DECISIONS, DECISIONS, DECISIONS! - TEACHABILITY OF DECISION-MAKING COMPETENCE

Verena Liszt-Rohlf, University of Applied Sciences Burgenland
Brigitte G Halbfas, Bergische University Wuppertal
Alexandra Baldwin, University of Applied Sciences Burgenland

ABSTRACT

Entrepreneurship education researchers consider decision-making an essential competence for entrepreneurs and have repeatedly pointed out that decision-making competences impact business success and performance. Starting from the premise that these competences are essential, the question arises how teaching entrepreneurial decision-making requires certain approaches to parse out two distinct logics and describes how the authors discovered this. Current definitions accept tying teachability to observability. The present paper investigates observability and teachability in teaching modes in entrepreneurship education at the University of Kassel, Germany, Europe. The research team conducted an empirical study with 63 MBA students who tested various teaching modes and wrote think-aloud protocols that formed the basis for content analysis. The findings reveal complex yet comprehensive approaches to ways in which to teach and learn decision-making in a founder-centered environment. The results exemplify numerous decision-making situations and showcase applications of causal and effectual decision logics. This allowed the authors to derive criteria that could serve as a starting point for planning teaching modes based on the model and propositions derived from the presented findings.

Keywords: Decision-Making, Teachability, Observation, Think-Aloud Protocols, Competence.

INTRODUCTION

Despite the fact that teaching entrepreneurial competences to future entrepreneurs could support overall economic and social success (Hahn et al., 2020; Nabi et al., 2017), the education perspective regarding decision-making competences deserves attention because many aspects of entrepreneurship entail some form of decision-making, e.g., feasibility models, business plans, business models, industry/competitive analyses, pitch decks, venture capitals investing.

Entrepreneurs have to make decisions. Decisions they make while starting a business could have a long-lasting impact on how a business develops. Many authors refer to decisions made in the early stages of running a business as trendsetting decisions (Murmann & Sardana, 2013; Sarasvathy & Dew, 2005; Wiltbank et al., 2006) because at this stage, decisions lay down a company's direction and it is a matter of concern that nascent entrepreneurs often lack the knowledge to consider alternatives (Murmann & Sardana, 2013).

Sarasvathy (2001) showed that entrepreneurs follow different logics when making decisions under uncertainty and that their decision-making logics follow a specific process and further explained that these entrepreneurship-inherent logics either adhere to causation, i.e., they are goal-oriented, or they adhere to effectuation, i.e., they are resource-oriented. People in decision-making positions typically are unaware of the type of logic they use when making

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decisions. Strategic decisions appear to follow a hybrid logic that simultaneously uses effectuation and causation (Reymen et al., 2015). Throughout, there is also talk of a rapid change between the individual principles of the logics (Palmié et al., 2019) and even of effect effects of the individual principles on the other principles (Ranabahu & Barrett, 2020). More broadly, hybridity leads to "*effectual*" interaction and implies inseparability in relation to a single activity (Galkina & Jack, 2022).

Being aware of one's decision-making options reduces the level of uncertainty that is inherent in the decision-making process, which is crucial in the founding process (Busenitz, 1999; Murmann & Sardana, 2013) and to know about the options is one task of education.

Educators mainly teach decision-making in an indirect manner. Scholars criticize a lack of integration of decision-making logic and other options for volitional decision-making into entrepreneurship education (Gabrielsson & Politis, 2011; Lerner et al., 2018; Sarasvathy, 2008). Traditional entrepreneurship research emphasizes theoretical development and institutional legitimacy, consequently relegating questions of knowledge transfer to education (Béchard & Grégoire, 2005). Future entrepreneurship education research thus benefits from robust theoretical and conceptual foundations that draw from education and entrepreneurship research (Fayolle, 2018) so that entrepreneurship education in practice can design better teaching modes. Additionally, further entrepreneurship education research in the field of decision-making needs to focus on different nationalities as the cultural background could be influencing (Chang & Rieple, 2018).

Given the importance of reducing uncertainty in entrepreneurial decision-making, this research aims to identify how teaching entrepreneurial decision-making requires certain approaches to parse out two distinct logics and to show how the authors discovered this.

The authors expect to advance entrepreneurship education research by investigating these questions in two ways. Firstly, the authors stand to gain insights from entrepreneurial decision-making research on a superordinate knowledge level (Murmann & Sardana, 2013; Reymen et al., 2015; Ruiz-Jiménez et al., 2020) by adding insights from entrepreneurial education (Bacigalupo et al., 2016; Béchard & Grégoire, 2005; Hahn et al., 2020; Nabi et al., 2017). The combination of theories support teaching modes in which theory and practice parse out the decision-making processes students use to take decisions. With the data set generated and the ensuing interpretation thereof, the authors aspire to advance the understanding of entrepreneurial decision-making to help future entrepreneurs (at this stage learners, students) understand how they approach decisions and help educators in their effort to teach entrepreneurial decision-making.

Secondly, this analysis allows developing assessment criteria for teaching modes, especially for the simulation of entrepreneurial scenarios. These criteria open up further research and teaching options for entrepreneurship education, such as validating them or developing and evaluating new assessment methods for decision-making in entrepreneurship education. These criteria for simulations could transfer or extend to other disciplines. Thus, knowledge gained in this research and the resulting pedagogical model could apply to various entrepreneurship education settings.

In a first step, this paper introduces the goals and basic concepts of entrepreneurship education, which draws attention to decision-making as an essential entrepreneurial competence. In a second step, it examines two decision-making logics and their importance for entrepreneurial actions. In a third step, this paper analyzes the teachability of decision-making competence. Here, the authors define the observability of a competence as an aspect related to

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assessment and assurance of learning, which in turn connects with teachability. In a fourth step, the authors propose a pedagogical model that is based on the previous three steps and that builds on the observation that each simulation triggers different logics and could be used to plan and evaluate different simulations designed to promote decision-making competences for future entrepreneurs.

