




Why bother teaching entrepreneurship? A field quasi-experiment on the behavioral outcomes of compulsory entrepreneurship education

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ABSTRACT

The proliferation of entrepreneurship education in business schools suggests that it is commonly believed to foster venture creation. At the same time, research on entrepreneurship education is growing. However, further studies are needed to determine the effectiveness of compulsory entrepreneurship education (CEE) by providing evidence on the specific type of entrepreneurial behavior it elicits and when these effects occur. To address this gap, this study evaluates different behavioral outcomes of CEE over time while building on social cognitive career theory to account for mediating effects of entrepreneurial intentions and entrepreneurial self-efficacy. We conduct a field quasi-experiment by following university business students (1,387 observations for 450 individuals) over 24 months post-treatment. Our findings reveal that CEE effectively increases entrepreneurial behavior in the short term but does not extend much beyond that. A follow-up study ($N = 395$) adds confidence to the generalizability of the results. We contribute to research on entrepreneurship education and policy.

KEYWORDS

(Compulsory) entrepreneurship education; entrepreneurship policy; entrepreneurial behavior; entrepreneurial intentions; entrepreneurial self-efficacy

Introduction

Entrepreneurship education is seen as a vital catalyzer for entrepreneurial activities and, through increased venture creation, leading to wide-ranging economic benefit (O'Connor, 2013). It is even proclaimed by the European Commission to be an important tool for “the post-COVID-19 economic recovery” (Lilischkis et al., 2021, p. 6). Thus, it is not surprising that the European Commission (2012, p. 4) aspires that “all young people should benefit from at least one practical entrepreneurial experience before leaving compulsory education,” claiming that “investing in entrepreneurship education is one of the highest return investments that Europe can make” (European Commission, 2016, p. 3). Similarly, the Organisation for Economic Co-operation and Development (OECD) is dedicated to support local

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and national governments through various entrepreneurship programs in their attempts to facilitate economic growth (OECD, 2023), while the World Bank emphasizes the role of entrepreneurship in economic development worldwide (Coste et al., 2020). Next to efforts on the supranational level, national governments also largely implement compulsory entrepreneurship education (CEE). For example, the Swedish government introduced CEE from preschool to 12th grade (Hoppe, 2016), and also some African countries have imposed compulsory participation in an entrepreneurship course for secondary school students (e.g., Rwanda; Blimpo & Pugatch, 2019) as well as for university education (e.g., Nigeria; Olorundare & Kayode, 2014). In particular, higher education institutions such as universities play a critical role in implementing those educational programs to foster entrepreneurship (OECD/European Union, 2019), and more and more universities—and particularly business schools—introduce compulsory entrepreneurship courses into their curriculum. For instance, Jerome Katz (2016) published a list with 41 universities that made entrepreneurship courses mandatory for all students. This list can easily be updated nowadays by adding Anahuac University in Mexico, Audencia Business School in France, DePaul University in the United States, Pontifical Catholic University of Chile, Rotterdam School of Management in the Netherlands, and Warwick Business School in the United Kingdom, to name a few.

At the same time, numerous studies on the outcomes of entrepreneurship education¹ have posited that it positively changes beliefs about the attractiveness and feasibility of entrepreneurship (e.g., Florin et al., 2007; Peterman & Kennedy, 2003; Piperopoulos & Dimov, 2015) or the intention to become an entrepreneur (e.g., Rauch & Hulsink, 2015; Souitaris et al., 2007), which refers to the cognitive state prior to executing entrepreneurial activities (Krueger, 2009). Other empirical studies show that entrepreneurship education in general yields positive results on entrepreneurial behavior (e.g., Charney & Libecap, 2000; Elert et al., 2015; Kolvereid & Moen, 1997; Rauch & Hulsink, 2015)—conceptualized as steps taken toward founding a venture (Bird et al., 2012). Naturally, such results would encourage policymakers, (business) school administrators, and educators to include entrepreneurship education, even mandatory courses, in students' curricula. Yet, generalizing from these results is considered problematic because most of these studies suffer from self-selection bias due to the voluntary nature of entrepreneurship courses (Bae et al., 2014; Rideout & Gray, 2013). Eliminating voluntary selection, in the context of compulsory entrepreneurship courses only a handful of empirical studies exist. Such work on CEE considered entrepreneurial skills (Hahn et al., 2020; Von Graevenitz et al., 2010), entrepreneurial intentions (Fayolle &

¹While this study is concerned with *compulsory* entrepreneurship education, the literature on entrepreneurship education in general is much more developed than the literature on entrepreneurship education focused on mandatory courses. Thus, we need to draw from the broader entrepreneurship education literature at times, but note that we refer to CEE only if we focus on this specific, mandatory context of entrepreneurship education.

Gailly, 2015; Karimi et al., 2016; Von Graevenitz et al., 2010), entrepreneurial competencies (Oosterbeek et al., 2010), attitude toward entrepreneurship (Fayolle & Gailly, 2015), and opportunity identification (Karimi et al., 2016) with mixed outcomes.

While some attention has been paid to CEE, we suggest that three issues in particular need to be better understood. First, venture creation consists of multiple activities that may be spread over years. Although pretest posttest experimental designs are commonly employed when assessing the impact of educational interventions (e.g., Blimpo & Pugatch, 2019; Clark et al., 2022; Mukesh et al., 2020), many studies on the effectiveness of entrepreneurship education do not include a time lag in their design with additional, extended measurement waves. Studies that do so introduced various different time lags ranging from 5 months (Souitaris et al., 2007) to even 8 years (Kolvereid & Moen, 1997), but it remains unclear which entrepreneurial activities occur after what time. Second, we do not know what type of entrepreneurial behavior is affected by CEE and when. Entrepreneurship has a long and ongoing tradition to differentiate between entrepreneurship-related activities (Bird et al., 2012; Carter et al., 1996). Some of these activities are closely related to *initiating entrepreneurial behavior* such as opportunity recognition and organizing a start-up team, while other activities involve active *engagement in entrepreneurial behavior* such as aligning resources and developing a business model (Shepherd et al., 2019). Third, there is initial evidence that electives (i.e., courses that students voluntarily choose to follow) are positively related to entrepreneurial behavior (Lyons & Zhang, 2018; Rauch & Hulsink, 2015). Yet, we do not know whether behavioral effects appear in the context of CEE.

It is against this background that we not only examine *whether* entrepreneurial behavior can be stimulated through CEE but also explore *what kind of* entrepreneurial behavior occurs upon participating in CEE and *when*. We rely on social cognitive career theory (SCCT; Lent & Brown, 2013; Lent et al., 1994, 2002), allowing us to develop hypotheses regarding how CEE affects relative proximal mediating processes first, such as entrepreneurial intentions and entrepreneurial self-efficacy, before affecting activities and behaviors later. SCCT has been applied to entrepreneurship before (e.g., Pfeifer et al., 2016; Pidduck et al., 2022) and allows developing a process perspective of the evolvement of entrepreneurial behavior as a future career option for students over time (Meoli et al., 2020). In addition, SCCT emphasizes the choice of actions related to career attainment (Lent & Brown, 1996; Lent et al., 1994, 2002).

To test our hypotheses, we designed two studies. First, we conducted a longitudinal field quasi-experiment. The treatment group consists of undergraduate students following a compulsory entrepreneurship course at a Dutch business school. The course combined theory-focused knowledge transfer with firsthand entrepreneurial experiences. The comparison group consists

of undergraduate students following an identical program at the same institution, but without CEE. Data were collected at four points in time (one pre-measurement and three post-measurement waves), following students 24 months after the course concluded. Second, we conducted a follow-up study using a cross-sectional design, which allowed us to validate the findings of the initial study. Taken together, our results show that CEE can be considered a driver of entrepreneurial behavior, but the effects cannot be sustained over time. In particular, students initiated first steps taken toward founding a venture immediately after the entrepreneurship course took place, but these effects diminish over time. CEE did not significantly affect entrepreneurial behavior in the medium- and long-term (i.e., 8 and 24 months after the course took place). These results were replicated in the follow-up study. At the same time, we found clear differences between the two studies regarding the mediating roles of entrepreneurial intentions and entrepreneurial self-efficacy. Adopting a longitudinal design in the field quasi-experiment, we find a dampening effect of entrepreneurial intentions through which CEE negatively impacts entrepreneurial behavior—via decreased entrepreneurial intentions—at each point in time.

