accepted frame of reference helps specify, organize, and communicate the complex relationships and mechanisms existing in EE when it comes to understanding its potential for fostering EM attributes.

The following sections provide an outline of the historical development of the S-O-R tradition, its link to learning, and the philosophical and methodological underpinnings of this development. We suggest that current uses of S-O-R models represent a critical realist perspective and argue that **this philosophical tradition** is also useful for EE studies and particularly for conceptualizing our knowledge of how EM develops in an EE setting.

Placing entrepreneurship education and the entrepreneurial mindset in an S-O-R logic

The dominant logic in EE research is that EE can develop students' EM. This implicitly assumes that EE can act as a *stimulus* that creates a particular *response* ($S \rightarrow R$), namely an EM. This is, of course, an over-simplified view but was the position of early behaviorist-based social science. The behaviorist position was essentially an early learning theory stating that behavior is learned as a simple **involuntary** response to stimuli in the environment (Young, 2016). This idea is best known from Pavlov's (1960) principles of classical conditioning, **but continued by Thorndike (1923) and (Skinner, 1961), into a theory of operant conditioning, where learning takes place in a combination of positive reinforcements (rewards) or punishment for certain behavior. In this perspective, free will is an illusion, and internal thoughts, reflections, and motivations are of limited interest if we wish to understand everyday learning processes. Learning and future actions appear as consequences of previous reactions (stimuli). Transferred into a learning philosophy, this means that students' future behavior depends on the consequences encountered in their previous learning activities. Students cannot simply learn by receiving passive information, but learn by association from rewards (i.e., praise) or punishment (i.e., ignorance) (Skinner, 1961, Thorndike, 1923). This logic partly resembles the experienced-based learning approach to EM formation, where a mindset is learned due to a series of educational experiences.**

These approaches fall within the behaviorist research tradition (Phillips and Burbules, 2000), suggesting that observation is the basis upon which all knowledge claims should be made. This is also the main tenant of the positivistic philosophic tradition (Watson and Kimble, 1998), typically performed under headings like Experimental Psychology (Woodworth, 1938) (Woodworth, 1938). In the context of learning, experimental psychologists would rely on empirical observation and the scientific method using experimental designs to test how different instructional methods or environmental factors impact learning outcomes (Kirschner *et al.*, 2006, Rosenthal and Jacobson, 1968). As we cannot observe the mind, knowledge about learning requires inferring cause-effect relationships on the basis of the observed stimuli and response (Phillips and Burbules, 2000, Watson and Kimble, 1998). Although behaviorists acknowledge that psychological or mental processes may play a role in shaping behavior and learning, these processes are unobservable and can therefore not be subjected to research (Clark, 2018, Phillips and Burbules, 2000, Watson and Kimble, 1998). Early models thus only considered the stimulus-response variables and deliberately left out the psychological processes that might mediate between stimuli and response. In these models, the psychological processes were acknowledged as a "black box" ($S \rightarrow \text{Blackbox} \rightarrow R$), as the potentially mediating (unobservable) processes were outside the possible realm of research and knowledge.

From the 1930s and forward, behavioralism emerged as an alternative approach to - or development of - the behaviorist approach. **Learning is still seen as a consequence of stimuli or experience, but the interest is on how this influences the organism as a mediator between stimuli and behavior (De Houwer *et al.*, 2013). Behavioralism adheres to a post-positivistic philosophy that maintains a realist ontology but epistemologically acknowledges that our knowledge of reality is a result of interpretation (Badie *et al.*, 2011). Therefore, researchers should search for plausible explanations of behavior and not for empirical generalizations. When it comes to learning, typical questions would be how, why, and when stimuli lead to**

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responses, and a central task for the behavioral sciences has been to use modeling to explore the cognitive processes involved in the development of responses (Badie *et al.*, 2011). The S→O→R model resulted from this work as a modification of the behaviorist S→R understanding of human behavior and learning (Buxbaum, 2016, Young, 2016). It is important not simply to see this as a process of theoretical progression. Both paradigms today exist side by side, typically labeled functional explanations (S→R) or cognitive explanations (S→O→R) (De Houwer *et al.*, 2013).

The underlying logic in the following parts of this paper is that an individual’s behavior as a response to external stimuli cannot be fully explained without considering the mediation of important internal factors and mental activities. These internal mechanisms are represented in the O, as the “organism” part of the model. For example, in a learning situation, a student’s mental processes (such as memory, perception, and affective state) play a role in the learning outcomes the student reaches (Tikly, 2015). Students are also constantly exposed to other exogenous stimuli, apart from the stimulus variables that are considered the controllable elements of an educational intervention. Environmental stimuli that are not controllable by EE may come from a large number of sources in the environment, including family and social relationships outside the program, the broader institutional setting, and cultural and social norms, to mention a few. Indeed, EE may perhaps only represent a minor stimulus on students’ learning and behavior related to entrepreneurship. Figure 1 depicts the general form of the S-O-R model.

[INSERT FIGURE 1 HERE]

The S-O-R model as a critical realist model

As a strand within the post-positivistic paradigm, critical realism has been suggested as particularly suitable for studying complex, open, social systems, such as education (Shipway, 2010, Tikly, 2015). Open, social systems are characterized by multi-causality making it impossible to isolate the effect of certain interventions (S) on events or outcomes (R) (Tikly, 2015). In education, for instance, although educational researchers seek to understand what causes (or hinders) learning from taking place, this is challenged by the impossibility of attributing causality to the specific educational interventions as the learner is subject to multiple, simultaneous, environmental stimuli (Tikly, 2015). Critical realism recognizes this challenge and addresses it by acknowledging that researchers should not seek to identify particular cause-effect relationships. Instead, they should seek plausible explanations for mechanisms that might influence the generation of certain events, for example, certain learning outcomes, under various circumstances (Danermark *et al.*, 2005, Sayer, 1999). Although these mechanisms are ontologically real (Bhaskar, 1998), they are unobservable, and researchers cannot reach certainty or claim general laws (Corson, 1991). At best, they can produce rational (but fallible) judgments about these mechanisms (Sayer, 1992). Hence, through the study of mechanisms, researchers may arrive at the identification of what Bhaskar (1975) denotes causal tendencies. Critical realists regard the world as comprised of objects, either physical entities (e.g., minerals, atoms, books, or classrooms) or social objects, such as interpersonal relationships, processes, beliefs, and more. Any phenomenon possesses an intrinsic structure consisting of more or less stable properties (Sayer, 1999). By virtue of its structure, each entity possesses causal powers or liabilities, understood as an object’s (or a grouping of object’s) potential to behave in certain ways or facilitate (or hinder) certain developments (Blundel, 2007, Sayer, 1999). For instance, by virtue of an individual’s biological and psychological structure, she has the capacity to learn (Tikly, 2015).

However, whether or not a potential outcome is generated depends not only on the powers of the entity but also on the existence and activation of what critical realists refer to as the (causal) mechanisms (Blundel, 2007). It is important to emphasize that the simple existence of a mechanism does not guarantee that a potential outcome will be generated. The mechanism needs to be realized (Bhaskar, 1975). For instance, two EE interventions may have (similar) properties and capabilities to foster EM attributes of students, yet the mechanism(s) that generate this response may only be realized in the case of one of the interventions. That can be due to differing conditions of the individuals (e.g., prior knowledge or social support system) or due to the exercising of mechanisms of other entities (e.g., values and norms in the school system) (Tikly, 2015). Indeed, both the mechanisms of the teaching and the institutional setting may activate, hinder or entirely block a student's learning mechanism. Figure 2 illustrates the critical realist view of causal tendencies.

[INSERT FIGURE 2 HERE]

Source: Based on Sayer (1999), p.5.

Figure 2 shows that the critical realist approach to explaining how and why learning outcomes are generated (or not) depends on identifying causal mechanisms and how they work, discovering if they have been realized, and if so, under what conditions. This closely resembles the logic of the post-positivistic S-O-R model in figure 1. We, therefore, suggest an S-O-R model based on a critical realist paradigm as a fruitful conceptual form to assist the operationalization of generating knowledge about the role of EE in fostering EM attributes.

An S-O-R model for entrepreneurship education with a critical realist perspective

The basic rationale of a critical realist S-O-R model holds that EE has the causal power to generate a response in students, which in this case is the development of EM attributes. The content of the response variable is the topic of the next section, where we will unfold affective, conative, and cognitive attributes of the EM. In principle, the response could take one of three forms in the individual student: 1) no EM attributes are fostered; 2) some EM attributes are fostered; or 3) all EM attributes are fostered.