ENTREPRENEURSHIP EDUCATION AT ITS BEST

Aims of Entrepreneurship Education

The assumptions and approaches educators have about entrepreneurship need to become transparent because different approaches to entrepreneurship education impact the design and framing of entrepreneurship education (Béchard & Grégoire, 2005; Fayolle & Gailly, 2008). This is especially true in the European realm today, where scholars treat and understand entrepreneurship education as a means of empowerment (Bacigalupo et al., 2016).

A framework of entrepreneurship education describes one end of the spectrum about the meaning of entrepreneurship education as "*fully embracing entrepreneurship as a mold-breaking activity not complying with the principles of scientific management*" (Bhatia & Levina, 2020). When focusing on entrepreneurial decision-making, this end of the spectrum could be a starting point for using both logics. Educators want to train entrepreneurial decision-making in uncertain situations, it is important that they consider the framework conditions of uncertain decisions, such as a lack of knowledge-base and issues associated with calculated estimations or probabilities (Murmann & Sardana, 2013; Sarasvathy, 2008).

Johanisson (2018) argues that entrepreneurship education breaks with the principles of scientific management and instead focusses on scientific facts from entrepreneurship research. In an ideal higher education setting, educators share their knowledge and experience with students in open dialogue and give them a chance to unlearn managerial convictions, to be able to acknowledge entrepreneurialism as an ideology and recall their original entrepreneurial selves (Johanisson, 2018). Although, real entrepreneurship and settings in entrepreneurship education differ, with specific teaching modes educators can come close to real life and access students' learning and development (Chang & Rieple, 2018).

A host of researchers have come to the conclusion that entrepreneurship education should focus on the students, i.e., future entrepreneurs, come from diverse backgrounds and have different motivations, entrepreneurship education should consider diverse human and biographies (Bonesso et al., 2018; Toutain et al., 2017; Williams Middleton et al., 2020).

State-of-the-Art Concepts to Foster Entrepreneurial Competences

Entrepreneurial competences are mainly described as knowledge, skills, and attitudes, which are required to perform a specific task and are both learnable and changeable (Komarkova et al., 2015; Lans et al., 2011; Mitchelmore & Rowley, 2010; Morris et al., 2013). In general, there is agreement that entrepreneurial competences focus on the practice of successfully mastering entrepreneurial tasks (Bacigalupo et al., 2016; Komarkova et al., 2015; Mitchelmore & Rowley, 2010; Morris et al., 2013; Reis et al., 2020). More detailed concepts conclude that the decision-making competence is essential. It already started in 1992, when Chandler & Jansen (1992) identified three roles that founders needed to take on. These three roles cover entrepreneurial, managerial, and technical aspects. The technical role concerns tools, procedures and techniques, including decision-making (Chandler & Jansen, 1992). Here are similarities to

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conceptual competency (Man et al., 2002). In 2005 two frameworks have been developed that endorse decision-making as important competence (Bartram, 2005; OECD, 2005). Some years later, competence concepts still include decision-making competences named under conceptual competencies or judging (Lans et al., 2011; Mitchelmore & Rowley, 2010) or, more specific, risk management and mitigation competence, which includes decision-making as important processes in entrepreneurship (Morris et al., 2013). A key competence in the European context is the sense of initiative and entrepreneurship (The European Parliament and the Council of the European Union, 2006). One of three competence areas is called into action and entails the competence coping with uncertainty, ambiguity, and risk: making decisions dealing with uncertainty, ambiguity, and risk (Bacigalupo et al., 2016).

New concepts based on literature analyses revealed that risk management or coping with risk entails decision-making as a competence (Gianesini et al., 2018) in three models (Bacigalupo et al., 2016; Bartram, 2005; Morris et al., 2013) or include the ability to make a decision in the category leadership (RezaeiZadeh et al., 2017) or even list decision-making as one of 33 core competences (Reis et al., 2020).

INSIGHTS INTO ENTREPRENEURIAL DECISION-MAKING

The results of the literature review indicate that successful entrepreneurs apply both decision-making logics and that knowing which logic applies in which situation can be crucial to success. So, future entrepreneurs should learn to make effective decisions in different situations.

In this context, numerous scientific contributions look at how risk and rationality are essential in the entrepreneurial process. The current research suggests that rational decision-making consists of maximizing expected utility when decision-makers face choices with risky (i.e., probabilistic) payoffs. This view of risk as the first major construct represents a mathematical approach to the topic. It stems from classical management theory, and researchers adopted it in entrepreneurship research, although this assumption has a very limited understanding of risk. (Miller, 2007; Mintzberg, 2005).

Rationality, a second important construct, refers to a normative basis for deciding and acting. It is a subjective and dynamic construct that includes critical reflection on values and learned preferences. This leads to a view of risk as a multidimensional construct, with different origins comprising unpredictable, unknowable, and uncontrollable contingencies that encompass different meanings across individuals and situations (Miller, 2007).

For the present work, the authors follow Murmann & Sardana (2013) definition of uncertain situations, which goes hand in hand with a broad understanding of risk and rationality and "*in which the full range [of] outcome options and probabilities that particular options will obtain are also not known. This frequently leads [to] options to possess multiple possible meanings for the decision-maker*" (2013: 197). Thus, ambiguity seems to be a key feature driving entrepreneurial decision-making (Forbes, 2007).

In addition to looking at the initial situation, some researchers adopt different views on decision-making in the foundation process. One possible view is that non-deliberative impulse- or intuition-driven behavioural logics could serve as a basis for business venturing (Lerner et al., 2018; Sinclair & Ashkanasy, 2005). Another point of departure assumes two ways of dealing with decisions in uncertain situations when starting a business: one follows a causation logic, and the other follows an effectuation logic (Sarasvathy, 2001; Sarasvathy, 2008).

These entrepreneurship-focused decision-making theories contradict classical management theories, which assume that decision-making is inherent to analysis, i.e. the

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decision-making of analytical problems is in the foreground (Mintzberg, 2005) and focus on the above-mentioned limited constructs regarding risk and rationale (Miller, 2007). Here, the scope of decision-making is limited but should extend to the areas a) identifying the issue in the first place, b) diagnosing its character, finding and inventing possible choices, c) evaluating them to select one, and d) seeing that one through and put it into action (Mintzberg, 2005).