This study makes three contributions to entrepreneurship research. First, we contribute to the discussion about the timing of effects (Arenius et al., 2017; Eller et al., 2022; Gielnik et al., 2014; Lévesque & Stephan, 2020) as we provide a fine-grained understanding of behavioral outcomes across time. Specifically, SCCT allows us to predict that some effects occur immediately and relatively early after CEE, while other entrepreneurial behaviors are delayed. This argument leads to our second contribution, as theorizing about the timing of effects requires us to differentiate between behavioral outcomes. For practical reasons often conceptualized in a dichotomous way, entrepreneurial behavior is more than just venture creation as it covers a broad range of activities that all inform the formation of a new organization (Gartner, 1988; Shepherd et al., 2019). Some of these behaviors, such as initiating entrepreneurial behavior, occur earlier in the firm formation process than typically expected and some actions related to engaging in entrepreneurial behavior are further delayed (Shepherd et al., 2019). Accordingly, CEE will affect these behaviors in a different way. As such, our study contributes to the discussion about which type of activities are affected by CEE at which point in time (Arenius et al., 2017; Lichtenstein et al., 2007). Finally, this study adds to the discussion on the effectiveness of CEE by shedding light on its behavioral outcomes (Martin et al., 2013), and thereby extending the studies by Oosterbeek et al. (2010) and Von Graevenitz et al. (2010). In particular, studies on the compulsory nature of entrepreneurial education are sparse (Fayolle & Gailly, 2015; Hahn et al., 2020; Karimi et al., 2016; Oosterbeek et al., 2010; Von Graevenitz et al., 2010). We contribute to the discussion by explicating the positive effect that CEE has on entrepreneurial behavior and, in doing so, seek to enhance methodological

rigor and research validity as recommended by Souitaris et al. (2007), Nabi et al. (2017), as well as Yi and Duval-Couetil (2021). Importantly, this study also seeks to inform entrepreneurship education policy and may aid governments in their quest to stimulate entrepreneurship as a critical driver of economic and societal betterment. Contrary to the commonly held belief that entrepreneurship education fosters venture creation simply by including it into (business) schools' curricula, we suggest to take a more differentiated view on it. While CEE may be stimulating entrepreneurial behavior for some time after the educational intervention took place, it does not guarantee long-term engagement.

Theoretical background

We build on SCCT (Lent & Brown, 2013; Lent et al., 1994, 2000) to explain how entrepreneurship education affects motivational process in students and helps them to turn these into entrepreneurial behavior over time. Entrepreneurship is a career-relevant experience and, as such, CEE has found its way into many business school curricula. Specifically, SCCT explains how contextual variables affect career relevant activities and points to the social context that plays a vital role in explaining intentions to pursue a certain career (Lent & Brown, 1996). CEE is one of the variables affecting interests and skill development that translate into career-related activities, such as entrepreneurial behavior (Vanevenhoven & Liguori, 2013). Accordingly, SCCT can be used to investigate the effect of entrepreneurship education (Meoli et al., 2020). Moreover, the theory identifies several sociocognitive mechanisms, such as goal intentions and self-efficacy, that mediate between contextual variables and career decisions. As such, SCCT builds on and extends Bandura's social cognitive theory (Bandura, 1986) and is used to explain career choices and career transitions over time.

Building on SCCT requires us to define the type of career-related activity central in the context of CEE, namely entrepreneurial behavior, and theorize about the timing of effects. Shepherd et al. (2019) suggest to differentiate between behavior related to initiating entrepreneurship and behavior for engagement in entrepreneurship.² According to the authors, initiating entrepreneurial behavior is related to taking up first steps to recognize and evaluate an opportunity, to develop a proclivity toward entrepreneurship, and to look for a potential founding team. Engaging in entrepreneurial behavior is related to the process of exploiting an opportunity. It requires to align financial and human resources and involves an increasing commitment of time and resources. Since initiating and engaging in entrepreneurship require different

²Additionally, the authors defined *performing entrepreneurial endeavors* and *contextualizing entrepreneurial endeavors*; both are related to established new ventures and, thus, do not apply to the context of entrepreneurship education.

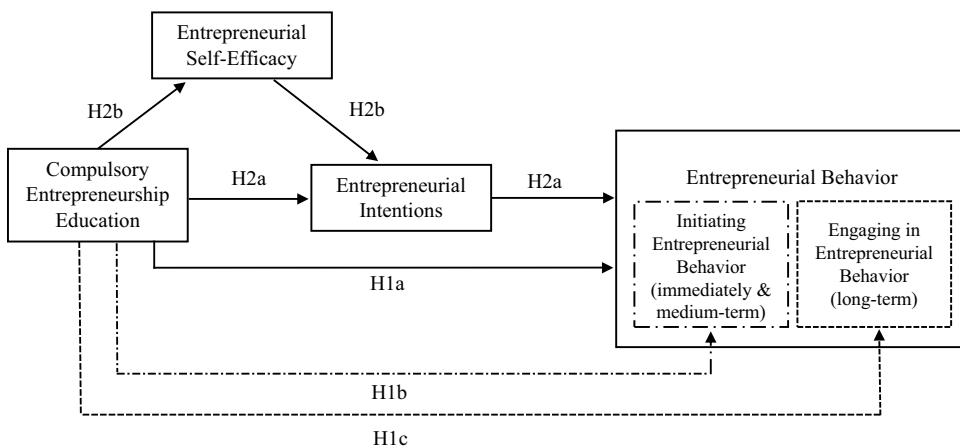


Figure 1. Conceptual model with proposed hypotheses.

activities and different levels of commitment, it is reasonable to assume that they are affected by CEE in different ways. Moreover, SCCT is a process theory allowing to develop hypotheses regarding the timing of effects as career-related activities occur over time (Gati & Kulcsár, 2021; Rogers & Creed, 2011).

In line with SCCT, we expect CEE to have a direct effect on entrepreneurial behavior in general (H1a). In particular, we suggest a positive effect on initiating entrepreneurial behavior immediately and in the medium term (H1b), while engaging in entrepreneurial behavior is affected by CEE in the long term (H1c). Additionally, mediation processes influence this relationship and we argue that CEE enhances entrepreneurial intentions, which then affect entrepreneurial behavior (H2a), while CEE also increases entrepreneurial self-efficacy, which leads to changes in entrepreneurial intentions (H2b). **Figure 1** describes the conceptual model of our study.

In what follows, we develop our hypotheses for the effect of CEE on entrepreneurial behavior, detailing behavioral activities over time, and discuss relevant mediating effects.

Hypotheses development

Entrepreneurial behavior

Entrepreneurial behavior describes an individual's activities in creating a new firm (Gartner et al., 2010) and can range from entrepreneurial discovery to working fulltime for the newly established venture (Rauch & Hulsink, 2015). As such, entrepreneurial behaviors consist of vital activities performed in pursuit of entrepreneurship as career choice. Building on SCCT, entrepreneurship education provides a highly relevant experience

to students when looking at entrepreneurship as a potential career option. This is because knowledge about and experience with entrepreneurship—also through mandatory educational interventions—can direct attention toward entrepreneurship and create a desire and proclivity to become an entrepreneur (Rauch & Hulsink, 2015). In addition, it can increase the individual's confidence in their ability to succeed in entrepreneurship (Martin et al., 2013). Thereby, we argue that CEE is motivating individuals to carry out entrepreneurial behaviors. As scholars have long suggested that entrepreneurship education in general has a positive effect on entrepreneurial behavior (e.g., Charney & Libecap, 2000; Elert et al., 2015; Fiet, 2001; Hills, 1988; Katz, 2003; Kolvereid & Moen, 1997; Kuratko, 2005; Lyons & Zhang, 2018; Vesper & Gartner, 1997), our baseline hypothesis represents the following replication hypothesis applied to the context of CEE:

Hypothesis 1a. Participation in compulsory entrepreneurship education increases entrepreneurial behavior.

Entrepreneurial behavior is a process involving many different activities and actions that unfold over time (Gartner et al., 2010). While a particular sequence of action is difficult to identify (Arenius et al., 2017; Davidsson, 2006), there are temporal patterns of start-up behaviors taking place (Lichtenstein et al., 2007). We argue that the increasing commitment associated with initiating versus engaging in entrepreneurial behavior involves increasing time lags in which these entrepreneurial behaviors occur.

Initiating entrepreneurial behavior involves exploring entrepreneurship as a career option by identifying entrepreneurial opportunities and developing a propensity to act upon them (Shepherd et al., 2019). Notably, these are proximal outcomes of entrepreneurship education that should be directly affected by course outcomes (Elert et al., 2020). Moreover, these behavioral outcomes involve little obligation as there is little resource commitment. As a consequence, we expect initiating entrepreneurial behavior such as opportunity recognition and subsequent nascent entrepreneurial activities to be manifested relatively early in the entrepreneurial process (Davidsson & Honig, 2003; Shepherd et al., 2019). Rauch and Hulsink (2015) show that entrepreneurship education stimulates entrepreneurial behavior 6 months after students graduated from their entrepreneurship program. Indeed, novice entrepreneurs have been found to organize a team, save money for their business, and write a business plan during the first 3 months of operating their business, while other subsequent activities tend to follow in the last quarter of their first year (Alsos & Kolvereid, 1998). Therefore, initiating entrepreneurial behavior likely occurs directly and within several months after CEE took place. Thus, we propose:

Hypothesis 1b. Initiating entrepreneurial behavior occurs immediately and in the medium term after participation in compulsory entrepreneurship education.