The stimulus variable in our model involves the didactics and pedagogies applied in EE. Vast agreement exists among EE researchers and practitioners that these didactics and pedagogies should be anchored in experienced-based learning processes to achieve entrepreneurial learning outcomes (Hägg and Gabrielsson, 2019). Furthermore, transformative learning processes should be included when the educational intervention seeks to address the development of student mindsets, as transformative learning implies adjusting the frame of reference based on new meaningful learnings (Larsen, 2022).

In the traditional S-O-R logic, the organism represents psychological processes, including perception, emotion, judgment, thinking, and motivation. Taking a critical realist approach, these processes represent psychological mechanisms that when exercised could potentially foster EM attributes. These mechanisms exist by virtue of the causal powers inherent in the experienced-based and transformative learning processes. From our knowledge of entrepreneurial learning and learning in the entrepreneurial classroom, we may speculate that these mechanisms could include e.g. experienced emotions, personal relevance and reward, and some level of personal challenge. For example, Lackéus and Sävetun (2019) explored how emotional learning events support non-cognitive learning outcomes such as entrepreneurial passion, self-efficacy, and proactiveness. Similarly, Pittaway and Cope (2007) argue for the

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importance of emotional exposure and personally relevant activities in enhancing student learning in EE. This is supported by Tunstall and Neergaard (2021) who show how self-directed learning experiences that create personal meaning for students to support the development of their self-efficacy.

Finally, critical realists argue that the mechanisms of the organism can be either unexercised, exercised unrealized, or exercised depending mainly on the interaction with the mechanisms and causal powers of other structures (Bhaskar, 1975). These other structures correspond to the exogenous variables in an S-O-R logic. To understand how EE learning processes might foster EM attributes, the immediate structures of interest would be the individual students, the teacher, and the group. Figure 3 below depicts our model for how the role of EE in fostering student EM can be understood.

[INSERT FIGURE 3 HERE]

Unpacking the content of a model for the entrepreneurial mindset in entrepreneurship education

Our conceptualization of EM is rooted in the research stream that considers EM to be a frame of mind, which draws an individual towards entrepreneurial behavior. This conceptualization is theoretically founded in social psychology and the trilogy of mind (Larsen, 2022). Psychology has traditionally studied three components of the mind: affect, conation, and cognition (Huitt, 1996, Tallon, 1997). The foundation for this “trilogy of mind” has been central to psychology for more than 200 years, and its influence extends into the twenty-first century (Hilgard, 1980).

In the following sections, the affective, conative, and cognitive dimensions will be understood by drawing mainly on Snow *et al.*’s (1996) taxonomy of individual difference constructs in education psychology. However, further research in psychology and learning as well as social psychology theory will be included to arrive at an identification of the specific affective, conative, and cognitive constructs that are relevant to our EM definition. Subsequently, the theoretical foundation will serve to identify specific affective, conative, and cognitive constructs in EE literature that may constitute EM attributes in our model. Recognizing that affective, conative, and cognitive constructs are highly interrelated, overlapping in mental functioning and exerting reciprocal influence on each other (Kuratko *et al.*, 2021, Snow *et al.*, 1996) we aim to identify potential constructs for operationalizing EM in an EE context. However, for analytical reasons, we will not address the interwoven nature of these psychological constructs.

Affect, conation, and cognition

According to Clore *et al.* (2001), the *affective* dimension refers to representations of feelings associated with personal values. The dimension includes *temperamental traits, emotions, and characteristic moods* (Snow *et al.*, 1996). As our study concerns identifying malleable attributes of the EM, temperamental traits will not be dealt with further as these are personality traits formed in early childhood (Buss and Plomin, 1975). Emotions include feelings about something, including events, actions, or objects. Moods are affective states without objects. The difference can be described as “I am in a bad mood” but “I feel passionate about xxx”, xxx being the object (Clore *et al.*, 2001). As moods are affective states without objects, these will also not be addressed since our interest is in those affective constructs that are directed at a particular object, that object being entrepreneurship and entrepreneurial behavior. Emotions or feelings are experiential representations of value that can be opposites on a scale, e.g., pleasant-

unpleasant, boring-exciting (Clore *et al.*, 2001, Russell and Carroll, 1999). The dimension also includes preferences and attitudes, which are affective dispositions (Clore *et al.*, 2001).

Conation involves a tendency to take and maintain purposive action or direction towards goals (Snow *et al.*, 1996) and is necessary to explain how knowledge, beliefs, and emotion are translated into behavior (Bagozzi, 1992). Conation is the most complex group of psychological constructs due to the sheer number of concepts that scholars identify in this category. Conation can be divided into motivational and volitional constructs. *Motivation* relates to the desires, wants, and needs of the individual which influence the processes involved in decision-making and choice with respect to individual goals (Snow *et al.*, 1996). *Volition* is a will, or will-power, and involves the process that turns intentions into action (Keller, 2008). It is associated with the persistence of behavior and proactivity (Bandura, 1991, 1997). Volition comes into play after goal setting and motivation and volition can therefore be seen as a kind of commitment pathway starting with the deliberation of options and goals, over intention to enactment or implementation (Snow *et al.*, 1996).

The *cognitive* dimension refers to the process of coming to know and understand an object (Huitt and Cain, 2005, Snow *et al.*, 1996). It involves conceptual knowledge and procedural skills, where conceptual knowledge refers to knowledge about the concepts of a domain and the interrelations between the concepts, whilst procedural skills represent an individual's cognitive strategies, skills, and tactics (Gilmore *et al.*, 2017, Schneider *et al.*, 2011). This understanding of cognition has its roots in cognitive and educational psychology. Drawing on socio-cognitive theory, on the other hand, we find that cognition centers on an individual's beliefs and perceptions about oneself and the world (Bandura, 1986, Dweck and Leggett, 1988). Snow *et al.* (1996) similarly place individual belief as a subset of declarative knowledge. As our study takes a socio-psychological approach to the understanding of mindset, the procedural skills of cognition will not be addressed any further. These cognitive abilities, strategies, skills, and tactics are considered more suitable when EM is defined in line with a purely cognitive understanding (Larsen, 2022). Similarly, under conceptual knowledge, our study will only consider individual beliefs related to entrepreneurship and not knowledge about entrepreneurship, as knowledge in itself will not draw a person towards entrepreneurial behavior, cf. our definition of EM.

Looking specifically at the field of education, the development of the 'mind' takes center stage. Boud (1993) maintains that in higher education, we often pretend that learning is purely a cognitive process; indeed, the goal of most teaching is to ensure that learners achieve the appropriate level of conceptual knowledge and procedural skills, e.g., the ability to design processes, solve problems, and produce new knowledge. However, learning should be perceived as a holistic process with affective, conative, and cognitive features. According to Alias *et al.* (2014), the affective dimension of learning may, in fact, support the internalization of conceptual knowledge and procedural skills, and Lashari *et al.* (2013) maintain that the affective dimension facilitates cognitive processes and can therefore be used in teaching to promote cognitive learning. Traditionally, educational research thus focuses on the role of affective and conative elements in supporting cognitive learning outcomes such as the ones presented for example in Bloom's (1956) original taxonomy for learning (Allen and Friedman, 2010). Modern research, however, demonstrates scant interest in addressing affective and conative components as actual learning outcomes in higher education (Reeves and Herrington, 2010, Snow *et al.*, 1996). Some early efforts in addressing affective learning outcomes include Krathwohl's (1964) and Allen and Friedman's (2010) taxonomies for affective learning. Their taxonomies address affective learning outcomes as the internalization of professional values.

Based on the above review, Figure 4 displays an overview of affective, conative, and cognitive constructs and their associated attributes.

[INSERT FIGURE 4 HERE]

Unfolding psychological constructs of the entrepreneurial mindset in entrepreneurship education

The following sections discuss the affective, conative, and cognitive constructs from an EE perspective. The sections follow the structure provided in Figure 4 and discuss each construct in depth. The EM attributes of each construct are included according to the criteria established by Robinson and Gough (2020). According to these criteria, attributes (1) should have empirical support, (2) should be conceptually consistent with current concepts (in social theory and practice), (3) should be able to differentiate entrepreneurs from non-entrepreneurs, and (4) should be possible to influence through education, whether formal or informal and experience (Robinson and Gough, 2020). Table I presents some of the previous research that has been used to evaluate each attribute according to the four criteria proposed by Robinson and Gough (2020).

[INSERT TABLE I HERE]

Affective constructs in entrepreneurship education

EE literature is increasingly interested in the affective elements of entrepreneurial learning. However, in line with the general education literature (Allen and Friedman, 2010), EE research typically focuses on exploring the role that emotions play in achieving cognitive or skill-based learning outcomes, for example, entrepreneurial competencies. However, our main interest is not in identifying how affect plays a role in developing student EM but rather to explore affective attributes of EM as actual learning outcomes in EE. This can be referred to as addressing the “heart” in EE (Nabi *et al.*, 2017, Souitaris *et al.*, 2007).