To follow up on these thoughts, the authors consider the teachability of decision-making competence. The scope of teaching-learning content is of particular interest here. Recent findings from research on decision-making logics vary. Chandler et al. (2011) developed and measured causation and effectuation logics while creating new ventures. They found that causation logic has a negative association with uncertainty, whereas effectuation logic has a positive association with uncertainty.

Dew et al. (2009, 2011) demonstrated that there is a difference between entrepreneurial experts and novices in decision-making. While experts preferred following an effectuation logic, novices preferred a more predictive frame, i.e., causation logic. Based on this Eberz et al. (2017) explored the effectual and causal behaviours of novice entrepreneurs. Their results indicate that novices show causal as well as effectual behaviours. In fact, novice entrepreneurs expose more causal AND effectual behaviour in a stable environment compared to an unstable one, in which they avoid making decisions.

It seems counterintuitive that a stable environment would foster both logics and behaviours, but study results suggest that they complement rather than preclude each other (Perry et al., 2012). Another explanation for this phenomenon could be that novice entrepreneurs find themselves paralyzed in unstable environments and that they refrain from making decisions in such a framework.

Gabrielsson & Politis (2011) showed that entrepreneurs' career motives also influence their decision-making. Spiral or transitory career motives tend to lead to effectual decision-making logics, while linear or expert career motives tend to lead to causal decision-making logics (Gabrielsson & Politis, 2011).

In theory, both decision-making logics can apply in a pure form. In reality, however, decision-makers typically combine the logics. Murmann & Sardana (2013) and Reymen et al. (2015) analyzed combinations of decision-making logics. Murmann & Sardana (2013) argued that entrepreneurs assess the amount of ambiguity inherent in any given situation, as well as their own level of expertise regarding a particular situation that requires decision-making. Thus, the successful entrepreneur selects a type of decision logic (Murmann & Sardana, 2013). Reymen et al. (2015) induced a dynamic model that extends the literature on strategic decision-making in venture creation, which concludes that both decision-making logics were important. However, an applied logic depends on the decision-makers' expertise and the degree of uncertainty.

THE TEACHABILITY OF ENTREPRENEURIAL DECISION-MAKING

The authors adhere to a constructivist teaching approach. Cognitive constructivism means that learning results from learners' active knowledge construction. In doing so, the learners learn through using existing cognitive structures inherent in the individuals (Glasersfeld, 1974). In other words, learners continuously develop their cognitive structures or mental models as they acquire new knowledge (Driscoll & Burner, 2005). Cognitivist teaching methods aim to support learners in the effort to build cognitive structures or mental models. Educators see themselves as facilitators of learning and provide a problem-solving-oriented teaching-learning-environment. (Oliver, 2000; Tam, 2000).

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In addition, learning should be embedded in realistic contexts and put forward authentic tasks (Honebein, 1996). Whether something is teachable depends on whether what is to be taught is observable (Ericsson & Simon, 1984) regarding assessment and tangible learning outcomes. It must address all relevant competency components (Beliaeva et al., 2017), and it must be relevant to the learners' real-life experience (Fox et al., 2018). One can teach and learn decision-making competence by dividing decision-making competence into knowledge, skills, and attitudes (Hahn et al., 2020; Walter & Dohse, 2012).

Components of Teachability

Observability: Something is defined as teachable if it entails a change in behaviour on the side of the learner that is observable by educators through speaking or acting. In the case of decision-making competence, this means that learners make and reflect on decisions.

The result of a successful decision-making learning process yields measurable decision-making logics and observable associated thought processes. These thoughts associated with decision-making are mental processes. A mental process, like a cognitive performance, could, e.g., become observable by keeping think-aloud protocols and thus make mental processes explicit (Ericsson & Simon, 1980; Sarasvathy, 2008).

Observation as a method provides insight into mechanisms, dynamics, processes Flyvbjerg (2001) and is therefore already common in decision-making research. It involves operationalizing theory categories that need to be observed and collecting data as non-participating observations. So, researchers take notes (Ilonen et al., 2018; O'Reilly et al., 2017) and triangulate the data from the observations with other data, such as interview transcripts (Johansson et al., 2021).

Decision-making competence: Successfully taught decision-making competence, knowledge, skills and attitudes must positively correlate with entrepreneurial intentions and early-stage entrepreneurial activity (Bosma et al., 2021). Beliaeva et al. (2017) identified these three central competence components entrepreneurs need in decision-making-processes knowing about causation and effectuation logic alone is not enough for entrepreneurs when adequately applying a decision-making process. Educated entrepreneurs should know about the two logics as it is a necessary prerequisite to decide on the adequate logic consciously and leads to a well-thought-through decision (Haase & Lautenschläger, 2011).

As a result, it should become clear that "*cognitive skills have a positive impact on survival for both the self-employed and employees*" (Asoni & Sanandaji, 2016) and that entrepreneurial learning develops students' entrepreneurial mindsets and that entrepreneurial learning affects decision-making processes and behaviours (Rauch & Hulsink, 2015). Attitude includes the attitude towards unexpected events and the attitude towards outsiders (Reymen et al., 2015). Underlying attitudes differ in causal and effectual behaviour.

In the case of entrepreneurial decision-making competences, students should have the opportunity to experience knowledge, skills and attitudes that pertain to decision-making competences during observable teaching modes.

Real-life-relevance: Numerous studies confirm the positive influence of education on entrepreneurial behaviour and careers (Martin et al., 2013; Nabi et al., 2017; Rauch & Hulsink, 2015). These positive correlations pertain to the financial level (Kolstad & Wiig, 2015), the level of career choice (Daghbashyan & Hårsman, 2014), and the probability of success in entrepreneurship (Asoni & Sanandaji, 2016). The students' previous experiences and education levels reinforce the positive education effect (Bonesso et al., 2018; Hahn et al., 2020).

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Students' work, cultural, and international experiences further influence the students' entrepreneurial intentions (Bonesso et al., 2018). Since those factors influence how students relate to their environment and reality (see also the concept of Lebensweltbezug by Klafki, 2007), these factors influence their entrepreneurial decision-making. Teaching should embed the learning objectives in the student's environment and reality. Educators should ensure the relevance and scope of any method or action used to induce learning (Chakravorty & Franza, 2005; Fox et al., 2018; Haase & Lautenschläger, 2011; Walter & Dohse, 2012).