Following initiating entrepreneurial behavior, subsequent activities and engagement in entrepreneurial behavior may occur (Shepherd et al., 2019). Thus, the effects of CEE on engaging in entrepreneurial behavior may take more time to unfold as compared to initiating entrepreneurial behavior. This is because the behaviors required when engaging in entrepreneurship become more complex and abstract, and such activities require a longer timeline to execute (Shepherd et al., 2019). For example, early venture development processes require more time and resource commitment. The planning for and achieving of a number of milestones as part of the business development process (Block & MacMillan, 1985; Starr & Bygrave, 1991; Starr et al., 1993), interacting with the external environment, and hiring personnel describe activities happening just 9 months after starting a business venture (Alsos & Kolvereid, 1998). Thus, engaging in entrepreneurial behavior becomes more complex and more concentrated later in time when entrepreneurs move away from informal activities and start formalizing by making their business more tangible (Gartner et al., 2010; Reynolds & Miller, 1992). Regarding the timeline of engaging in entrepreneurial behavior, Davidsson and Honig (2003) reported that many nascent entrepreneurs were still involved in entrepreneurial activities after 18 months, and Lichtenstein et al. (2007) showed that firm gestation behavior may take up to 24 months. Thus, an extended timeline between CEE and entrepreneurial behavior might take up to 24 months after an educational intervention ended (Arenius et al., 2017). Thus, we propose:

Hypothesis 1c. Engaging in entrepreneurial behavior occurs in the long term after participation in compulsory entrepreneurship education.

Mediating role of entrepreneurial intentions and entrepreneurial self-efficacy

SCCT proposes that self-efficacy and goal intentions serve as a mechanism that translates experiences such as CEE into career-related actions and behaviors. Entrepreneurial intentions describe a “state of mind that direct attention, experience, and action” toward new venture founding (Bird, 1988, p. 442), while entrepreneurial self-efficacy refers to an individual’s belief in their capability and skills to perform tasks and roles aimed at entrepreneurial outcomes (Chen et al., 1998), for example, to launch a new venture successfully (McGee et al., 2009). In the setting of CEE, educational interventions can change a participant’s mindset with regard to entrepreneurship, increasing their inclination and the perception of their capabilities to engage in entrepreneurial behavior (Vanevenhoven & Liguori, 2013).

One of the key presumptions of SCCT is that goal intentions precede career-relevant behavior (Lent & Brown, 2013; Lent et al., 1994, 2000). Thus, intentions such as the intention to start a new venture (Krueger et al., 2000; Pidduck et al., 2022; Schlaegel & Koenig, 2014) are conceptualized as a predictor of behavior (for meta-analytic evidence, see Sheeran, 2002). Intentions are motivating; they help individuals to persist and to engage in behaviors that are related to entrepreneurship. As Fishbein and Ajzen (1975, p. 369) pointed out, intentions are “the best single predictor of an individual’s behavior.” This line of reasoning is extended in SCCT by conceptualizing goal intentions as a mediator. CEE can alter intentions of individuals to perform entrepreneurial behaviors by changing their beliefs about entrepreneurship in multiple ways, including their evaluation of (perceived) available support or their confidence in pursuing an entrepreneurial career, to name a few examples (Vanevenhoven & Liguori, 2013). All of this is needed to translate the mere intention to start a business into actual entrepreneurial behavior (Fayolle & Liñán, 2014; Kautonen et al., 2015). Indeed, several studies reported that entrepreneurship education does affect students’ entrepreneurial intentions (Fayolle & Gailly, 2015; Liñán et al., 2011; Peterman & Kennedy, 2003; Sánchez, 2013). Moreover, two studies validated the premise that entrepreneurial intentions mediate the relationship between entrepreneurship education and entrepreneurial behavior (Rauch & Hulsink, 2015; Souitaris et al., 2007). In the context of CEE, even when “forced” to actively go through the entrepreneurial experience, we expect this rather robust relationship to hold. Thus, we propose:

Hypothesis 2a. Entrepreneurial intentions mediate the effect of compulsory entrepreneurship education on entrepreneurial behavior such that there is a positive indirect effect via entrepreneurial intentions.

Furthermore, SCCT outlines that intentions are shaped by positive beliefs about the ability to perform certain behaviors (Lent & Brown, 1996). Self-efficacy is motivating and helps to further develop goal intentions (Lent et al., 1994, 2000). Moreover, self-efficacy is considered a key factor in determining human agency (Bandura, 1989), while individuals with a “can do” mindset are more likely to pursue and persist in entrepreneurship (Chen et al., 1998; Kickul et al., 2009; Zhao et al., 2005). Scholars posit that entrepreneurial self-efficacy is an antecedent of entrepreneurial intentions (Boyd & Vozikis, 1994; Hsu et al., 2019; Schmutzler et al., 2019). Essentially, self-efficacy develops in reaction to prompts such as feedback on and mastery of a task (Bernacki et al., 2015). As self-efficacy is developed domain specific, knowledge about a subject can help enhance it (Bandura, 1989, 1992), making entrepreneurship education well suited for enhancing knowledge about entrepreneurship. In addition, entrepreneurship education often provides

opportunities to observe successful role models, be it through case studies or guest lectures (Cox et al., 2002). Entrepreneurial self-efficacy may also be enhanced by allowing students to actively test ideas and reflect on their educational experiences (Piperopoulos & Dimov, 2015). While intentions to become an entrepreneur are critical for eliciting entrepreneurial behavior, it is important that students initially strengthen their entrepreneurial self-efficacy and form beliefs about whether they are able to become entrepreneurs themselves. As such, it is suggested that also in the context of CEE, entrepreneurial self-efficacy mediates the effect CEE has on entrepreneurial intentions (Wilson et al., 2007). Thus, we propose:

Hypothesis 2b. Entrepreneurial self-efficacy mediates the effect of compulsory entrepreneurship education on entrepreneurial intentions such that there is a positive indirect effect via entrepreneurial self-efficacy.

To test the proposed model, we conducted two studies: a longitudinal field quasi-experiment and a cross-sectional follow-up study, which we will further detail in the following.

Methods field quasi-experiment

Research design

We conducted a longitudinal field quasi-experiment (Hui et al., 2000; Mayer & Davis, 1999). We selected two groups of undergraduate business administration students from a business school in the Netherlands. As Grant and Wall (2009) argue, the random assignment of participants to conditions is often impossible in field settings but should be viewed as an acceptable tradeoff compared to the rich data that can be collected. To mitigate the influence of confounding effects, we show that we took several measures of precaution to ensure that groups do not systematically differ regardless. Furthermore, students are an appropriate sample if students are representative of the target audience (Hsu et al., 2017). Since our study focuses on the effectiveness of university education, it is thus appropriate to sample students in our field quasi-experiment.

Timing of effects

Any theorizing about timing of effects needs to be adapted to the specific context and to the specific constructs under investigation. In the context of CEE, we need to be conscious of two considerations. First, some behaviors are affected earlier than others (Fayolle & Gailly, 2015; Gielnik et al., 2014). We

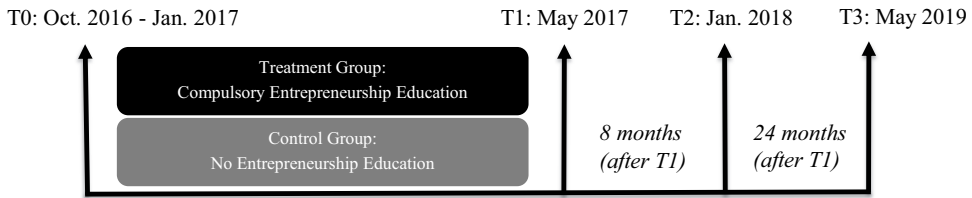


Figure 2. Data collection.

differentiate between immediate and medium-term effects (T1 & T2) as well as long-term effects (T3). With regard to entrepreneurial behavior, we expect that initiating entrepreneurial behavior occurs first, although it is deficient as it may not result in venture creation. Engaging in entrepreneurial behavior requires more time and commitment; thus, effects are expected to take additional time until they occur (Shepherd et al., 2019). These arguments bring us to the second consideration: defining the time lag and the relationships between constructs (George & Jones, 2000), thus defining the exact time interval by which entrepreneurial behavior is affected by CEE. Unfortunately, the entrepreneurship education literature used various time lags, often without justifying the specific ones. For example, studies introduced time lags ranging from 5 months (Souitaris et al., 2007) or 6 months (Fayolle & Gailly, 2015) to 12 months (Gielnik et al., 2015) to 18 months (Rauch & Hulsink, 2015) to even 8 years (Kolvereid & Moen, 1997). Because shorter time frames are adequate for activities that can be affected directly by educational interventions such as initiating entrepreneurial behavior (e.g., thinking about starting a business), we measured T1 directly after the end of the courses. However, engaging in entrepreneurial behavior takes more time to unfold. Therefore, we measured T2 8 months after the course ended, which is in line with other studies looking at entrepreneurial behavior (e.g., Gielnik et al., 2015, who also used an 8-month follow-up after the treatment ended). In order to capture behaviors that describe engaging in entrepreneurship of this groups as well, we employed an additional measurement wave (T3) and measured entrepreneurial behaviors 24 months after course completion, which is in line with other studies looking at entrepreneurial behavior (e.g., Lichtenstein et al., 2007, who employed longitudinal data also capturing a 24-month period).