As much EE literature is characterized by ambiguity when it comes to how the affective component is understood, it is essential to clarify our understanding of affect, before elaborating on the affective constructs in EE (Keller and Kozlinska, 2019). Following the classification of the affective dimension developed by Keller and Kozlinska (2019), we will focus on discrete emotions and attitudes. Discrete emotions are relatively short-lived affective states targeted at a specific object, and attitudes are longer-lasting or chronic affective feelings, likewise directed at a specific object. Based on our conceptual understanding of affect and affective learning, two affective constructs were identified as potential learning outcomes in EE: attitude to entrepreneurship and entrepreneurial passion.

Attitudes to entrepreneurship: When it comes to addressing affective learning outcomes in EE, entrepreneurial attitude is the outcome that has received the most attention (Ilonen and Heinonen, 2018, Keller and Kozlinska, 2019, Longva and Foss, 2018). According to various scholars, attitudes are a strong predictor of behavior and refer to the degree to which an individual has a favorable or unfavorable evaluation or appraisal of a particular behavior (Ajzen, 1991, Rauch and Hulsink, 2015). Thus, entrepreneurial attitudes reflect an individual’s perceived desirability of entrepreneurship and entrepreneurial behavior (Krueger *et al.*, 2000, Shapero and Sokol, 1982). Previous studies confirm that the more favorable the attitude toward entrepreneurship and related tasks is, the stronger the individual’s intention to engage in entrepreneurial behavior (Douglas and Shepherd, 2002, Robinson *et al.*, 1991, Varamäki *et al.*, 2015). Although attitudes are typically classified as an affective construct in EE, it should be noted that attitudes can be affect-based, cognition-based, and/or conation-based (Eagly and Chaiken, 1993). If, for example, attitudes are cognition-based, it follows that students’ attitudes

to entrepreneurship may be changed by changing their beliefs about the favorable outcome of entrepreneurial behavior. This can be done by stressing the rewards of entrepreneurship and removing perceived threats associated with entrepreneurship (Rauch and Hulsink, 2015, Souitaris *et al.*, 2007). If, on the other hand, attitudes are considered a result of experiencing positive discrete emotions, EE should instead be directed at fostering and developing these emotions in students. For example, Souitaris *et al.* (2007) posit that positive attitudes can be instilled by emphasizing the positive emotions and passion associated with entrepreneurship, supporting Keller and Kozlinska's (2019) view that short-lived discrete emotions are antecedents of attitudes as longer-lived affect. Vast research confirms that EE can instill positive attitudes toward entrepreneurship in students (Fayolle and Gailly, 2015, Jones *et al.*, 2011, Lackéus, 2014, Otache *et al.*, 2019, Peterman and Kennedy, 2003, Rauch and Hulsink, 2015). Fretschner and Weber (2013), however, found that EE not only instills positive attitudes but can also form a negative attitude towards entrepreneurship among students who come to be aware of some of the challenges of entrepreneurship, such as risk, workload, and responsibility.

Entrepreneurial passion: Entrepreneurial passion is defined as “consciously accessible intense positive feelings experienced by engagement in entrepreneurial activities associated with roles that are meaningful for the self-identity of the entrepreneur” (Cardon *et al.*, 2009). Vallerand *et al.* (2007) introduce the notion of harmonious passion, which is associated with positive affect and is linked to an individual's motivational force to engage freely in an activity because of the individual's endorsement (positive evaluation) of that activity (Gielnik *et al.*, 2017, Vallerand *et al.*, 2007). Vallerand *et al.*'s (2007) understanding of passion is broader than that of Cardon *et al.* (2009) because it focuses on entrepreneurship in general and not on the specific entrepreneurial activities involved in invention, exploration, or development (Gielnik *et al.*, 2017). **Entrepreneurial passion has been found to be a strong indicator of an individual's motivation to build a venture and continue exploiting opportunities when faced with difficulties (Cardon *et al.*, 2009, Chen *et al.*, 2009), and there is a generally positive relationship with entrepreneurial behavior and attitudes (Gielnik *et al.*, 2015, Newman *et al.*, 2021).** Entrepreneurial passion cannot be taught or trained (Cardon *et al.*, 2009, Costa *et al.*, 2018); however, it develops when people are engaged in activities that to them are highly meaningful. If students in EE are exposed to entrepreneurial activities that they find meaningful, whether it is enacting change or developing new products, initial entrepreneurial passion might be instilled. This corresponds to Lackéus' (2014) findings which show that student entrepreneurial passion can develop when the educational intervention involves positive feedback from people outside the educational environment. Gielnik *et al.* (2017) find that entrepreneurship training impacts business creation through passion and that EE's effect on passion is mediated by self-efficacy. They use passion as an indication of students' motivation for entrepreneurship since passion is a solid energizing driver of entrepreneurial behavior reflected in a willingness to work hard, persistently, and with dedication to realizing business ideas. Fellnhöfer (2017) finds that entrepreneurial role models in EE influence students' entrepreneurial intention, mediated by the entrepreneurial passion that is transferred from the entrepreneurial role models whom students meet during the EE intervention. Although current research thus points to the possibility of enhancing student entrepreneurial passion through EE, Lackéus and Sävjetun (2019) argue that while EE seems to be able to increase general passion, it is more challenging to increase specific entrepreneurial passion.

Conative constructs in entrepreneurship education

According to Ruohotie and Koiranen (2000), the EE field was long dominated by a “skill” factor, whereas the “will” factor was largely overlooked. The “will” factor reflects the volitional element of conation, and together with motivation, volition is an essential factor for

entrepreneurial behavior in a learning context as it is the process that determines if motivation and intention will ultimately lead to action (Hikkerova *et al.*, 2016, Longva and Foss, 2018, Ruohotie and Koironen, 2000). If a student becomes passionate about entrepreneurship and develops a positive disposition for entrepreneurial behavior, volition can be the driver that causes the student to actively study and learn entrepreneurial knowledge and skills, resulting in increased entrepreneurial intention and behavior (Ruohotie and Koironen, 2000).

Motivation can thus be seen as the starting point for entrepreneurial action (Van Gelderen *et al.*, 2015) and according to Snow *et al.* (1996), motivation encompasses the psychological constructs of *achievement orientation*, *self-directed orientation*, and *interest*. However, as self-directed orientation reflects an individual's perception and belief about the self, it overlaps in content with the cognitive aspects of a mindset in a socio-psychological view, and the construct will thus be treated as cognitive. Similarly, interest is closely linked to attitudes (Snow *et al.*, 1996) and will therefore not be treated as a separate construct. The last motivational construct, achievement orientation relates to the personal determinants of decision-making or willingness to engage in learning or performance tasks (Snow *et al.*, 1996) and is defined by Utsch and Rauch (2000) as "*the disposition towards performance improvement and achievement under challenging and competitive conditions*". Snow *et al.* (1996) identify three groups of volitional constructs: *action controls*, *other-directed orientation*, and *personal style*. Action control is a person's ability to handle competing intentions and carry out plans despite distractions (Snow *et al.*, 1996). Other-directed orientation is a willingness to influence and be influenced by others and includes a person's social ability, which is a theme that has received much attention in EE due to the importance of personal relationships for entrepreneurial intention and action (Bacigalupo *et al.*, 2016, Bonesso *et al.*, 2018). Personal style involves a complex bundle of cognitive and learning styles (Snow *et al.*, 1996). We therefore consider the construct of higher relevance when mindset is analyzed from a cognitive-psychological view than from a socio-psychological view. This construct is therefore omitted in our model. Following the attribute criteria outlined by Robinson and Gough (2020), three conative constructs have been identified as EM attributes in an EE context: learning goal orientation as a motivational construct and self-regulation and social ability as volitional constructs

Learning-goal orientation: A person's achievement motivation (e.g. intrinsic motivation and persistence) is determined by underlying personal goals (Grant and Dweck, 2003). Previous research has identified two main groups of goals that individuals adopt in achievement situations: Performance goals and learning goals (Grant and Dweck, 2003, Midgley *et al.*, 1998). For a person motivated by performance goals, the purpose in achievement situations is to demonstrate ability and avoid demonstrating a lack of ability. This tends to cause a vulnerability to helplessness and debilitation after setbacks or negative feedback (Grant and Dweck, 2003), which would obviously be counterproductive in an entrepreneurial process that is bound to experience both. On the other hand, a person motivated by learning goals, also called mastery goals, is motivated by acquiring new knowledge and skills and a desire to master challenges. Such active learning goals tend to result in active coping, sustained intrinsic motivation, persistence, and higher achievement in the face of challenges (Grant and Dweck, 2003), all essential drivers of entrepreneurial behavior. Indeed, learning and learning goal orientation is increasingly regarded as central aspects of the entrepreneurial process (Baum, 2013, Cope, 2005, Minniti and Bygrave, 2001, Noel and Latham, 2006). **Previous research suggests that there is a positive relationship between high learning-goal orientation and collaborative knowledge sharing, creativity, new venture performance, and the overall pursuit of entrepreneurial endeavors (Baum, 2013, Culbertson *et al.*, 2011, Huang and Luthans, 2015); although the individual's level of self-efficacy might mediate this relationship (Culbertson *et al.*, 2011).** Despite this, the concept of learning or

mastery goal orientation is hardly present in EE research, although it is known that students' learning goal orientation can be fostered in an educational setting (Dweck, 2006, Ross *et al.*, 2021). Burnette *et al.* (2020) found that an EE intervention based on growth mindset orientation, where learning goal orientation is central (see the following section on cognitive constructs), increased students' task persistence.