Entrepreneurial learning methods: Entrepreneurship education takes a particular interest in simulation methods, as they cater to the somewhat action-oriented aspects of entrepreneurship education (Gielnik et al., 2015) and have repeatedly proven to offer learning benefits to students (Chakravorty & Franza, 2005; Fox et al., 2018; Shepherd, 2004; Walter & Dohse, 2012). Simulated entrepreneurial learning should feature entrepreneurial decision-making. Pittaway & Cope (2007) identified four key features, namely 1) integrating uncertainty and ambiguity, 2) heightening emotional processes, 3) including reflection as well as 4) imitating challenging situations through time pressure. Educators can arrange oral debriefings, discussions or write journal articles in that field to enhance the learnings from simulations in entrepreneurship education (Shepherd, 2004).

Simulations are an experiential, work-based form of social practice (Pittaway & Cope, 2007) featuring role-playing and computer simulations as the most popular forms (Fox et al., 2018). Computer-based learning simulations typically evaluate along three criteria: fidelity, verification, and validity. The fidelity criterion reflects how realistic the simulation is. While it should be rich enough to include critical aspects, it should be manageable for students (Fox et al., 2018). The validity criterion looks at how to best design processes to mirror real-life situations (Fayolle et al., 2016; Fox et al., 2018). The verification criterion considers technical reliability and is therefore particular for computer simulations (Fox et al., 2018).

Research Design to Test the Teachability of Two Decision-Making Logics

This research aims to distinguish how entrepreneurship education trajectories need to be segmented to serve as a basis for teaching modes. Therefore, the authors zoom in on teaching modes for decision-making that enable educators and researchers to observe and identify causation and effectuation logics and identify logics that dominate in different teaching modes. The authors selected typical founding scenarios to exploit many possible simulations in entrepreneurship education. The design also enables identification of topics that are particularly suitable for promoting the development of decision-making competence.

Procedure: In the first step, the authors selected typical situations entrepreneurs find themselves in when starting a business. This collection comprised six different teaching modes: a) choosing a location for a business, b) starting a restaurant, c) designing a slogan and logo, d) deciding food truck vs. restaurant, e) starting a restaurant individually vs. in a group, and f) finding another member for the founding team Table 1.

In a second step, the authors developed teaching modes based on the operationalization of both logics. The authors have taken the categories for the operationalization for the simulation from the observation catalogue of a study (Reymen et al., 2015). In a third step, students took part in the teaching modes and were asked to verbalize their thoughts as they went through the decision-making process. The authors recorded these verbalized thoughts in a verbatim think-aloud protocol. In a fourth step, the authors conducted a qualitative content analysis (Schreier, 2012).

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Method: Since the objective was to understand the differences in decision-making associated with different teaching modes in an entrepreneurship education context, the authors selected the method of verbatim protocol analysis. This approach analyzes the participants' think-aloud protocols that were recorded during problem-solving tasks. This method allows to gain insights into real-time cognitive processing (Ericsson & Simon, 1980).

Using think-aloud protocols in decision-making research is a well-respected method in social science that yields high-quality data. Recording video and audio material allows to transcribe and analyze the wording of thought processes comprehensively. Compared to persons' subjective description of actions, the method of recording think-aloud-protocols offers a more accurate approach to describing what goes on in people's minds in the cognitive decision-making process. Retrospective methods such as interviews tend to be subject to rationalization and justification of cognitive processes rather than yielding real-time information. Working with the think-aloud method allows for circumventing rationalization and justification biases.

Participants: In previous studies, participants often were established entrepreneurs or managers. Here, the authors worked with entrepreneurship students, which allowed to study how people learn a specific competence. This approach offered more insights into the possible training associated with learning. The sample included 63 European entrepreneurship students who were enrolled in an MBA program at the University of Kassel, Germany, Europe. The students were between 21 and 27 years old and had no entrepreneurship experience. Regarding the target group, the authors assumed managerial thinking prevailed due to the student's business education background. The authors expected to identify little entrepreneurial thinking in terms of decision-making. Participants did not receive any monetary compensation for participating.

Teaching modes and documentation: The focus in this paper was on how teaching entrepreneurial decision-making requires specific approaches to parse out two distinct logics and how the authors discovered this. Thus, the authors expected to be able to draw conclusions about the teachability of decision-making. All teaching modes represented typical situations one could encounter when starting a business. The authors worked with situations like selecting a business location, selecting another founding team member, determining key features of the business plan, and creating a logo and a slogan Table 1.

Table 1
SIMULATIONS

Name	Description	Categories		
		Freedom of action	Correspondence to real-life environment	Venture creation
Choosing a location for a business	Students are in the situation of choosing one of three possible locations for a company. The company produces solar panels and needs corresponding storage and production capacities. Each student is in the role of founding team member and they have descriptions of the locations, incl. costs, premises, etc., at their disposal.	low	high	low
Starting a restaurant	Students are asked to join a start-up team as themselves in this game. They join as who they are, with no prescribed persona. In the team, they are to think through the process of starting a restaurant near the university. There are six categories (advertising, pricing, financing, product offer, staff	medium	low	high

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	selection, resources of the founding team) to choose from, within which decisions are to be made individually and as a team.			
Designing a logo and slogan	Students are asked to join a start-up team as themselves in this game. They join as who they are, with no prescribed persona. The team is presented with a description of a business idea for a start-up that deals with the recycling of electronic waste. The task is divided into two parts. First, the team has to design a logo with given materials, which corresponds to the description of the business idea. The materials include. Cables, pieces of wood, fabrics, sand, felt, beads and screws. Then they are asked to come up with a slogan.	high	high	low
Deciding foodtruck vs. restaurant	Students are asked to join a founding team as themselves in this game. They join as who they are, with no prescribed persona. The game is structured like a card game and should lead the students into a decision-making situation in which they experience different situations with an uncertain outcome. The aim is to approach the decision whether to open a food truck versus a restaurant within the framework of these different situations.	low	low	high
starting a restaurant individ-ually vs. in a group	Students are asked to join a founding team as themselves in this game. They join as who they are, with no prescribed persona. There are hardly any guidelines and the students have to make individual and group decisions. The focus is on the thematically open development of an idea. They are given one hour. The students are simply guided through the classic BMC categories and make the decisions.	high	medium	high
Finding another member for the founding team	Students are in a founding team that wants to open a continuing education facility near the university. The roles of the team members are predefined and the students are asked to take on these roles. Subsequently, possibly missing resources of other team members are identified and a new member that could close the gap is selected from a pool of personas.	medium	medium	high

The 63 participants worked in groups of three and read aloud a detailed description of the situation and the task. They read all (open and multiple choices) questions and tasks out loud and then answered the questions and voiced their thoughts throughout the task, thus making their decisions out loud. The teaching modes took approximately an hour, the processes were recorded by video and audio, and all interactions were transcribed. Over two years, from 2016 to 2017, the authors collected 21 protocols, in total 136 pages.