Thus, we collected data for the treatment and comparison group in four measurement waves through surveys (see Figure 2 for an overview). The first wave of data (T0) was collected from October 2016 to January 2017, shortly before the start of the course for both the treatment and comparison group, respectively. The intervention took place between January 2017 and May 2017. By the end of both courses, the next wave of data (T1) was collected in May 2017. We then followed up on both groups with the next

wave of data (T2) collected in January 2018, about 8 months after the courses ended. By that time, students in the treatment and comparison group had proceeded to the third and final year of their undergraduate studies. Finally, the last data collection wave (T3) took place in May 2019, 24 months after both courses ended. Students mostly finished their 3-year bachelor's program by then and either proceeded to follow a master's program at the same university or at another university or pursued a career.

Sample and procedure

To test our hypotheses, we employed a pretest-posttest-comparison group design with a total sample size of 870 individuals (treatment group $N = 424$, comparison group $N = 446$) across four measurement waves (pre-matching sample size). Participants in the treatment group are second-year undergraduate Dutch business administration (BA) students. As part of their bachelor's degree curriculum, these students had to participate in a compulsory entrepreneurship course running for about half a year. Participants in the comparison group are second-year undergraduate international business administration (IBA) students. Their bachelor's program curriculum is identical to the treatment group except for the entrepreneurship course, with the comparison group following a compulsory course on cross-cultural management instead. The BA program is fully taught in Dutch as it primarily consists of Dutch students, whereas the IBA program is taught in English and therefore consists of an international student body. While every student who meets the Dutch qualification guidelines for following university education may enroll in the BA program, the IBA program also has selection criteria including high school grades and essay questions regarding students' motivation.

In order to increase response rates for the surveys, we initially distributed paper questionnaires to all participants. This was possible for T0, T1, and T2. To keep students engaged, individuals who participated in all waves could take part in a lottery to win a flight ticket of their choice up to 1,000 Euro. This led to considerably high response rates for the first three waves of data collection (treatment group: 86% at T0, 82% at T1, 69% at T2; comparison group: 70% at T0, 90% at T1, 84% at T2). Non-respondents from the paper questionnaires were also approached via e-mail and asked to fill in the survey digitally. For the last measurement wave (T3), students had mostly left university as their bachelor's degree program had finished for about 9 months. Thus, questionnaires at T3 could only be sent out through e-mail, followed by a reminder, explaining lower yet adequate response rates (treatment group: 32% at T3; comparison group: 31% at T3). Generally, the willingness to participate was very high, with only 34 individuals who did not respond to any questionnaire.

Treatment and comparison condition

In the treatment group, students followed an entrepreneurship course during 21 weeks with a study load of five ECTS. The course consisted of two parts: the foundational theory part during the first half of the course and the applied practice part during the second half of the course, thus combining different elements of entrepreneurship education (Debarliev et al., 2022). The theory part combined four 90 minutes lectures for all students with five 90 minutes tutorials. Students were divided into groups of 18 students for the latter to discuss the lecture content and apply theory to in-class examples. Topics included defining entrepreneurship and entrepreneurial behavior, opportunity recognition, as well as corporate and social entrepreneurship. The aim of this part of the course was to provide students with background knowledge. Assessment was based on participation during group discussions, three essays in which students had to apply lessons from the literature to three movies, and an individual research assignment in which students conducted a case study on an entrepreneur of their choice while drawing on the course literature. The practice part combined four lectures with four small tutorials and hands-on workshops, in which students could practice tools and received feedback on their own venturing process. Topics included principles of the lean start-up, idea generation, business modeling, entrepreneurial marketing and finance, as well as pitching. The aim of this part of the course was to have students experience themselves what it means to be an entrepreneur by having them develop a business model of their own and reflect on those experiences. Assessment consisted of a group report and presentation on the start-up process. Please see [Appendix A](#) for an extract from the course syllabus describing course content, set-up, requirements, and assessment in greater detail. In the comparison group, students followed a cross-cultural management course of 21 weeks, also with a study load of five ECTS. The course combined larger lectures with tutorials, in which students were divided into smaller groups to discuss the lecture content. Topics included issues around internal cultural diversity in organizations and global transformations more broadly. The aim of the course was to provide students with the means to cope with the complexities of cultural diversity in organizations. Assessment included an individual written test and individual assignment, three shorter group assignments, and a group research report.

Measures

Data on entrepreneurial behavior, entrepreneurial intentions, and entrepreneurial self-efficacy were collected during all waves. Control variables were collected at T0 and T1 and supplemented with information from the university's registrar office.

Entrepreneurial behavior

We asked participants whether they undertook 18 different activities as used earlier by Rauch and Hulsink (2015), which were drawn from similar items in the Panel Study of Entrepreneurial Dynamics (PSED; Gartner & Carter, 2003) and the Global Entrepreneurship Monitor (GEM; Reynolds et al., 2005) to cover “a representative set of activities associated with the creation of new business ventures” (Rauch & Hulsink, 2015, p. 195). Participants indicated whether they engaged in any steps toward venture creation during the past 12 months (binary yes/no items). Importantly, after the treatment at T1, students were explicitly instructed to only consider activities other than efforts required for the course. We generated three dependent variables by adding the number of activities associated with (a) overall entrepreneurial behavior; (b) initiating entrepreneurial behavior; and (c) engaging in entrepreneurial behavior. While overall entrepreneurial behavior comprises all items from the index scale, initiating entrepreneurial behavior describes the first steps toward new venture creation and captures activities that are related to opportunity identification, commitments to take steps to start the business, as well as organizing start-up activities (Shepherd et al., 2019). For instance, this involves spending time thinking about and evaluating different variants of business opportunities, looking for others to team up with, or saving up money to invest into the business. Engaging in entrepreneurial behavior refers to the exploitation of opportunities and includes activities that are directly related to and involving firm formation (Shepherd et al., 2019). Such activities involve, for example, creating a legal entity; investing resources into raw materials, equipment, or facilities; or devoting full-time hours to the business. Each of these scales was divided by the number of items included in the scale; thus, values ranged from 0 to 1. Please see [Appendix B](#) for the complete list of all measured activities.

Entrepreneurial intentions

We measured entrepreneurial intentions with the six-item scale from Liñán and Chen (2009). Participants indicated their level of agreement ranging from 1 (total disagreement) to 7 (total agreement) on questions such as “I am ready to do anything to be an entrepreneur” or “my professional goal is to become an entrepreneur.” This scale’s coefficient alpha was internally constant through all measurements and ranged between $\alpha = .95$ and $\alpha = .97$.

Entrepreneurial self-efficacy

We used McGee et al.’s (2009) 19-item scale to measure entrepreneurial self-efficacy. This scale contains questions about an individual’s self-efficacy related to five distinct dimensions in entrepreneurship. Participants were asked to indicate how much confidence they have in their abilities related to

entrepreneurial activities ranging from 1 (very little) to 5 (very much). The scale comprises three questions regarding searching (e.g., “identify the need for a new product or service”); four questions regarding planning (e.g., “design an effective marketing/advertising campaign for a new product or service”); three questions regarding marshaling (e.g., “get others to identify with and believe in my vision and plans for a new business”); six questions regarding implementation with a focus on people (e.g., “recruit and hire employees”); and three questions regarding implementation with a focus on finance (e.g., “organize and maintain the financial records of my business”). Through all measurement periods, this scale’s coefficient alpha ranged between $\alpha = .85$ and $\alpha = .88$.

Control variables

We used gender (1 = female; 0 = male), age (range: 18 to 25 years), GPA (range: 6.2 to 9.0), entrepreneurial experience before treatment (1 = currently or previously self-employed; 0 = no), entrepreneurship training/education received before treatment (1 = yes; 0 = no), and parents’ entrepreneurial background before treatment (1 = either one or both parents currently or previously self-employed; 0 = no) as control variables. The importance of including these individual-level control variables has been stressed in earlier research on entrepreneurial self-efficacy (Newman et al., 2019), entrepreneurial intentions (Fitzsimmons & Douglas, 2011; Laspita et al., 2012), and entrepreneurial behavior (Simoes et al., 2016).

Analysis

Matching

In order to minimize differences between both groups, we employed propensity score matching,³ which is based on the propensity score retrieved from a selection model (binary probit regression) where the dependent variable is participation in the BA program (treatment group) vs. the IBA program (comparison group). Individuals in the treatment group were matched with individuals in the comparison group based on the propensity scores. In this way, we could obtain a matched sample, which enabled us to explain the observed differences between the two groups based on the treatment rather than possible differences in terms of characteristics. We included all individuals who participated in any wave.

We used a caliper-based nearest neighbor propensity score matching technique (McDonnell & Cobb, 2020) with a caliper width of 0.025.⁴ Variables are

³We used the command `psmatch2` in Stata 16.