Self-regulation: According to the action control perspective, goal pursuit involves several interrelated self-regulatory tasks (Kruglanski *et al.*, 2000, Snow *et al.*, 1996). According to Baumeister *et al.* (2006), self-regulation is a process by which the individual attempts to exert control over thoughts, feelings, impulses, and task performance. Self-regulation is considered a volitional skill (Ilouga *et al.*, 2014) that refers to an individual's control over free will and represents an individual's capacity to use motivation, commitment, and determination in the pursuit of motivational goals (Hikkerova *et al.*, 2016, Ilouga *et al.*, 2014, Ruohotie and Koiranen, 2000). Self-regulation is relevant for entrepreneurship as it is central to an individual's ability to achieve goals that may require sacrifice, which is often the case when starting a new entrepreneurial project (Van Gelderen *et al.*, 2015). Furthermore, it plays a role when entrepreneurs evaluate and decide to exploit opportunities (Brockner *et al.*, 2004, Bryant, 2007) and therefore serves to explain the link between entrepreneurial intention and behavior (Hikkerova *et al.*, 2016). The volitional aspect of self-regulation as a mindset attribute is captured by the concept of an 'implementing mindset', which Mathisen and Arnulf (2013) find to correlate with new venture creation. Self-regulation can be improved by training (Baumeister *et al.*, 2006, Bryant, 2007, Pihie and Bagheri, 2013), but despite its relevance for drawing students towards entrepreneurial behavior, there is hardly any research about developing self-regulating abilities of students in EE (Pihie and Bagheri, 2013). Ustav and Venesaar (2018) addressed the issue in relation with meta-cognition, and Pihie and Bagheri (2013) examined the relationship between entrepreneurial self-efficacy, self-regulation and entrepreneurial intention in an EE context. Their study finds that self-regulation partially mediates the relationship between entrepreneurial self-efficacy and students' entrepreneurial intention.

Social ability: Entrepreneurship is a social activity (McMullen *et al.*, 2021, Sarasvathy, 2009) and EE's role in fostering social competencies is receiving increased attention from EE scholars. Indeed, the ability to build and maintain relationships is an important learning outcome of the "through" teaching approach to EE (Pittaway and Edwards, 2012) and the EntreComp framework recognizes the importance of interpersonal competencies in driving actual entrepreneurial action among students (Bacigalupo *et al.*, 2016). Research confirms that EE has the potential to improve students' social abilities (Boyles, 2012, Lackeus, 2014, Morris *et al.*, 2013). Empathy is an essential conative construct that underlies the ability to develop key relationships (Snow *et al.*, 1996). Empathy is important in the entrepreneurial endeavor as it allows the entrepreneur to interact better with all stakeholders, including partners, employees, and customers (Humphrey, 2013, McMullen *et al.*, 2021, Packard and Burnham, 2021). Being a rather novel area of interest for entrepreneurship research, no empirical evidence exists as yet which shows that entrepreneurs are more empathic than others, but a recent study corroborates the assumption that entrepreneurs who have higher levels of empathy are likely to experience better performance of the new venture (Zhao *et al.*, 2021). Thus, although we cannot empirically conclude that empathy is a distinguishing characteristic of entrepreneurs, an indication exists that successfully navigating the entrepreneurial process depends on the entrepreneur's social ability, where empathy stands out as particularly important. In their practice approach to teaching entrepreneurship, Neck *et al.* (2014) argue that EE can develop empathetic competence in students and teach them to persuade others to buy into their ideas through collaboration. Nevertheless, scant research exists that explores EE's potential in developing empathy among students. Peschl *et al.* (2021) and Rivas and Husein (2022) suggest

various approaches to teaching social ability, including empathy and persuasiveness, in order to educate more innovative and entrepreneurial students, however, the efficacy of the proposed approaches has not been evaluated. Drawing on studies from other fields, such as medical studies, we find that empathy (Kelm *et al.*, 2014, Pohontsch *et al.*, 2018) can be developed in an educational setting.

Cognitive constructs in entrepreneurship education

People's beliefs about themselves and their perception of the surrounding world are essential in human agency and thus in driving behavior (Ajzen, 1991, Dweck and Leggett, 1988). This notion is central to Bandura's social cognitive theory (Bandura, 1986) and in Ajzen's (1991) theory of planned behavior, both of which have inspired much research in the field of EE. Particularly, EE scholars widely agree that students' beliefs in own ability to perform entrepreneurial behavior must be addressed if educators are to increase the likelihood that students will develop entrepreneurial intention and subsequent action. Along the same lines, Dweck's (1986, 2006) work on implicit self-theory has recently gained interest in EE research on mindset development in the entrepreneurial classroom (Burnette *et al.*, 2020). Implicit self-theory involves a person's belief in whether or not human capabilities are fixed or malleable (Dweck and Leggett, 1988). This belief is central in the formation and maintenance of motivation and in determining the amount of effort a person will put into an action (Dweck, 2006). Beliefs about the surrounding environment are likewise essential in driving effort and perseverance (Ajzen, 2002). If a person for example believes that the world is just and predictable, he is more likely to consider himself responsible for what happens to him and for the reactions from the environment and he is thus more willing to exert effort in completing an action successfully (Collins, 1974).

Together, the beliefs a person holds about the controllability of a situation and about the self in relation to entrepreneurial behavior represent the person's perceived feasibility of successfully engaging in entrepreneurial action (Liñán, 2007). Feasibility perception has repeatedly been considered an important antecedent of entrepreneurial intention and behavior in EE studies (Krueger *et al.*, 2000, Kuehn, 2008, Peterman and Kennedy, 2003). From this theoretical basis, three cognitive constructs have been identified as attributes of EM in an educational setting: entrepreneurial growth mindset, entrepreneurial self-efficacy, and perceived behavioral control.

Entrepreneurial growth mindset: According to Dweck (1986, 2006), people with a growth mindset believe human attributes, such as intelligence or personality, can be developed over time, whereas people with a fixed mindset believe they cannot. Growth mindset is domain-specific, meaning that an individual can have a growth mindset in some professional or personal areas while having a fixed mindset in others (Burnette *et al.*, 2020). Three central psychological aspects constitute the growth mindset: positive interpretation of failure, learning-goal or mastery-goal orientation (cf. the conative construct described previously), and positive effort beliefs, meaning that exerting an effort is regarded as something that activates and increases one's ability (Dweck, 1999, Dweck and Yeager, 2019). Together these three aspects of a growth mindset drive a person to seek challenges and to be resilient in the face of difficulties and uncertainty (Dweck and Yeager, 2019), all of which are characteristic of entrepreneurial behavior. It is important to highlight that it has not been empirically corroborated that entrepreneurs exhibit a more intense entrepreneurial growth mindset than other individuals (Billingsley *et al.*, 2021). Therefore, criterion 3, proposed by Robinson and Gough (2020), is not fulfilled. Nevertheless, as we are conceptualizing the EM for an EE context we have included the entrepreneurial growth mindset as a mindset attribute because the individual student's belief that she or he can develop the abilities for navigating the entrepreneurial process is central to learning in any EE course or program. Despite its

importance, the aspect of students' effort beliefs, how they influence the tendency to seek challenges, and EE's potential to foster positive effort beliefs is currently overlooked in EE research. When it comes to interpretation of failure, however, since the 2000s, teaching content in EE has begun to include learning from failure (Hägg and Gabrielsson, 2019, QAA, 2018). For example, Shepherd (2004) suggests that EE ought to focus on teaching students how to manage emotions related to failure for students to be able to regard failures in a more positive light. Politis and Gabrielsson (2009) found that EE can foster a more positive interpretation of failure by increasing students' awareness of how failures represent opportunities for learning and self-development upon which future venturing efforts can be built. Bolinger and Brown (2015) argue that the role of EE is to acknowledge both costs and benefits of failure in order for students to acknowledge its complexity. Finally, Alvarado Valenzuela *et al.* (2020) propose vicarious learning as a safe approach in an educational situation for students to increase their knowledge and positive perception of the role of failure by drawing on someone else's experience.