Coding: Two researchers coded each decision as single category from one of eight sub-categories in either the causation or the effectuation logic. The authors defined four main categories of the causation and the effectuation logic: a) basis for taking action, b) attitude toward unexpected events, c) attitude toward outsiders, and d) view of risk and resources. Each

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of these main category features four to five sub-categories. The authors have adopted these categories from a study that developed them based on scientific findings and tested them (Reymen et al., 2015). To test the reliability of the coding, the authors used an inter-coder reliability. Cohen's kappa was 0.81, thus exceeding the threshold value of 0.7 (Schreier, 2012).

Analysis: The qualitative content analysis enables to identify passages of the protocols that pertained to causation or effectuation logic. The authors followed a deductive approach to analyze the qualitative content and the protocols using a coding scheme (Reymen et al., 2015). It included the four mentioned main categories. Each category featured five different sub-categories.

RESEARCH RESULTS

This study aims to determine how teaching entrepreneurial decision-making requires certain approaches to parse out two distinct logics and how the authors discovered this. The authors demonstrated that the application of both logics is observable and, therefore teachable. When designing teaching modes, the findings could help derive criteria catering to both logics. The decision-making simulations offered insights into different decision-making processes and revealed the underlying decision-making logics. The documented observations show that entrepreneurial decision-making could be taught and which teaching modes favor which decision-making logic. Of the observed and identified 353 decisions, 209 decisions followed the causation logic, 144 decisions followed the effectuation logic. Table 2 presents the number of codes generated and shows the results clustered in the four main categories. Within these four categories, either the causation or the effectuation logic dominates.

Table 2
RESULTS FROM ANALYSING PROTOCOLS

	Causation		Sum	Effectuation		Sum
basis for taking action	**goal oriented**	basing actions upon expectations and predictions	35	**means oriented**	building on own knowledge base and other available existing own resources	57
		defining and pursuing project goals, product, customer needs, or market goals	18		defining only rough visions while leaving the details open	9
		defining and satisfying organizational needs and selecting between options based on specific goals	15		using infrastructure of local environment and technological know-how available in environment	5
		evaluating planned progress and adapting means based upon feedback	3		following personal preferences	8
		searching and selecting contacts, clients and partners based upon predefined plans	9		building on existing network of contacts to identify/create opportunities	1
attitude toward unexpected events	**avoid**	carefully interacting with environment for secrecy reasons	3	**leverage**	accepting, gathering, and incorporating unexpected feedback, leading to changing paths of development	11
		carrying out plans as defined in cases of unforeseen developments	7		changing and adapting any potential plans made to accomodate unforeseen events	4

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		in cases of unforeseen developments, focusing on activities within the firm rather than engaging in interactions with the environment	0		actively exposing company to outside influences, while being open minded	1
		drawing back from project or quickly resolving in cases of unforeseen developments	4		positively reacting to and incorporating unforeseen developments	0
attitude toward outsiders	**competitive analysis**	acquiring resources through market transactions or contract-based agreements with stakeholders	33	**partnerships**	reaching trust-based flexible stakeholder agreements and commitments	7
		creating and carrying out patent strategy	4		cocreating business with stakeholders	14
		carrying out competitor analysis and competitive positioning	8		enaging in stakeholder collaborations to pursue opportunities	3
		carrying out systematic market research activities	4		exposing (draft) products to potential clients early on	0
view of risk and resources	**expected returns**	maximizing personal profit	26	**affordable loss**	being willing to make affordable personal sacrifices for the best of the venture	14
		calculating and evaluating expected outcomes/returns	17		finding unused resources in local environment	0
		planning development in big steps and with large sums	11		investing limited, small amounts of personal/company money, time, and effort	9
		postponing stakeholder contact at the expense of own funds	10		managing growth expectations and ambitions	1
		searching for stakeholders to commit the amounts necessary for the execution of the plan	2		limiting stakeholders' commitments to levels that are uncritical to them	0
			209			144

Descriptive results: Most observations that fall into the causation logic were in category (A) basis for taking action (80 decisions). Typically, protocol passages cite comments such as "*Let's define a specific goal*" or "*We should develop some criteria to make sure to attain the desired result*". This causation category had a sub-category called actions based on expectations and predictions (35 decisions). In this sub-category, participants either based their actions on expectations about the market, technology, policy trends, or on the predictions of board members, investors, or their ideas about founding. This became especially visible in a simulation where they had to decide what kind of food they wanted to sell ("*Asian restaurants exist ten a penny*"). Category (B) attitude toward unexpected events counted 14 codes. This small number of codes was either owed to a few unexpected situations during the teaching modes or to the fact that students had yet to ever experience any of the unexpected events (e.g., losing financial security). In category (C) attitude toward outsiders, 49 codes have been generated and aligned to acquiring resources through market transactions or contract-based agreements with stakeholders or patents. Specific statements associated with these codes were, "*We should sign a contract with the investor to gain more security*". Category (D) view of risk and resources yielded 66 codes. About one-third of the codes (26 of 66) related to maximizing personal profit. The codes identified ideas such as "*talk about reducing costs*".