⁴We initially employed three caliper widths: 0.01, 0.025, and 0.05. We selected 0.025 as this value is very close to the commonly used caliper of 20% of the standard deviation of the propensity scores (Rosenbaum, 2010); also, it led to a good matching quality while preventing the loss of too many observations.

usually included in the matching process that both relate to the treatment and the outcome (entrepreneurial behavior; Stuart, 2010); also, variables that are related to the outcome but not to the treatment are generally added to the matching process (Garrido et al., 2014). Hence, we decided to match the treatment and comparison group on all control variables, entrepreneurial self-efficacy, and entrepreneurial intentions, all measured at time T0. GPA and nationality were also part of the collected data, but we excluded these variables from the list of matching variables. That is, the two variables led to a poor balance of propensity scores among both groups and caused difficulties in obtaining a matched sample with satisfactory balance statistics for all other matching variables. We decided to include GPA as a control variable and restrict our analyses to Dutch students only.

We relied on absolute standardized mean differences (Staffa & Zurakowski, 2018), denoted with d , to assess the balance of the matching variables in the treatment and comparison group after matching.⁵ We generated five matched samples where each treated person was matched to 1, 2, 3, 4, and 5 nearest neighbors. Ultimately, we selected 1:4 nearest neighbor matching because this matching procedure (given the 0.025 caliper) led to the most substantial reduction in standardized mean differences for our variables. See Table 1 for an overview of how the matching variables compare in the treatment and comparison group before and after the matching process. The standardized mean differences are also shown and ideally should not exceed 0.10 (Staffa & Zurakowski, 2018), which is the case after our matching process for each matching variable. Compared to the initial sample of $N = 424$ for the treatment group and $N = 446$ for the comparison group, the reduced before-matching sample size can be explained by the fact that 50 individuals in the treatment group did not experience a “full” treatment. Those participants did not earn a grade for the course as they dropped out prematurely. Furthermore, missing values for entrepreneurial intentions and entrepreneurial self-efficacy at T0 lead to a reduction of 163 individuals. Furthermore, the restriction to Dutch students lead to a sample of 460 students. Additionally, 7 students in the treatment group and 3 students in the comparison group could not be matched, which resulted in a matched sample of 450 students.

Analytical approach, model specification, and estimation

We follow the difference-in-difference (DID) framework (Bodner & Bliese, 2018; Lechner, 2011), a standard practice in experimental research, to analyze the impact of CEE on entrepreneurial behavior. Following the DID

⁵The estimated coefficients in the selection model (binary probit regression; 460 observations included) with treatment group (value 1) vs. comparison group (value 0) as the dependent variable are -0.348 ($p = .01$) for gender, 0.249 ($p = .001$) for age, -0.542 ($p = .002$) for entrepreneurial experience, -0.150 ($p = .33$) for entrepreneurial training, 0.146 ($p = .29$) for entrepreneurial parents, 0.049 ($p = .34$) for entrepreneurial intentions, and 0.065 ($p = .69$) for entrepreneurial self-efficacy.

framework, we compared the average difference between post-treatment and pre-treatment values in the treatment group with the average difference among individuals in the comparison group.

As we formulated hypotheses on the timing of CEE effects, we included time dummy variables for T1, T2, and T3 (1 = observation belongs to the specific wave; 0 = otherwise) with a dummy variable indicating the post-matching treatment group (value 1) or comparison group (value 0) as well as interaction terms between the time dummies and the treatment dummy variable. The coefficients of the interaction terms reflect the treatment effects for the time periods (Bodner & Bliese, 2018).

The intraclass correlation coefficient (ICC) values are 0.54, 0.51, and 0.49 for entrepreneurial behavior, initiating entrepreneurial behavior, and engaging in entrepreneurial behavior, respectively. Hence, about 50% of the variation in entrepreneurial behavior was at the individual level, which is relatively high (Hox et al., 2017) and which justifies the inclusion of a random intercept. In addition, likelihood ratio tests for testing whether the individual variance component equals zero result in $p < .001$ for all our model specifications. Hence, we added a random intercept at the individual level to allow for differences across individuals in terms of entrepreneurial behavior, following Bodner and Bliese (2018), estimated by means of maximum likelihood. We performed random-intercept multi-level linear regressions and, hence, treated the dependent variables as continuous variables, which has advantages in terms of interpretability of the coefficients and the treatment effects (Gomila, 2020). Also, the calculation of indirect effects is straightforward for continuous dependent variables. We used cluster-robust standard errors. Furthermore, we used the weights resulting from our matching procedure

Table 1. Descriptive information of sample, before and after matching (quasi-experiment).

Variables (measured at T0)	Unmatched Sample			1:4 Nearest Neighbor Propensity Score Matched Sample		
	Mean Treatment Group	Mean Comparison Group	Standardized Mean Difference	Mean Treatment Group	Mean Comparison Group	Standardized Mean Difference
Female	0.42	0.56	0.29	0.42	0.44	0.03
Age	19.75	19.37	0.39	19.66	19.66	0.001
Entr. Experience	0.14	0.23	0.22	0.14	0.13	0.01
Entr. Training	0.23	0.28	0.10	0.23	0.24	0.02
Entr. Parents	0.57	0.51	0.12	0.57	0.57	0.003
Entr. Intentions	4.46	4.19	0.18	4.43	4.43	0.004
Entr. Self-Efficacy	3.61	3.58	0.07	3.61	3.62	0.01
Number of Respondents	337	123		330	120	

An absolute standardized mean difference smaller than 0.10 indicates a satisfactory balance between the treatment and comparison group for a matching variable. Weights have been applied where each observation in the comparison group receives a weight reflecting the number of times it has been matched in the matching procedure. We also performed *t* tests as an additional analysis and found non-significant results post-matching for all variables.

where each observation in the comparison group receives a weight reflecting the number of times it has been matched in the 1:4 matching procedure (Leuven, 2023).

Sample

As Table 1 shows, the treatment group consists of 330 individuals and the comparison group consists of 120 individuals after the matching (450 individuals in total). Given that individuals do not participate in each wave, we ended up with an estimation sample of 1,387 observations for all 450 individuals. Table 2 contains descriptive statistics. The table also shows the correlation matrix for the full sample from which it can be concluded that the Pearson correlation coefficients (all below ± 0.5 for the independent variables) do not pose any concerns for multicollinearity. In addition, values of the variance inflation factor are also below the commonly accepted cutoff value of 10.0 (Hair et al., 2010).

Results of field quasi-experiment

Table 3 shows the regression results with entrepreneurial behavior as the dependent variable. The model specifications include time dummies ($T1$, $T2$, $T3$), a variable denoting whether a person belongs to the treatment group or the comparison group ($Treatment$), and interaction terms between the time dummies and the treatment variable representing the treatment effects. The inclusion of these interactions allows for different treatment effects at $T1$ ($Treatment \times T1$), $T2$ ($Treatment \times T2$), and $T3$ ($Treatment \times T3$). The coefficients of the interaction terms indicate the difference between the treatment and comparison group in the change in entrepreneurial behavior between $T0$ and $T1$, $T0$ and $T2$, and $T0$ and $T3$, respectively. Table 3 also shows the results of a likelihood ratio test that examines whether the random intercept (random effect) equals zero. The null hypothesis of zero variance is rejected in all cases and justifies the inclusion of the random intercept.

Hypotheses testing

Hypotheses H1a–H1c (entrepreneurial behavior)

The results for entrepreneurial behavior are shown in column 1 (control variables only) and column 2 (all variables) of Table 3. A significant and positive treatment effects was found directly after the course ended ($\beta = 0.066$ for $Treatment \times T1$; $p = .02$). The treatment effects 8 months after the course ($\beta = 0.035$ for $Treatment \times T2$; $p = .22$) and 24 months after the course are non-significant ($\beta = -0.008$ for $Treatment \times T3$; $p = .82$). Hence, H1a is partially supported. The treatment effect at $T1$ represents the increase in entrepreneurial behavior (from $T0$ to $T1$) that is 0.066 points higher among the

Table 2. Descriptive statistics and correlation table of estimation sample (quasi-experiment).