Entrepreneurial self-efficacy: Self-efficacy is an individual's perception of his or her "capabilities to mobilize the motivation, cognitive resources, and courses of action needed to exercise control over events in their lives" (Bandura and Wood, 1989). Similar to the growth mindset, self-efficacy is also domain-specific (Bandura, 2012, Newman *et al.*, 2019). Thus, entrepreneurial self-efficacy is the strength of a person's belief that he or she can successfully perform entrepreneurial tasks (Chen *et al.*, 1998, McGee *et al.*, 2009). These tasks involve identifying opportunities, managing risk, and developing creative and innovative solutions (Chen *et al.*, 1998, Hultén and Tumunbayarova, 2020). Entrepreneurial self-efficacy has been found to be a distinguishing attribute of entrepreneurs (Chen *et al.*, 1998, Culbertson *et al.*, 2011). According to the reciprocal causation model in social cognitive theory (Bandura, 1986), an individual's belief about own efficacy can be affected by the environment and instilled in various ways, including mastery experiences, modeling, and social persuasion (Bandura, 1986, Bandura and Wood, 1989). Self-efficacy is thus an attribute that can be affected by entrepreneurship education (Gielnik *et al.*, 2017), which is supported by numerous empirical studies in EE (Burnette *et al.*, 2020, Karlsson and Moberg, 2013, Longva and Foss, 2018, Peterman and Kennedy, 2003, Pihie and Bagheri, 2013).

Perceived behavioral control: Ajzen and Madden (1986) have defined perceived behavioral control as a "person's belief as to how easy or difficult performance of the behavior is likely to be" (p. 457). An individual will typically only adopt a particular behavior if she has some level of control over it and believes she can complete it successfully (Ilouga *et al.*, 2014). Perceived behavioral control relates to the concept of uncertainty, which is central in entrepreneurship theory, as uncertainty is the perception of controllability of a situation (Kuehn, 2008). The perception of whether a behavior is personally controllable is determined by past experiences and perceived obstacles to behavior, for example, perceived absence of resources and opportunities (Ajzen, 1991, Rauch and Hulsink, 2015). Factors that influence an individual's perceived control over an intended behavior may be internal to the person, such as skills, abilities, willpower, and knowledge, or external, including time, opportunity, and dependence on others. Where internal control closely resembles self-efficacy, external control relates to a perception of controllability of a situation and the surrounding environment (Liñán, 2007), corresponding to the concept of perceived feasibility (Liñán *et al.*, 2011). In entrepreneurship, perceived controllability is found to relate closely to nascent entrepreneurship, which is a proxy for entrepreneurial behavior (Vamvaka *et al.*, 2020). Perceived controllability is also central to Sarasvathy's (2001) effectuation theory, as she posits that entrepreneurs focus on controlling aspects of an uncertain future, whereas managers are more likely to focus on predicting the future. In the context of EE, evidence can be found that EE programs have the potential to positively influence students' perception of behavioral

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control (Fayolle *et al.*, 2006, Longva and Foss, 2018, Rauch and Hulsink, 2015). The influence is exerted through a modification of the student’s beliefs about the availability of resources or by enhancing beliefs about the ability to engage in entrepreneurial behavior, for example, by providing entrepreneurial mastery experiences. Furthermore, the dispelling of spurious experiences of infeasibility and the increase of student competencies could improve student perception of feasibility and perceived behavioral control (Rauch and Hulsink, 2015).

Table II displays the identified affective, conative, and cognitive constructs in EE that are relevant for the subsequent finalization of an S-O-R model of EM in EE.

[INSERT TABLE II HERE]

An S-O-R model for entrepreneurial mindset in entrepreneurship education

Combining our model form in Figure 3 and the identification of psychological attributes of EM in Table I, Figure 5 sums up our proposal for how to operationalize knowledge generation about the role EE might play in fostering students’ EM.

[INSERT FIGURE 5 HERE]

Discussion

The paper relies on an S-O-R logic to systematize the operationalization of EM in an EE context. In the following, we discuss whether the chosen form helps us understand the role of EE in EM development. We do this by addressing two central aspects of our conceptual model: the usefulness of an S-O-R model to depict the EE-EM relationship and our selection of psychological attributes of the EM.

This paper aimed to explore whether applying the S-O-R model as a well-known descriptive tool is useful for establishing an improved understanding of the complex, dynamic relationship between EE and the students’ EM development. On the one hand, it provides theoretical support for our conceptual model that it is built on a scientifically accepted approach to understanding how external stimuli are being mediated by psychological processes in generating responses such as learning or mindset change. It definitely produces a familiarity that facilitates the understanding of the processes involved. On the other hand, using a relatively simple structure as the S-O-R model may not catch all interrelated relationships and feedback loops involved in the process. As was previously pointed out, the interrelated nature of the affective, conative, and cognitive attributes in the response variable has not been captured by the S-O-R model in its current form. For example, it is recognized that an individual’s thoughts and beliefs impact emotions and behavioral dispositions (Dweck and Leggett, 1988). Likewise, how students feel can affect how they think about and act in the entrepreneurial process (Lackeus, 2014, Morris *et al.*, 2012). These dynamics are not explicitly addressed in an S-O-R model.

Furthermore, the visualization of the model might imply a cause-effect relationship where the stimuli from the pedagogy will result in the development of mindset attributes when these are mediated by the psychological mechanisms in the center of the model. However, this linear causality does not exist in a complex, open system such as education. We address this challenge by applying a critical realist lens to the S-O-R logic and thereby surface the multi-causal characteristic of learning in EE. We argue that the model should not be applied to detect causal relationships but to explore potential causal tendencies and plausible explanations of which circumstances and which mechanisms that (in concert) have the potential to foster EM attributes in an educational setting.

Regarding the content of our model, our focus is on the response variable, the psychological attributes of EM. We recognize that our choices about which attributes to include are equivocal. Indeed, in the process of developing our model, a series of other psychological constructs were considered for our EM conceptualization, including entrepreneurial inspiration, entrepreneurial identity, need for achievement, optimism, self-confidence, and persuasiveness, to mention a few. They were excluded because they failed to meet one or more of the selection criteria. For example, the need for achievement and optimism have largely been determined to be personality traits that are practically stable over time (Carver and Scheier, 2014, Rauch and Frese, 2007) and thus very difficult to influence by education. Moreover, inconclusive evidence exists about the effects of optimism on entrepreneurial behavior (Hmieleski and Baron, 2009). Entrepreneurial inspiration was initially included in our model as an affective attribute of EM. However, we found that the concept overlaps considerably with the concept of entrepreneurial attitudes. We chose to include attitudes towards entrepreneurship instead of entrepreneurial inspiration, as the former is founded on a longer research tradition in the fields of psychology and entrepreneurship.

Even when we have determined that a construct fulfilled all criteria for inclusion, we acknowledge that others might reach different conclusions. For example, EE's positive role in developing some attributes, such as self-regulation and learning-goal orientation has been studied only empirically to a limited extent. Yet, we rely on the few existing studies that show indications of the malleability of the constructs and include the constructs in our model due to their relevance for successful entrepreneurial behavior. More insight into the malleability of these psychological constructs in an educational setting is needed and could lead to alterations of our model. Such insights are most welcome as they will strengthen our model and help educators direct their educational efforts towards those attributes of EM where the most impact can be achieved. On the positive side, we have gone through a thoughtful deliberation guided by a careful application of four selection criteria, and we believe that our study contributes with a theoretically well-founded proposal for conceptualizing EM as a multivariable outcome of EE.

Limitations

The proposed model for depicting and operationalizing the dynamic relationship between EE and the development of EM attributes is not without limitations. As previously pointed out, applying an S-O-R model may simplify a very complex and dynamic relationship between a great variety of variables in all model elements. To mediate this risk, we applied a critical realist lens to the model. Second, we have focused our attention on the R because focusing on a single element reduces the complexity of our study, allowing for a deeper discussion of that element, in this case, the EM attributes. Vast research exists that addresses the EM as an important outcome of EE, but few attempts have been made to support the selection of EM attributes with theoretical insights from psychology, education, and entrepreneurship. We strongly encourage future research that applies a similar approach to explore the S, the O, and the exogenous variables of our model, drawing on theories from education and psychology

Contributions and perspectives

Notwithstanding these limitations, the proposed model has both theoretical and practical relevance. The contributions of the model mainly evolve from the three approaches applied in developing our model. First, applying an S-O-R logic to depict and operationalize the dynamic relationship between EE and the development of EM attributes. Second, the application of a critical realist perspective on this relationship. Third, the understanding of the EM as a multivariable construct consisting of affective, cognitive, and conative attributes.