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The majority of codes attributed to the effectuation logic were in category (A) basis for taking action (80 decisions). The decisions revolved around building their own knowledge base and other resources, including employees and material resources (57 out of 80). The protocols contain comments such as "*We should decide with our performance and experience in mind*". Category (B) attitude toward unexpected events comprised 16 codes, 11 of them related to accepting, gathering, and incorporating unexpected feedback ("*the future of the company is manageable*"), which could lead to changing development paths. In category (C) attitude toward outsiders, 14 of 24 codes referred to co-creating business with stakeholders. The protocols cite thoughts such as "*The cooperation with suppliers has been identified as controllable*". Category (D) view of risk and resources included 24 codes, and 14 of them related to the willingness to make reasonable personal sacrifices (including non-monetary ones) for the best of the venture, for example, "*to lose one part of the company is an affordable loss*".

Ascertaining learning outcomes: comparison of categories and observations: Comparing the categories and discussing the number of codes within each category and sub-category allows identifying possible learning outcomes. The number of codes generated from the causation logic was well-balanced between the categories (A: 80, C: 49, D: 66).

However, category (B) attitude toward unexpected events only accounted for 14 codes. This could be due to the students' lack of experience concerning uncertainty or due to the teaching modes' setting. Some teaching modes involved less risk or were ambiguous, which led to fewer unexpected events. The analysis reveals that three specific kinds of codes integrated half of the codes from the causation logic: basing actions on expectations and predictions (35), acquiring resources through market transactions or contract-based agreements with stakeholders (33), and maximizing personal profit (26).

Most codes in the effectuation logic are related to category (A). This category held the code associated with building on one's own knowledge base and other accessible resources, including employees and material resources (57 out of 80). The other categories appeared more balanced (B: 16, C: 24, D: 24), yet, contained fewer codes.

Criteria to classify simulations for teaching modes: The authors identified differences in the simulations ' results upon analyzing the categories within the different simulations for teaching modes. The simulations for teaching modes built on active learning approaches.

Moreover, some teaching modes had higher incidences in the causation categories, while others had higher rates in the effectuation categories. There is a difference among the various categories of one logic, which indicates that some teaching modes focused on (C) attitude toward outsiders while others centered on (A) basis for taking action, or on (D) view of risk and resources. The focus also varied: either on the preparation of the simulation, the associated experiences, or the discussion among the students.

To ascertain the criteria that could be relevant for creating teaching modes, the authors applied the principles of hermeneutic analysis, and the following three criteria appeared to be suitable frameworks for the teaching modes: (1) venture creation, (2) freedom of action, and (3) real-life environments.

Venture creation: The majority of codes relate to venture creation teaching modes. Two teaching modes had some, and four teaching modes had a strong link to venture creation. In the teaching modes with a weaker connection, the authors noticed a balance between causation and effectuation codes in category (A) basis for taking action. When concentrating on the ones with stronger ties, the authors mainly identified causation codes in category (C) attitude toward outsiders and in category (D) view of risk and resources. Most codes measured in teaching

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modes with strong links are clustered in category (A) basis for taking action in the effectuation logic (43%) rather than in the causation logic (27%).

Freedom of action: The authors identified simulations along with degrees of freedom of action. Most codes related to simulations with low freedom of action (50%). In absolute numbers, the authors counted 105 causation and 73 effectuation codes. The authors found 46 causation and 20 effectuation codes in category (D) view of risk and resources. Simulations with a medium degree of freedom of action include about 29% causation and about 36% effectuation codes. Most effectuation codes (36%) related to category (A) basis for taking action. The authors found fewer codes in simulations with a high degree of freedom of action and identified more decisions based on causation logic.

Correspondence to real-life environments: Comparing different degrees of correspondence to real-life environments yielded new insights into the different simulation settings and potential influences on choosing one decision-making logic over another.

The distribution of the causation and the effectuation logic appeared to be well-balanced. The authors identified almost half of the causation codes related to teaching modes that showed a low degree of correspondence to real-life environments in the category (D) view of risk and resources. The authors could assign half of the causation codes to two segments with a medium degree of correspondence to real-life environments in the category (A) basis for taking action. In teaching modes with a high degree of correspondence to real-life environments, the authors could assign most causation codes also to category (A) basis for taking action.

Decisions based on effectuation logic seem to mainly apply to category (A), regardless of whether it measured the degree of correspondence to real-life environments. The higher the degree of correspondence to real-life environments, the fewer codes relate to teaching modes with a lower degree of correspondence to real-life environments.

INTERMEDIATE DISCUSSION

The causation and effectuation coding yielded three noteworthy insights Table 2. First, both logics include 80 codes in category (A) basis for taking action. This category holds 39% of the causation codes and about 56% of the effectuation codes. This suggests that the authors identified reasons for activities based on the observations. These reasons are mainly related to the expectations of others and their own knowledge. Second, in the category (C) attitude toward outsiders, the authors identified twice as many causation (49) logic behaviours as effectuation (24) logic behaviours. This indicates that the students mainly tried to protect their ideas instead of thinking about co-creating or involving others. This tendency indicates a strong managerial orientation resulting from standard business education. Third, category (D) view of risk and resources, contained 66 causation and 24 effectuation codes. About 40% of the causation codes within this category related to maximizing personal profit. This could suggest that the students focused on their perceived personal returns.

The three criteria to classify simulations show that the criteria venture creation represents mainly causation codes in category (C) attitude toward outsiders and in category (D) view of risk and resources. This suggests that protecting one's own knowledge could be an underlying motive for students who favor causation-based decision logic. Considering that most codes on percentage measured in high correspondence simulations are in category (A) basis for taking action in the field of effectuation leads to the results which are in line with the literature, which shows that management decision-making situations favor the causation logic. In contrast, entrepreneurial decision-making situations propone the effectuation logic (Sarasvathy, 2008). In

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sum, students embrace the causation logic as they are accustomed to managerial thinking due to their learning experiences (MBA). These results are consistent with Johanisson (2018) comments. Supporting entrepreneurial logic or ideology needs teaching modes related to venture creation to enable students to change their tenets.

However, experience-based soft skills like the target-oriented application of different decision-making logics are more complex to impart or develop (Haase & Lautenschläger, 2011). Therefore, educators should teach new planning and analysis methods in new or experimental contexts that work in unstable environments (Gabrielsson & Politis, 2011; Neck et al., 2014).