	Full Sample						Comparison						Full Sample													
	Mean	SD	Min.	Max.	VIF		Mean	SD	Mean	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	
1. Entr. Behavior	0.17	0.21	0	1			0.15	0.20	0.18	0.22																
2. Initiating Entr. Behavior	0.31	0.31	0	1			0.29	0.30	0.33	0.32	0.89															
3. Engaging in Entr. Behavior	0.10	0.19	0	1			0.09	0.18	0.11	0.21	0.92	0.64														
4. Entr. Intentions	4.27	1.54	1	7	1.32	4.11	1.59	4.42	1.47	4.45	0.45	0.53	0.30													
5. Entr. Self-Efficacy	3.64	0.47	1.37	5	1.19	3.63	0.46	3.64	0.48	0.25	0.24	0.20	0.38													
6. T0	0.33	0.47	0	1		0.33	0.47	0.33	0.47	-0.03	-0.04	-0.01	0.07	-0.03												
7. T1	0.30	0.46	0	1		2.70	0.31	0.46	0.29	0.45	-0.01	0.00	-0.01	-0.03	0.03	-0.46										
8. T2	0.27	0.44	0	1		2.62	0.25	0.43	0.28	0.45	0.01	0.02	0.00	-0.02	-0.05	-0.42	-0.39									
9. T3	0.11	0.31	0	1		2.47	0.11	0.32	0.10	0.30	0.04	0.04	0.03	-0.04	0.07	-0.24	-0.23	-0.21								
10. Treatment	0.50	0.50	0	1	1.15						-0.07	-0.07	-0.06	-0.10	-0.01	0.00	0.03	-0.04	0.02							
11. Female	0.44	0.50	0	1	1.10	0.45	0.50	0.44	0.50	-0.16	-0.19	-0.10	-0.17	0.00	-0.02	-0.02	0.00	0.05	0.02							
12. Age	19.64	0.95	18	25	1.05	19.64	0.92	19.63	0.97	0.07	0.06	0.08	0.08	-0.04	0.02	-0.02	0.02	-0.04	0.00	0.07						
13. GPA	7.41	0.53	6.16	9.02	1.22	7.22	0.47	7.60	0.51	-0.01	0.03	-0.03	-0.03	0.01	-0.03	-0.02	0.03	0.03	-0.36	0.13	-0.01					
14. Entr. Experience	0.13	0.34	0	1	1.10	0.14	0.34	0.13	0.34	0.31	0.25	0.31	0.17	0.11	0.00	-0.01	0.01	0.01	-0.10	0.07	-0.08					
15. Entr. Training	0.24	0.43	0	1	1.08	0.23	0.42	0.25	0.43	0.15	0.21	0.07	0.16	0.14	0.00	0.00	0.01	0.00	-0.02	0.03	0.18	0.07				
16. Entr. Parents	0.57	0.50	0	1	1.12	0.57	0.50	0.57	0.50	0.13	0.15	0.09	0.24	0.14	0.00	-0.01	0.01	0.00	0.00	-0.02	0.05	0.14	0.14	0.14	0.14	0.10

Table based on 1,387 observations for the full sample, 1,015 observations for the treatment group, and 372 observations for the comparison group. Pearson correlations coefficients are shown for the full sample of 1,387 observations. Correlations in *italics* are significant at 5%. SD = standard deviation; Min. = minimum; Max. = maximum; VIF = variance inflation factor. T0 (pre-treatment) is used as the reference category in the regressions. T1 is after the course; T2 is 8 months after course; T3 is 24 months after the course. Weights have been applied where each observation in the comparison group receives a weight reflecting the number of times it has been matched in the matching procedure.

treatment group than the comparison group. This coefficient represents a substantial increase of 41% relative to the mean of the dependent variable ($M = 0.160$; reported in Table 3).

To test H1b and H1c, we focus on columns 3 and 4 (initiating entrepreneurial behavior) and columns 5 and 6 (engaging in entrepreneurial behavior), respectively. Regarding H1b (column 4), we find a significant and positive treatment effect directly after the course ended ($\beta = 0.084$ for $Treatment \times T1$; $p = .03$), which partly supports H1b. The increase in initiating entrepreneurial behavior (from T0 to T1) is 0.084 points higher in the treatment group than the comparison group, which represents a substantial increase of 28% relative to the mean of the dependent variable. For H1c (column 6), we again find a significant treatment effect directly after the course ended ($\beta = 0.063$ for $Treatment \times T1$; $p = .03$). This larger increase among individuals in the treatment group represents an increase of 68% relative to the mean of the dependent variable. However, the treatment effects 8 months and 24 months after the course ended are not significant ($\beta = 0.033$ for $Treatment \times T2$; $p = .26$ and $\beta = -0.026$ for $Treatment \times T3$; $p = .47$). Therefore, H1c is not supported.⁶

Hypotheses H2a and H2b (indirect effects)

We investigated whether there is a significant indirect effect from CEE on entrepreneurial behavior through entrepreneurial intentions (note the significant and positive relationship between entrepreneurial intentions and entrepreneurial behavior in column 2 of Table 3; $\beta = 0.046$; $p < .001$). Therefore, we calculated the indirect effects and the associated percentile bootstrap confidence intervals using the methods described by Hayes (2017) with 5,000 bootstrap samples. The obtained indirect effects and the 95% confidence intervals for T1, T2, and T3 are displayed in panel A of Table 4. The confidence intervals at T1, T2, and T3 are entirely below zero. This means that entrepreneurial intentions serve as a mediator of the CEE-entrepreneurial behavior relationship, but we find negative indirect effects rather than positive effects as hypothesized. Therefore, H2a is not supported. To gain more insight in these indirect effects, we take entrepreneurial intentions as the dependent variable in columns 1 and 2 of Table 5. We observe that CEE has a negative relationship with entrepreneurial intentions. Participating in CEE negatively impacts entrepreneurial intentions directly after the course ($\beta = -0.488$ for $Treatment \times T1$; $p < .001$), 8 months after the course ($\beta = -0.476$ for $Treatment \times T2$; $p < .001$), and 24 months after the course ended ($\beta = -0.469$ for $Treatment \times T3$; $p = .05$). These

⁶We also applied random slopes for our time variables T1, T2 and T3. For T1, we find significant random slopes for *Entrepreneurial Behavior* and *Initiating Entrepreneurial Behavior*, and a non-significant random slope for *Engaging in Entrepreneurial Behavior*. In addition, the random slopes for T2 and T3 are all non-significant. Importantly, the results for the fixed part of our models (such as the treatment effects) remain similar once random slopes are added (not only for T2 and T3, but also for T1). Hence, we decided not to proceed with random slopes for the time variables in our main model specifications.

Table 4. Indirect effects and confidence intervals (quasi-experiment).

	Indirect Effect	95% Confidence Interval
<i>Panel A: CEE → Entrepreneurial Intentions → Entrepreneurial Behavior (H2a)</i>		
T1	−0.021	[−0.037; −0.012]
T2	−0.020	[−0.044; −0.005]
T3	−0.020	[−0.046; −0.001]
<i>Panel B: CEE → Entrepreneurial Self-Efficacy → Entrepreneurial Intentions → Entrepreneurial Behavior</i>		
T1	−0.002	[−0.006; 0.002]
T2	0.001	[−0.005; 0.010]
T3	0.003	[−0.003; 0.011]
<i>Panel C: CEE → Entrepreneurial Self-Efficacy → Entrepreneurial Intentions (H2b)</i>		
T1	−0.054	[−0.138; 0.060]
T2	0.030	[−0.110; 0.238]
T3	0.076	[−0.071; 0.269]

coefficients represent decreases in entrepreneurial intentions that are 0.488 points, 0.476 points, and 0.469 points lower among the treatment group than the comparison group at T1, T2, and T3, respectively. The coefficients represent decreases of 11% relative to the mean of the dependent variable ($M = 4.140$). For completeness, panel B of Table 4 also shows the indirect effects that sequentially run via entrepreneurial self-efficacy *and*

Table 5. Results of multi-level random-intercept regressions with entrepreneurial intentions and entrepreneurial self-efficacy and as dependent variables (quasi-experiment).

Mean of Dependent Variable	Entrepreneurial Intentions				Entrepreneurial Self-Efficacy			
	4.140		4.140		3.639		3.639	
	Controls Only (1)		All Variables (2)		Controls Only (3)		All Variables (4)	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Treatment × T1			−0.488***	0.135			−0.061	0.050
Treatment × T2			−0.476***	0.139			0.036	0.085
Treatment × T3			−0.469*	0.238			0.078	0.102
T1			0.054	0.120			0.080#	0.044
T2			0.020	0.118			−0.043	0.080
T3			−0.019	0.213			0.018	0.090
Treatment			−0.084	0.160			−0.010	0.059
Entrepr. Self-Efficacy	0.856***	0.081	0.860***	0.085				
Female	−0.473***	0.140	−0.445**	0.138	0.012	0.049	0.011	0.048
Age	0.123	0.108	0.118	0.100	−0.025	0.027	−0.022	0.028
GPA	−0.059	0.146	−0.197	0.156	−0.010	0.054	−0.014	0.057
Entr. Experience	0.411*	0.208	0.398*	0.201	0.119#	0.067	0.118#	0.067
Entr. Training	0.316*	0.152	0.336*	0.146	0.133*	0.058	0.134*	0.058
Entr. Parents	0.576***	0.140	0.583***	0.138	0.120**	0.045	0.121**	0.045
Intercept	−1.039	2.629	0.223	2.499	4.062***	0.803	4.044***	0.833
R^2 (level 1)	0.09		0.13		0.00		0.02	
R^2 (level 2)	0.28		0.30		0.10		0.10	
Variance level 1	0.66		0.63		0.12		0.12	
Variance level 2	1.16		1.13		0.09		0.09	
Observations	1,387		1,387		1,387		1,387	
Individuals	450		450		450		450	

$p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$. Estimated coefficients are shown. SE = cluster-robust standard error. T1 is after the course; T3 is 8 months after the course, and T4 is 24 months after the course. Weights have been applied where each observation in the comparison group receives a weight reflecting the number of times it has been matched in the matching procedure. R^2 measures: see Table 3.

Table 6. Summary of hypotheses testing (quasi-experiment).