First, our study contributes to the discussion of how to conceptualize the EM by clearly positioning it in a research stream that acknowledges EM as a multivariable construct. Relying on four selection criteria and knowledge from psychology, education, and entrepreneurship, our study contributes with a theoretically founded identification of which psychological constructs can be considered EM attributes. Despite the increased attention to the EM concept, such attempts are few, yet necessary to generate serious scholarly discussion to advance our understanding of the EM as a multivariable psychological construct. Furthermore, the psychological attributes that are identified in the response variable of our model are measurable markers of EM that can be studied using different qualitative or quantitative research designs. The application of the model for research purposes thus helps us gain knowledge about the state and development of separate EM attributes, contributing to a broader understanding of the EM concept in an EE setting. The identification of specific psychological attributes of EM also has practical relevance as it assists educators in designing EE activities with the aim of fostering students' EM, as these activities can be more specifically developed to address selected parts of the EM.

Another theoretical contribution of the paper is that the conceptual model provides a framework for studying the learning processes that take place in the EE classroom and for exploring the inherent mechanisms of these processes that have the potential to foster or hinder the development of EM attributes of individual students. The S-O-R logic helps visualize the relationship between relevant aspects of the learning process and ensures that attention is given to the numerous intervening aspects when understanding the role of EE in fostering students' EM. The contribution of a critical realist perspective is its emphasis on the fact that such learning processes are complex and dynamic. Thus, a critical realist S-O-R model visualizes multiple, indirect, and combined causality, an inherent characteristic of learning in EE, which must be addressed when investigating how learning outcomes are generated in EE in different contexts. With its particular focus on the mechanisms of learning processes, our model provides a framework that can be applied to explore how and when a particular pedagogical approach supports the development of EM attributes. Despite an increased focus on mindset development in EE research, scant knowledge exists about these mechanisms. The application of our model will, therefore, also have practical relevance for educators. Indeed, a better understanding of the mechanisms that foster EM attributes will help in the design of teaching activities that embrace contextual situatedness.

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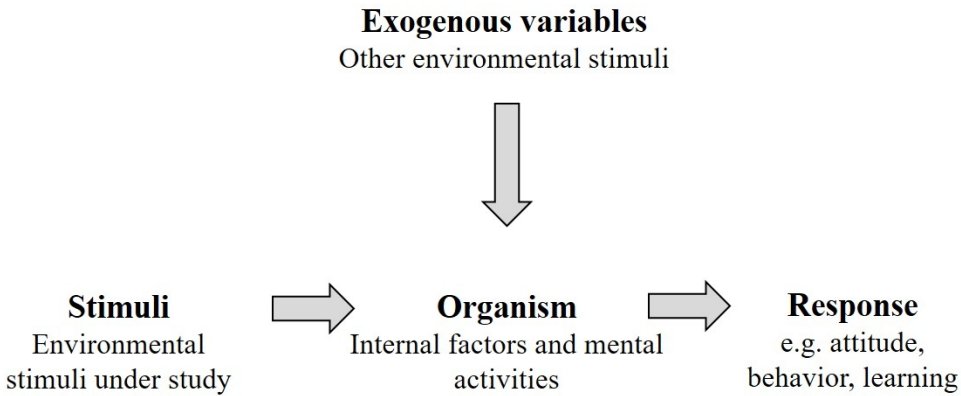
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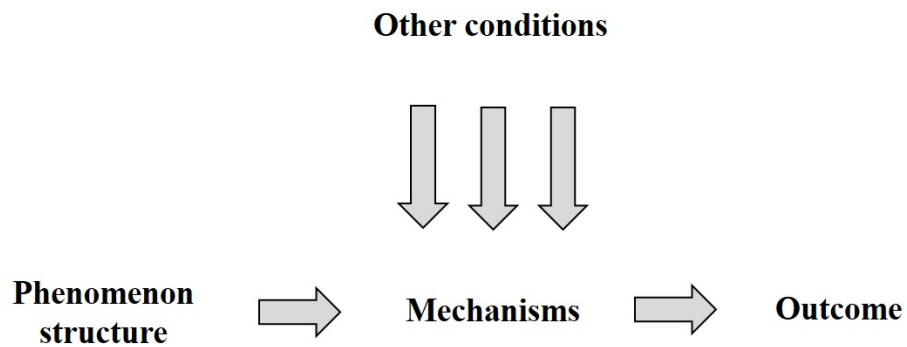
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The S-O-R model

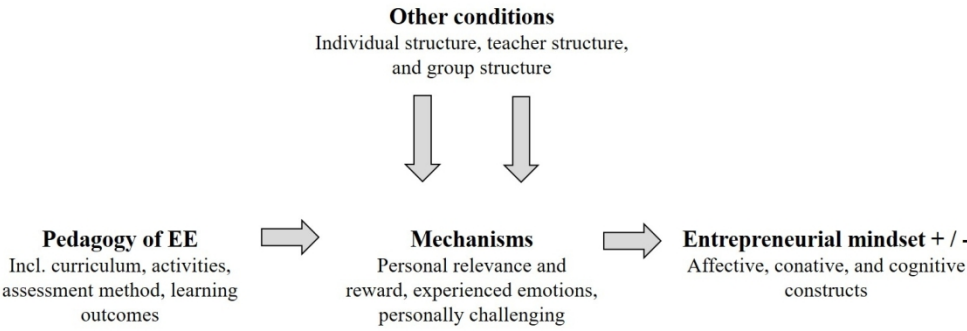
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Critical realist view of causal tendencies

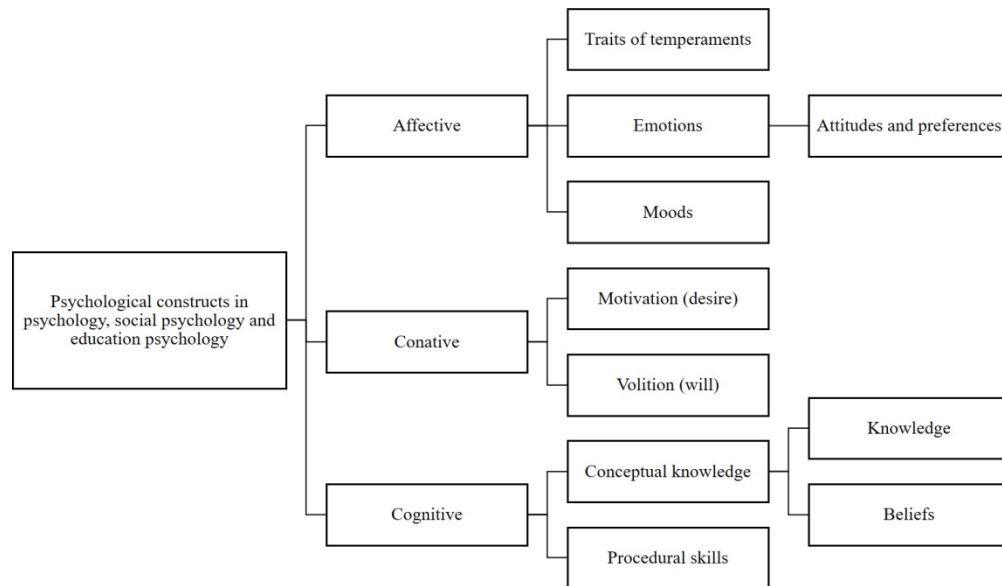
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S-O-R model for entrepreneurial mindset development in entrepreneurship education

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Affective, conative, and cognitive constructs

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Table I. Selection criteria for entrepreneurial mindset attributes and supporting references