Within the category 'freedom of action' the authors counted 105 causation and 73 effectuation codes in simulations with low freedom of action. These figures support the results of Murmann & Sardana (2013); Reymen (2015), who state that low freedom of action leads to decision-making based on causation logic. The authors also have to add that the authors found fewer codes in simulations with a high degree of freedom of action and identified more decisions based on causation logic, contrary to the research results cited above. This could be because the students have little experience in entrepreneurship and stick to the ideology of managerialism, which is a common cause for causal decision-making (Johanisson, 2018).

In the category correspondence to real-life environment teaching modes with a high degree of correspondence to real-life environments, most causation codes related to category (A) basis for taking action. This suggests a connection between higher degrees of correspondence to real-life environments and causation logics when the focus is on category (A). Moreover, the lower the degree of correspondence to real-life environments, the more likely it appears that decisions based on causation logic focus on category (D) view of risk and resources, especially when it comes to maximizing personal profits. Decisions based on effectuation logic seem to mainly apply to category (A) basis for taking action.

These results led the authors to conclude that, on the one hand, teaching students with little entrepreneurial experience is more effective when working with teaching modes with a low degree of correspondence to real-life environments to avoid overwhelming students (Fox et al., 2018). On the other hand, educators should consider that potential entrepreneurs may require a more intensive education and training approach than real entrepreneurs to foster entrepreneurial attitudes, which are a prerequisite for achieving sustainable effects on the thinking and performance of potential entrepreneurs (Haase & Lautenschläger, 2011).

A PEDAGOGICAL MODEL AND SUGGESTIONS FOR FUTURE RESEARCH

Based on the theoretical work and research results, the authors attempt to develop a pedagogical model, which should be subject to subsequent research and practice in entrepreneurship education, especially in decision-making logics. The different approaches behind the elaboration of the competence in question–in addition to the causation and effectuation logic–serve as the basis for developing teaching modes.

This pedagogical model is subject-oriented; it is founded on the assumption that people are qualified to think and act as entrepreneurs and are afterwards aware of both logics. This assumption allows for planning education methods designed along a framework based on three criteria. These are: a) the degree of correspondence to venture creation, b) the freedom of action and c) the degree of correspondence to real-life environments Figure 1.

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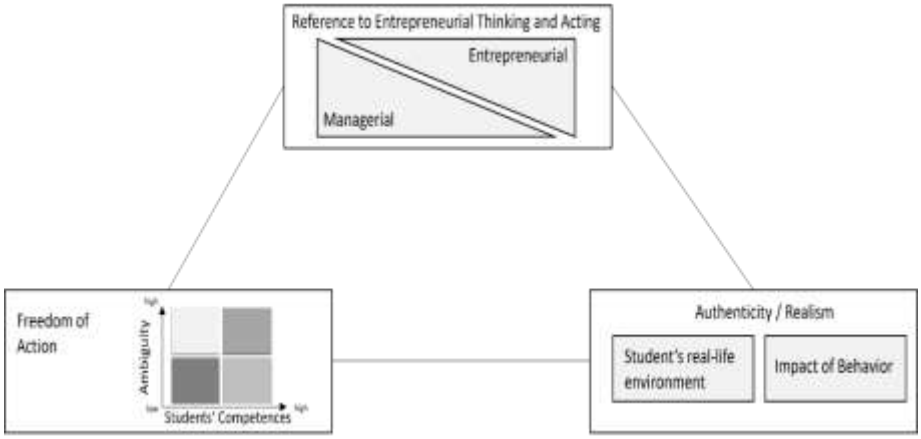

FIGURE 1
THE PEDAGOGICAL MODEL

When considering the degree of correspondence to venture creation, the method should reflect the contrasts between managerial and entrepreneurial behaviour patterns (Busenitz & Barney, 1997; Johanisson, 2018). It is up to the individual instructors to decide how strongly they wish to consider special start-up situations. The reference also depends on the students' previous entrepreneurial experience and abilities (Bonesso et al., 2018; Toutain et al., 2017; Williams Middleton et al., 2020). Referring to the teachability (Hahn et al., 2020; Nabi et al., 2017) of entrepreneurial decision-making, the authors suggest five propositions:

Proposition 1: The more teaching modes can tie to the entrepreneurship context, the more likely it is that decision-making processes follow effectuation logics.

When dealing with the freedom of action category, the authors recommend considering two indicators: ambiguity and the students' entrepreneurial competences, such as decision-making in insecure situations. Ambiguity stands for the many possibilities of interpreting situations and their associated decision-making possibilities (Murmann & Sardana, 2013).

The findings from the comparison could apply to students who have no or little experience with entrepreneurship and to students who have already gained some entrepreneurial experience. Educators could support both student groups in effectual decision-making. Based on their and this research results, the authors present the following graph and endorse four more propositions Figure 2.

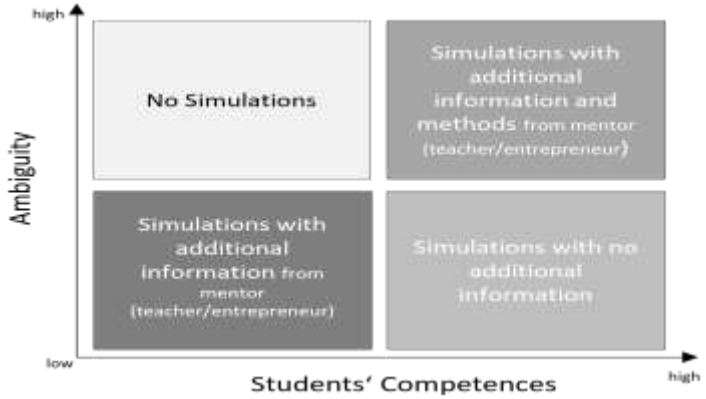

FIGURE 2
FREEDOM OF ACTION CATEGORY INDICATORS

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Proposition 2: If students demonstrate little expertise, educators should provide additional information to minimize ambiguity when asking students to simulate a decision-making process.