Hypothesis	Proposed Relationship	Degree of Support
1a	Participation in compulsory entrepreneurship education increases entrepreneurial behavior.	Supported for T1.
1b	Initiating entrepreneurial behavior occurs immediately and in the medium term after participation in compulsory entrepreneurship education.	Supported for T1.
1c	Engaging in entrepreneurial behavior occurs in the long term after participation in compulsory entrepreneurship education.	Not supported.
2a	Entrepreneurial intentions mediate the effect of compulsory entrepreneurship education on entrepreneurial behavior such that there is a positive indirect effect via entrepreneurial intentions.	Not supported; support for opposite direction (negative indirect effect).
2b	Entrepreneurial self-efficacy mediates the effect of compulsory entrepreneurship education on entrepreneurial intentions such that there is a positive indirect effect via entrepreneurial self-efficacy.	Not supported.

entrepreneurial intentions; these indirect effects are generally non-significant (the confidence intervals include zero).

To test the indirect effect of CEE on entrepreneurial intentions via entrepreneurial self-efficacy (H2b), the bootstrap confidence intervals are shown in [Table 4](#) as well (panel C). The confidence intervals for T1, T2, and T3 include zero. Thus, H2b is not supported. Entrepreneurial self-efficacy is the dependent variable in columns 3 and 4 of [Table 5](#). We do not find significant treatment effect directly after the course ended ($\beta = -0.061$ for *Treatment* \times *T1*; $p = .22$), 8 months after the course ended ($\beta = 0.036$ for *Treatment* \times *T2*; $p = .67$), or 24 months after the course ended ($\beta = 0.078$ for *Treatment* \times *T3*; $p = .45$).

Please see [Table 6](#) for a summary of the tested hypotheses and the degree of support found.

Additional analyses and robustness checks

Different activities constituting entrepreneurial behavior

We performed post hoc analyses for each separate behavioral item, as listed in [Appendix A](#) (18 items in total). When performing these separate analyses for each item, we find that CEE positively impacts thinking about starting a business at T1 ($\beta = 0.123$; $p = .04$), the selection of a business name at T1 ($\beta = 0.136$; $p = .05$) and T2 ($\beta = 0.137$; $p = .04$), purchasing raw materials and inventory at T1 ($\beta = 0.114$; $p = .02$), and creating a legal entity at T1 ($\beta = 0.120$; $p = .01$).

Quality of instructor

An alternative explanation for educational outcomes might be related to the quality of the instructor (Joensuu-Salo et al., 2021; Otache, 2019). To mitigate this concern, we obtained the course evaluation scores for all courses and instructors for the treatment group in their 3 years of studies. Out of 30

courses evaluated, the entrepreneurship course received a score of 6.4 ($M = 7$, $SD = 1.9$) on a scale ranging from 0 to 10, with other courses' scores ranging from 5.4 to 8.2 ($M = 6.9$, $SD = 0.7$). The instructor, among the 51 teaching staff involved in the bachelor's degree curriculum, received a score of 6.8 ($M = 7$, $SD = 1.7$) on a scale ranging from 0 to 10, with other teaching staff scores ranging from 5.5 to 9 ($M = 7$, $SD = 0.7$). Thus, we can conclude that the instructor's quality can be seen as neither too high nor too low relating both to the courses and teaching staff present during the treatment group's time of studies. We therefore have no concern that the instructor's quality has significantly influenced student outcomes.

Propensity score matching

As a robustness check, we adapted some aspects of our matching procedure. First, the current analyses include individuals in the treatment group who received the full treatment (they followed all sub-elements of the course). When also adding individuals with a partial treatment to the sample and classify them as treated individuals we end up with 1,485 observations and qualitatively similar results.⁷ Second, we analyzed our dataset with 1:1 (1,310 observations), 1:2 (1,354 observations), 1:3 (1,370 observations), and 1:5 (1,391 observations) nearest neighbor matched samples. In each case, the results in Table 3 remained unaffected. Third, we slightly adjusted the caliper width, with values of 0.01 (1,331 observations) and 0.05 (also 1,414 observations). Again, the results in Table 3 remained unaffected.

Fixed-effects

We also performed a fixed-effects analysis, in which the random intercept is replaced with dummy variables for each student. This fixed-effects analysis controls for all time-invariant (omitted) variables, and hence, all time-invariant control variables are removed from the specification (Zhou et al., 2019). The results of the fixed-effects regressions are shown in Table 7. We find significant positive treatment effects at T1 for entrepreneurial behavior ($\beta=0.060$; $p=.04$) and for engaging in entrepreneurial behavior ($\beta=0.062$; $p=.05$).

Poisson (count) regression

Rather than taking averages for the dependent variables, we counted the number of start-up activities. We then performed multi-level Poisson regressions as a robustness analysis for Table 3. The results can be found in Table 8 and are qualitatively similar to those in Table 3.

⁷We find significant positive treatment effects for entrepreneurial behavior at T1 ($\beta = 0.072$; $p = .02$), for initiating entrepreneurial behavior at T1 ($\beta = 0.097$; $p = .02$), and for engaging in entrepreneurial behavior at T1 ($\beta = 0.064$; $p = .02$).

Table 7. Results of fixed-effects regressions with entrepreneurial behavior as dependent variables (Quasi-experiment).

Mean of Dependent Variable	Entr. Behavior (1)		Initiating Entr. Behavior (2)		Engaging in Entr. Behavior (3)	
	0.160		0.296		0.092	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Treatment × T1	0.060*	0.029	0.072#	0.041	0.062*	0.031
Treatment × T2	0.034	0.031	0.047	0.044	0.035	0.032
Treatment × T3	0.013	0.033	0.062	0.045	-0.007	0.035
T1	-0.012	0.025	0.006	0.036	-0.026	0.027
T2	0.004	0.027	0.019	0.038	-0.009	0.028
T3	0.036	0.030	0.034	0.039	0.033	0.033
Entrepr. Intentions	0.037***	0.008	0.075***	0.013	0.020*	0.008
Entrepr. Self-Efficacy	0.010	0.025	0.022	0.039	0.003	0.022
R ²	0.71		0.71		0.66	
Observations	1,387		1,387		1,387	
Individuals	450		450		450	

$p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$. Estimated coefficients are shown. SE = cluster-robust standard error. T1 is after the course; T2 is 8 months after the course, and T3 is 24 months after the course. Weights have been applied where each observation in the comparison group receives a weight reflecting the number of times it has been matched in the matching procedure.

Methods follow-up study

Research design

While the design of the first study allowed us to find initial evidence of internal validity (Hsu et al., 2017), it relies on a student sample, which is appropriate for the topic of interest (i.e., the effectiveness of CEE), but limiting the external validity of the study (Grégoire et al., 2019). In order to enhance external validity and to replicate the findings, we conducted a follow-up study relying on another population (cf. Gupta et al., 2019; McNally et al., 2020; Sardeshmukh et al., 2021). Thus, the follow-up study serves to support the findings of the field quasi-experiment and help to extend as well as deepen our understanding of the effectiveness of CEE. Specifically, the follow-up study investigates whether people who ever followed entrepreneurship education are more likely to engage in entrepreneurial behavior than people who have not followed entrepreneurship education. To test this relationship, we used a two-group posttest design.

Sample and procedure

We relied on Prolific to obtain responses in a two-step process. Prolific is a commonly used online portal comparable to other platforms such as Amazon MTurk or Qualtrics, which are extensively used for academic studies (e.g., Barber III et al., 2022; Oo & Allison, 2022; Su et al., 2022). It assists researchers in their data collection, as Prolific provides a wide pool of registered participants who can be recruited. We collected the data using a two-step approach. In a first step, we identified participants who could be included into the follow-



Table 8. Results of multi-level poisson regressions with entrepreneurial behavior as dependent variable (quasi-experiment).

	Entr. Behavior (H1a)			Initiating Entr. Behavior (H1b)			Engaging in Entr. Behavior (H1c)												
	Controls Only (1)			All Variables (2)			Controls Only (3)			All Variables (4)			Controls Only (5)			All Variables (6)			
	Coeff.	SE		Coeff.	SE		Coeff.	SE		Coeff.	SE		Coeff.	SE		Coeff.	SE		
Treatment × T1				0.362*	0.160		0.281*	0.119					0.498#	0.281					
Treatment × T2				0.149	0.154		0.145	0.124					0.138	0.258					
Treatment × T3				0.141	0.196		0.202	0.141					-0.036	0.326					
T1				-0.046	0.136		0.000	0.102					-0.131	0.243					
T2				0.103	0.126		0.098	0.105					0.125	0.209					
T3				0.202	0.170		0.147	0.120					0.340	0.270					
Treatment				-0.174	0.138		-0.115	0.107					-0.199	0.247					
Entrepr. Intentions				0.273***	0.037		0.291***	0.037					0.214***	0.062					
Entrepr. Self-Efficacy				0.071	0.133		0.083	0.130					0.102	0.205					
Female				-0.230*	0.106		-0.225*	0.105					-0.213	0.194					
Age				0.040	0.056		0.042	0.058					0.064	0.138					
GPA				0.067	0.094		0.059	0.106					0.009	0.159					
Entr. Experience				0.613***	0.123		0.606***	0.123					1.067***	0.242					
Entr. Training				0.365***	0.103		0.364***	0.101					0.462*	0.209					
Entr. Parents				0.100	0.118		0.087	0.116					0.344#	0.209					
Intercept				-2.221	1.444		-2.341	1.553					-3.871	3.241					
Variance level 2				0.61	0.60		0.23	0.23					1.90	1.88					