	1) has been empirically supported	2) is consistent with social theory and practice	3) distinguishes entrepreneurs	4) can be influenced by education
Entrepreneurial attitude	Ajzen (1991) Krueger et al. (2000) Souitaris et al. (2007)	Souitaris et al. (2007) Robinson et al. (1991)	Robinson et al. (1991) Douglas and Shepherd (2002) Souitaris et al. (2007)	Fayolle and Gailly (2015) Rauch and Hulsink (2015) Keller and Kozlinska (2019)
Entrepreneurial passion	Cardon et al. (2009) Cardon et al. (2013)	Cardon et al. (2013) Gielnik et al. (2015) Newman et al. (2021)	Cardon et al. (2009) Chen et al. (2009)	Fellnhofer (2017) Gielnik et al. (2017) Lackeus (2020)
Learning-goal orientation	Midgley et al. (1998) Grant and Dweck (2003)	Grant and Dweck (2003) Huang and Luthans (2015)	Culbertson et al. (2011)	Dweck (2006) Ross et al. (2021)
Self-regulation	Baumeister et al. (2006)	Kruglanski et al. (2000)	Mathisen and Arnulf (2013) Hikkerova et al. (2016)	Baumeister et al. (2006)
Social ability: empathy	Snow et al. (1996)	McMullen et al. (2021) (Packard and Burnham, 2021)	Humphrey (2013)	Kelm et al. (2014) Pohontsch et al. (2018)
Entrepreneurial growth mindset	Dweck (1986); (2006)	Dweck and Yeager (2019)		Dweck (2006) Politis and Gabrielsson (2009) Bolinger and Brown (2015)
Entrepreneurial self-efficacy	Bandura (1986) Chen et al. (1998) McGee et al. (2009)	McGee et al. (2009) Newman et al. (2019)	Chen et al. (1998) McGee et al. (2009)	Gielnik et al. (2017) Longva and Foss (2018) Burnette et al. (2020)
Perceived behavioral control	Ajzen (1991) Krueger et al. (2000)	Liñán et al. (2011)	Sarasvathy (2001) Vamvaka et al. (2020)	Fayolle et al. (2006) Rauch and Hulsink (2015) Longva and Foss (2018)

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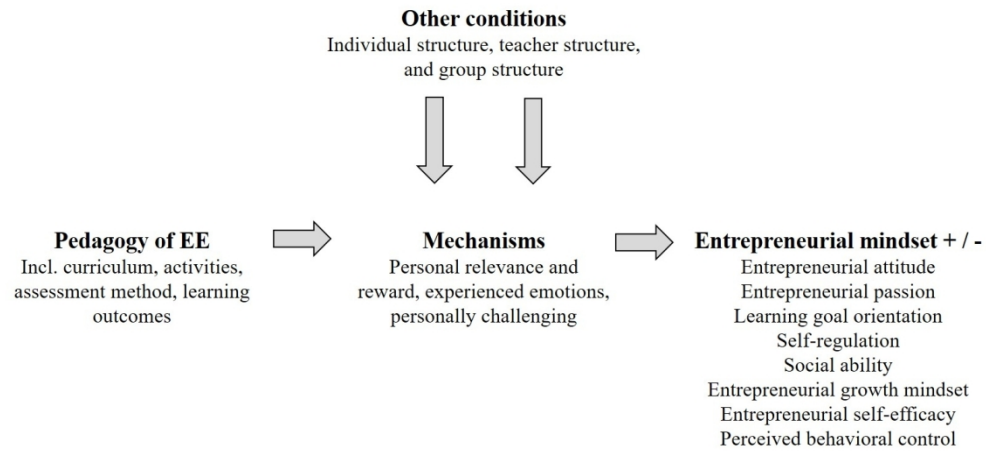
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Table I. Affective, conative, and cognitive attributes of the entrepreneurial mindset

Psychological construct		Construct in EE	Studied by
Affect	Emotions	Attitude to entrepreneurship	Packham et al. (2010) Athayde (2012) Karlsson and Moberg (2013) Lackéus (2014) Rauch and Hulsink (2015) Varamäki et al. (2015)
		Entrepreneurial passion	Cardon et al. (2009) Lackéus (2014) Gielnik et al. (2017) Fellnhöfer (2017) Lackéus and Sävetun (2019)
Conation	Motivation	Learning-goal orientation	Dweck (2006) Ross et al. (2021)
	Volition	Self-regulation	Ilouga et al. (2014) Brockner et al. (2004) Bryant (2007) Van Gelderen et al. (2015)
		Social ability: empathy	Peschl et al. (2021) Rivas and Husein (2022)
Cognition	Self-concept	Entrepreneurial growth mindset	Burnette et al. (2020) Casulli et al. (2022)
		Entrepreneurial self-efficacy	Karlsson and Moberg (2013) Pihie and Bagheri (2013) Gielnik et al. (2015) Hultén and Tumunbayarova (2020)
	Perception of the world	Perceived behavioral control (controllability)	Krueger et al. (2000) Fayolle et al. (2006) Rauch and Hulsink (2015) Otache et al. (2019)

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The role of entrepreneurship education in fostering entrepreneurial mindset attributes

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Dear Martin McCracken,

Thank you very much for giving us the opportunity and encouragement to revise and resubmit our manuscript. Based on the reviewers’ questions and recommendations, we have made several improvements to the manuscript. In particular, we have focused on strengthening the theoretical discussion of the introduction, on clarifying the selection of the EM attributes, and on highlighting limitations and contributions of our conceptual model.

Reviewer 1 comments	Author responses
This is a good piece of writing - but I believe more is needed to move it from being an excellent review of literature (and cataloging of relevant constructs), to a stimulating contribution which can aid readers and educators of EE. Well done on the progress thus far.	Thank you for appreciating the potential of our paper and providing useful suggestions for how to specify our contribution.
1. Originality: Does the paper contain new and significant information adequate to justify publication?: To some extent, yes. The paper presents a mapping of entrepreneurial constructs which are relevant to entrepreneurship education. Using the S-O-R framework and a criteria by Robinson & Gough (2020) the authors present a mapping of constructs which are important for entrepreneurs and can be developed in EE.	Thank you for acknowledging the originality of the paper.
2. Relationship to Literature: Does the paper demonstrate an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources? Is any significant work ignored?: There is an array of literature in the article, and a good range between seminal studies and recent publications. I think the paper lacks in a few areas however: 1) Though EM is mentioned many times, it is not linked to much scholarly work and indeed is defined (pg2,18) by the authors, without much discussion of previous framings. 2) Other attempts to map the field of EE. This type of framing paper has been published before so it is important to note similar studies and highlight the extended novelty in this article.	Thank you for this constructive comment, which helped us highlight the novelty of our study better. 1) We have addressed this comment in the introduction of the paper by including a theoretical discussion of the EM concept. 2) This comment is also addressed in the introduction as we refer to previous attempts to frame EE in terms of the applied pedagogical methods and contrast this with our approach that focuses on the EE-EM relationship.
3. Methodology: Is the paper's argument built on an appropriate base of theory, concepts, or other ideas? Has the research or equivalent intellectual work on which the paper is based been well designed? Are the methods employed appropriate?: There does appear to be a methodology applied, and the authors discuss the SOR model at length (though only referencing the applied studies not	We are a bit uncertain about this comment, and in particular the parenthesis. We have chosen to interpret this as if you would like to see the “the seminal works from the biological sciences” unfolded a bit more. We have elaborated this part with insight and references from the functional explanations logic from experimental psychology. We do, however, consider this a tricky balance. On the one hand, respect must be

the seminal works from the biological sciences discipline).	paid to the classics, but expanding too much on this may end up in a detour into theories we do not really use.
I would like there to be more information on the selection process applied in deciding on these constructs. For example it is noted that the construct needed to fulfill 4 criteria to be included. Are there examples of constructs which were not included for example? What were the challenges noted in this process? (For example, given the array of publications it may be possible to find studies which validate some constructs but through poor research design). More inclusion of this detail is important, to convince the reader this is a comprehensive mapping. Can you show that each construct has passed the four criteria in a table perhaps?	Thank you for this useful advice, which helped us increase transparency in regards to our selection process. Following your recommendation, we have developed a table (table II), which shows how previous theory has informed our choice about which attributes to select for our model. Furthermore, we have strengthened the arguments for the majority of constructs and addressed the selection criteria more specifically. Finally, in the discussion we have addressed some of the challenges in the selection process and given examples of constructs that we chose not to include in the model.
4. Results: Are results presented clearly and analysed appropriately? Do the conclusions adequately tie together the other elements of the paper?: N/A to an extent as this is a conceptual paper. The framework as the output is interesting. There is a lot of information about the approaches taken (critical realist etc.) in the literature sections but these do not seem to be developed or considered when developing the conclusions for the piece.	Thank you for the comment, which helped us develop a more reflexive conclusion and highlight the importance of our contributions.
5. Practicality and/or Research implications: Does the paper identify clearly any implications for practice and/or further research? Are these implications consistent with the findings and conclusions of the paper?: The discussion and conclusion are shorter. Limitations section is needed to acknowledge the areas which are underdeveloped - however the author does admit the issues in using a simplistic tool like the SOR model.	Thank you for the comment. In our discussion sections, we have addressed some of the limitations of our model. However, considering your comment we have elaborated further on these and have included a short section summarizing the limitations of the model.
The original mapping tool on which the paper is built on (Figure 4) - where did this come from? I think the source needs to be more explicit.	Figure 4 is a result of our own iterative process based on the review of the literature about affect, cognition, and conation. As mentioned in the beginning of the section, the main inspiration comes from Snow et al. We have added a short sentence before Figure 4, which clarifies that the figure is built on the previous sections.
6. Quality of Communication: Does the paper clearly express its case, measured against the	Thank you for this comment. We have revised the abstract to make it more concise and precise,