Proposition 3: If students demonstrate little expertise, low ambiguous decision-making simulations should be conducted, and students should get more support (like practice more rounds, talking with mentors)

Proposition 4: If students demonstrate a high level of expertise, low ambiguity decision simulations can be conducted without offering additional support.

Proposition 5: If students demonstrate a high level of expertise, they should get additional information and methods when performing decision-making simulations encompassing a high degree of ambiguity.

When working with categories regarding the degree of correspondence to real-life environments, educators should include two indicators: 1) real-life environment relevance, such as the students' way of life, how closely a situation reflects the students' actual life and their experience and authenticity. Thus, the simulations should reflect the students' real-life environment (Fox et al., 2018; Walter & Dohse, 2012). 2) an action's relevance or scope (Chakravorty & Franza, 2005; Fayolle et al., 2016). The simulated actions can range from weak to strong in terms of their perceived impact on the students' lives. While a simple simulation like a case study potentially only impacts the students, a five-dollar challenge can impact the students and others. Based on these considerations, the following two propositions could be derived:

Proposition 6: The stronger the relevance to the decision-makers' real-life environment, the more the students ponder considerations and the more decisions based on causation, or effectuation logic follow.

Proposition 7: The more the potential behaviour impacts the decision-makers' life, the more intensively students ponder considerations and the more decision options become subject to discussion among stakeholders.

DISCUSSION

Future Entrepreneurs can approach situations of uncertainty by applying causal or effectual decision-making logics. For this study, the authors assume that both logics are valuable and teachable. Shirokova et al. (2017) have shown that student entrepreneurs employ causal and effectual logic when creating ventures and that university entrepreneurship education curricula are positively associated with the proclivity toward developing causal and effectual-oriented approaches (Shirokova et al., 2017). Regarding different contextual forces students are able to adopt different behaviours at different stages (Chang & Rieple, 2018). Positive effects also assume on new venture performance when using both cognitive logics and these logics serve as mediators in the culture-performance relationship (Laskovaia et al., 2022), which indicates that culture influences the kind of dominant decision-making logic (Hubner et al., 2022). It is also possible to redesign effectuation theory by defining design principles (Zhang & van Burg, 2020) or integrate the usage of intuition in the decision-making process besides the analytical and cognitive focus (Sinclair & Ashkanasy, 2005).

The authors work suggests that increasing the observability of decision-making processes increases the teachability of decision-making. Therefore, in a first step, the authors combined entrepreneurship research from the context of entrepreneurial decision-making (Reymen et al., 2015; Sarasvathy, 2001) and uncertainty (Alvarez & Barney, 2005; Busenitz, 1999; Murmann &

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Sardana, 2013) with entrepreneurship education research (Bacigalupo et al., 2016; Béchard & Grégoire, 2005; Reis et al., 2020). This allowed the authors to enhance the development of entrepreneurship education research by combining research results from both disciplines and proposing new research axes on a higher level of knowledge and expertise for entrepreneurship education. The resulting seven propositions should promote progress in entrepreneurship education research.

Several authors have already attempted to develop and define entrepreneurship education (Béchard & Grégoire, 2005; Bhatia & Levina, 2020; Garavan & Barra, 1994; Pittaway & Cope, 2007; Shepherd, 2004). A recent work of Wadhwani & Viebig (2018), for example, specifically deals with the differences between American and European entrepreneurship education. Considering the emergence of a discipline, and the pedagogy that accompanies it, can help extend the understanding of a discipline beyond its confines.

Clear limitations to the authors' work result from the study's framework. The homogenous student population at the University of Kassel, Germany, did not yield any insights that would allow reflecting on equity or inclusion issues or issues of ethnicity. This being said, examining these aspects in a more heterogeneous student population and changing cohort sizes could serve as a point of departure for further research and testing of the model. Another limitation of the proposed model is that the authors mainly tested it on groups. Further testing should include settings and analyses in which individuals go through the simulations and provide think aloud protocols of their decision-making thinking when tackling the tasks alone. Then combine them with group processes.

Furthermore, the authors identified three criteria that appear pivotal for teaching entrepreneurial decision-making. Researchers already employed the method of think-aloud protocols in entrepreneurial decision-making research settings (Ericsson & Simon, 1980; Sarasvathy, 2008). The results of this approach appear to be of particularly high quality, which could be due to the timeliness and directness of the data in comparison to self-reporting and interviews, which some authors consider disadvantageous when researching decision-making due to the retro-perspective (Shirokova et al., 2017).

Furthermore, the three suggested criteria hold the potential to be transferred to other disciplines interested in simulations or other subject-centric teaching modes. They could be considered for biographical approaches or subject-related approaches alike. In this context, it makes sense to refer to the findings of Yip et al. (2020), who have studied the identity work of various leaders. They also open up further research topics and present teaching modes useful for founder training. Their work could prove to be particularly useful when it comes to helping students move beyond a management ideology to adopt an entrepreneurship ideology (Johanisson, 2018).

The authors developed a pedagogical model that combines proven criteria to design methods or teaching modes. This model in the field of decision-making also contributes to education research per se and is especially helpful in entrepreneurship education practice when it comes to aspects of teachability. Here the authors point to a study on the teachability of ethical decision-making carried out by Parks-Leduc et al. (2021). They identified individual characteristics and character traits, such as conscientiousness or power values, as having either a positive or a negative influence on ethical decision-making. As this study focusses on competences instead of traits, another point of departure for further research opportunities could lie in identifying specific traits or characteristics that support causal or effectual behaviour, as character traits have rarely been studied in relation to decision-making logics (Yeh et al., 2020).

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CONCLUSION

Decision-making competence is essential in entrepreneurship education. While this competence applies to all phases of setting up a business, it can also be decisive for the success of a business. Against this background, it can thus be concluded that different cognitive performances, in this specific case logics, can be used to develop this competence. The use of logics can be observed and thus enables teachability in entrepreneurship education. The latter was discussed and examined in this paper.

The strength of this paper lies in investigating and developing the pedagogical model and examining teachability through observability. This draws attention to a competence essential for founding research and teaching topics. The paper in hand further transfers research results to teaching and enables educators to design state-of-the-art, future-oriented teaching methods. It supports lecturers in higher education in fostering entrepreneurial competences.

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