<p>technical language of the field and the expected knowledge of the journal's readership? Has attention been paid to the clarity of expression and readability, such as sentence structure, jargon use, acronyms, etc.:</p> <p>Excellent presentation of paper and discussion of some complex topics in a simple way, aided by examples and other tools. The abstract and conclusion are weaker than the other sections and feel rushed (I would advise shortened sentences for aided clarity and conviction).</p>	<p>and we have developed the concluding sections further considering your recommendations.</p>
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Reviewer 2 comments	Author responses
<p>Thank you for letting me to read and evaluate your manuscript, and I must say that the research you have conducted is quite intriguing. However, I noticed that there are several theoretical issues in the current version of the manuscript.</p>	<p>Thank you for appreciating the potential of our manuscript and providing useful suggestions for how to specify our contribution.</p>
<p>Abstract:</p> <p>The abstract is loosely demonstrated; it is often recommended to avoid formulating research question in the abstract. Moreover, the RQ is very general.</p>	<p>Considering your suggestions, we have revised the abstract to make it more concise and precise.</p>
<p>Introduction:</p> <p>The introduction of the paper lacks a strong theoretical discussion to support and build the rest of the paper.</p>	<p>We agree with your suggestion and have strengthened the theoretical discussion of the manuscript in the introduction. On the one hand, we have included a theoretical discussion of the EM concept and, on the other hand, we present previous attempts to frame EE in terms of the applied pedagogical methods and contrast this with our approach that focuses on the EE-EM relationship.</p>
<p>The Stimulus-Organism-Response framework is an important aspect of your study, but it is not well developed or justified in the introduction. This makes it difficult for the reader to understand the significance of your research and how it fits into the larger context of the field. Perhaps, a more robust theoretical discussion would help to provide a clearer framework for the reader to understand your findings and their implications. Furthermore, I would suggest including a more in-depth examination of the relevant literature on the topic, to demonstrate a strong understanding of the existing research and how your study contributes to the field.</p>	<p>We agree that the choice of S-O-R framework should be justified further. We have done this. Not in the introduction, though, but in the later section "Placing entrepreneurship education and the entrepreneurial mindset in an S-O-R logic" where we introduce the framework.</p>
<p>The theoretical discussion oversimplifies the relationship between entrepreneurship education (EE) and the development of an entrepreneurial mindset (EM). The assumption that EE can act</p>	<p>We very much agree with the critique that it is an oversimplification to state that EE results in EM development, even though this would be the behaviorist position on the relationship. We</p>

as a stimulus that creates a particular response (S $\square$ R) is a reductionist view of the complex and multidimensional nature of EM development.	have tried to make this clearer by expanding on the behaviorist and behavioralism traditions.
Moreover, the reference to classical conditioning theory and the ideas of Pavlov and Skinner may be outdated (while relevant) and do not accurately reflect the current state of research in the field, is it possible to update this?	We appreciate your suggestion, but also consider this a bit of a balance. On the one hand, respect must be paid to the classics, but expanding too much on this may end up in a detour. We have both elaborated on the background from the classics and added a few more contemporary discussions and references.
The assertion that students' future behaviour is solely determined by previous learning activities and that passive information alone is not enough to create learning, while partially true, may not be the only or even the dominant perspective in the field. A more nuanced and comprehensive understanding of the relationship between EE and EM development is thus needed, taking into account the multitude of factors that influence the development of an entrepreneurial mindset. It would be beneficial to consider a more nuanced and multi-disciplinary perspective on this topic, to avoid oversimplifying and misrepresenting the current state of research.	We completely agree that students' future behavior is not solely determined by previous learning activities, and we apologize if it could be misunderstood so. We have tried to make it clearer by elaborating on how learning is studied in experimental psychology versus how it is studied from a behavioralism perspective. Furthermore, we have elaborated on the contribution of applying a critical realist perspective to understanding the EE-EM relationship in the concluding sections of the manuscript.
The discussion on affect, conation, and cognition has been nicely presented and elaborated, specifically in EE context.	
The statement in the discussion "using a scientifically accepted approach to understanding how theoretical psychological constructs act as mediators between stimuli and response validates our model to a certain extent", needs some clarification and justification.	We realize this statement could be misunderstood and have attempted to clarify by rephrasing the sentence to "it provides certain theoretical support to our model that it is built on a scientifically accepted approach to understanding how external stimulus are being mediated by psychological processes in generating responses such as learning or mindset change."
Overall, while the results of your study are certainly interesting, the lack of a well-developed theoretical discussion makes it difficult to fully appreciate the significance of your findings. The statement you provided is a commendable start to evaluating the validity of a model in psychology, as the use of scientifically accepted approaches is crucial in this field. However, there are several areas where the statement could be improved and expanded upon.	Thanks for your comment. We hope that the inclusion of a theoretical discussion about the EM and EE in the introduction remedies this. Furthermore, we have revised the discussion and the concluding sections to highlight our contributions further.
Because the statement you provided is quite general and lacks specific details about, e.g. how your proposed model can be tested and	Thank you for this comment. We have emphasized the limitations of our model and clarified that our focus is on the Response

<p>evaluated. It would be useful to know what; for example, the stimuli and response are, as well as; for example, which constructs act as mediators. The statement only mentions that the approach used validates the model to a certain extent. It would be beneficial to quantify this extent, if possible.</p> <p>In addition, the authors should consider providing a more in-depth analysis of the limitations and weaknesses of the model, including areas for improvement. This will help to make the evaluation more thorough and provide valuable insights for future research.</p>	<p>variable. We recognize that similar studies of the stimuli and mediating variables would be equally relevant, though outside the scope of this paper.</p>
<p>In addition, the statement you provided provides a thoughtful evaluation of the limitations of a simple S-O-R model in capturing the complexity of psychological processes. However, there are several areas where the statement could be improved and expanded upon. For example, the statement mentioned that using a simple S-O-R model may not capture all interrelated relationships but does not provide specific examples of these relationships. It would be helpful to know what types of relationships are not being captured by simple S-O-R model.</p>	<p>Thank you for the comment. We have addressed the issue of the interrelated relationships by providing two examples in the first paragraph of the discussion.</p>
<p>Moreover, it is only mentioned the interrelated nature of affective, conative, and cognitive attributes in the response variable, but does not provide any information about how this interrelation might affect the validity of the S-O-R model.</p> <p>Working on these will help to provide a more comprehensive evaluation of the model and highlight areas for improvement.</p>	<p>Thank you for the suggestion, but unfortunately, we have difficulties understanding this specific comment.</p>
<p>In conclusion section, a good overview of the theoretical and practical relevance of a model in the field of EE is provided. It is mentioned that the psychological attributes identified in the response variable are measurable markers of EM, but it is not very clear how these markers have been validated.</p> <p>The authors concluded that EM is a multivariable construct but does not provide any specific examples of how this contribution is made. It would be helpful to know how the model specifically advances our understanding of EM as a multivariable construct.</p> <p>The authors could also discuss the potential limitations and weaknesses of the model, as well as areas for future research. This will help to provide a more comprehensive evaluation of the</p>	<p>Based on your comment, we have developed a table (table II), which shows how previous theory has informed our choice about which attributes to select for our model. Furthermore, we have strengthened the arguments for the majority of constructs and addressed the selection criteria more specifically. Finally, in the discussion we have addressed some of the challenges in the selection process and given examples of constructs that we chose not to include in the model.</p> <p>Following your recommendations, in the contribution section, we have emphasized how our study contributes to advancing our understanding of the EM as a multivariable construct.</p>

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60	model and provide valuable insights for future research in the field.	
	<p>In conclusion, the manuscript provides a good start to explaining the theoretical and practical relevance of a S-O-R model EE context. However, by addressing the comments and suggestions provided, the authors can strengthen their evaluation and provide valuable insights for future research in the field.</p> <p>I hope this feedback is helpful and I look forward to seeing the revised version of your paper.</p>	<p>Thank you for the valuable feedback on our manuscript. We have considered your comments carefully and hope the adaptations to our paper address your concerns, particularly in highlighting limitations and contributions and including a theoretical discussion about the EM and EE.</p>