$p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Estimated coefficients are shown. SE=cluster-robust standard error. Dependent variable operationalized as number of steps taken. Weights have been applied where each observation in the comparison group receives a weight reflecting the number of times it has been matched in the matching procedure.

up study relying on four selection criteria. To start with, we included individuals aged 18 to 30 years to minimize recall bias pertaining to the time passed since finishing their undergraduate studies. Second, since we study effects of entrepreneurship education, participants must have completed an undergraduate degree or higher (graduate or doctorate degree). Third, to only include reliable participants, we set a minimum approval rate of prior survey participation within Prolific of at least 99%, which means that their work has not previously been rejected on grounds such as failing attention checks or demonstrating low effort and engagement. Finally, to ensure that the study participants share a comparable context and educational system, all respondents were based in the United States. This first step resulted in 969 responses, of which 21.7% indicated that they followed a course that focused on entrepreneurship, start-ups, or new business creation during their undergraduate studies and 78.3% indicated that they did not. In the second step, we opened the actual survey for all 210 participants from the previous round that indicated that they received entrepreneurship education. We randomly selected 240 additional participants that did not follow any entrepreneurship education during their undergraduate studies. In total, we received 400 responses (88.9% response rate). Out of those, 5 responses had to be excluded as these participants had not finished their undergraduate studies yet. This left us with a total sample of 395 individuals (of whom 152 followed entrepreneurship education and 243 did not).

Measures

Entrepreneurship education

We used the following question to distinguish individuals who followed entrepreneurship education from those who did not: “Please think back at the time that you studied to obtain your undergraduate degree (BA/BSc/other). Did you follow a course that focused on entrepreneurship, start-ups or new business creation?” Hence, our variable *Entrepreneurship Education* takes value 1 if individuals answer “yes” to this question, while it takes value 0 if respondents answer “no” to this question.

Entrepreneurial behavior, entrepreneurial intentions, entrepreneurial self-efficacy

We employed the same scales as we did for our field quasi-experiment to measure entrepreneurial behavior, that is, overall entrepreneurial behavior, initiating entrepreneurial behavior and engaging in entrepreneurial behavior. To distinguish between the different instances in time when entrepreneurial behavior could occur, we asked respondents whether they engaged in any steps toward venture creation (a) directly after finishing their undergraduate studies and (b) at the moment of conducting the survey.

Table 9. Descriptive statistics of estimation sample (Follow-up study).

	Full Sample				
	Mean	SD	Min.	Max.	VIF
Entrepreneurship Education	0.38	0.49	0	1	1.04
<i>Dependent Variables after Graduation</i>					
Entr. Behavior	0.14	0.22	0	1	
Initiating Entr. Behavior	0.22	0.29	0	1	
Engaging in Entr. Behavior	0.10	0.21	0	1	
<i>Dependent Variables Now</i>					
Entr. Behavior	0.19	0.24	0	1	
Initiating Entr. Behavior	0.30	0.31	0	1	
Engaging in Entr. Behavior	0.14	0.23	0	1	
<i>Control Variables after Graduation</i>					
Female	0.52	0.50	0	1	1.04
Age at Graduation	22.57	1.68	18	29	1.02
Entr. Training	0.18	0.38	0	1	1.05
Entr. Parents	0.21	0.41	0	1	1.00
(once self-empl. but not now)					
<i>Control Variables Now</i>					
Current Age	26.64	2.47	18	30	1.08
Entr. Experience (in years)	1.57	2.46	0	15	1.18
Entr. Parents (once/now self-employed)	0.48	0.50	0	1	1.06
Employment: Inactive	0.03	0.17	0	1	1.05
Employment: Self-Employed	0.07	0.26	0	1	1.11
Employment: Wagework	0.73	0.44	0	1	
Employment: Student	0.09	0.29	0	1	1.13
Employment: Job Seeking	0.08	0.27	0	1	1.09
Entr. Intentions	3.13	1.82	1	7	2.09
Entr. Self-Efficacy	3.14	0.82	1	4.95	1.78

Table based on 395 observations for the full sample directly after graduation, and 350 observations for the full sample at the moment of conducting the survey. SD = standard deviation; Min. = minimum; Max. = maximum; VIF = variance inflation factor. Female and entrepreneurial training are included in all regression models but descriptives are shown for the total sample of 395 observations. Wage work is used as the reference category in the regressions.

Control variables

The set of control variables depends on the instance in time (that is, directly after finishing one's studies or at the moment of conducting the survey). For the direct impact (after finishing one's bachelor's degree studies) we include gender, age when graduating, entrepreneurial training, and entrepreneurial parents. For the moment of conducting the survey, we included all variables that are measured at the moment of data collection, which are gender, current age, entrepreneurial training, entrepreneurial parents, entrepreneurial experience, and employment status. Table 9 contains descriptive statistics of our follow-up sample.

Analysis

We performed ordinary least-squares (OLS) regressions with the entrepreneurial behavior measures as dependent variables. Heteroskedasticity-robust standard errors were used. Contrary to our quasi-experimental setup, we could not use the DID framework. This is because data were collected at one single point in time (i.e., asking about their entrepreneurial behavior directly after

finishing their undergraduate studies and at the moment of conducting the survey). We excluded individuals who graduated in the same year the survey was conducted, as we cannot determine a time gap between both instances. Note that for some individuals, the time gap between graduation and assessing their entrepreneurial behavior was greater than 24 months ago, thereby extending the field quasi-experiment.

Results of follow-up study

The results of OLS regressions are reported in Table 10. First, we focused on overall entrepreneurial behavior (columns 1 and 2), measured directly after graduation (column 1) and at the moment of conducting the survey (column 2). Those who have followed entrepreneurship education are significantly more likely to have taken steps toward venture creation than those without entrepreneurship education, both directly after graduation (column 1; $\beta=0.078$; $p < .001$) and at the moment of conducting the survey (column 2; $\beta=0.073$; $p=.003$). Columns 3 (after graduation) and 4 (currently) focus on initiating entrepreneurial behavior. We found a significant and positive relationship between entrepreneurship education and this measure of entrepreneurial behavior in both columns ($\beta=0.159$; $p < .001$ in column 3; $\beta=0.125$; $p < .001$ in column 4). Columns 5 (after graduation: $\beta=0.038$; $p=.08$) and 6 (currently: $\beta=0.047$; $p=.06$) zoom in on engaging in entrepreneurial behavior. Additionally, we performed moderation analyses and investigated whether the relationship between entrepreneurship education and present entrepreneurial behavior is different for those who graduated less than 2 years ago, 2 years ago, or more than 2 years ago. We find tentative evidence that the relationship as found in column 4 of Table 10 for initiating entrepreneurial behavior holds for students who graduated 2 years ago or less, but wears off for those who graduated more than 2 years ago. Yet, further research with larger sample sizes for different student cohorts is needed to confirm this.

In sum, we replicated the findings of the field quasi-experiment in that we found a significant and positive relationship between entrepreneurship education and entrepreneurial behavior. We found an immediate effect (directly after graduation) and a longer-term effect (assessed at the moment of conducting the survey). We confirmed the relationship between entrepreneurship education and initiating entrepreneurial behavior, while we found less convincing evidence for engaging in entrepreneurial behavior.

We also investigated indirect effects. We found a significant positive indirect effect on entrepreneurial behavior via entrepreneurial intentions (indirect effect = 0.024; 95% CI = [0.008; 0.043]). Similar results were found for initiating entrepreneurial behavior (0.036; 95% CI = [0.001; 0.064]) and



Table 10. Results of OLS regressions with entrepreneurial behavior as dependent variables (follow-up study).

	Entr. Behavior (H1a)			Initiating Entr. Behavior (H1b)			Engaging in Entr. Behavior (H1c)			
	After Graduation (1)			After Graduation (3)			After Graduation (5)			
	Coeff.	SE	Now (2)	Coeff.	SE	Now (4)	Coeff.	SE	Now (6)	
Entrepr. Education	0.078***	0.022	0.073**	0.159***	0.031	0.125***	0.038 [#]	0.022	0.047 [#]	0.025
Female	-0.034	0.021	-0.017	-0.053 [#]	0.028	-0.040	-0.025	0.021	-0.006	0.023
Age at Graduation	0.010	0.007		0.004	0.009		0.012	0.008		
Current Age			0.001			0.004			-0.001	0.005
Entr. Experience			0.021***			0.030***			0.017***	0.005
Entr. Training	0.114***	0.031	0.096**	0.127**	0.038	0.127**	0.108**	0.033	0.081*	0.034
Entr. Parents	-0.010	0.025	0.066**	0.005	0.034	0.095**	-0.017	0.025	0.051*	0.022
Empl.: Inactive			0.145			0.166			0.134	0.109
Empl.: Self-Empl.			0.125*			0.114 [#]			0.131*	0.059
Empl.: Student			-0.005			-0.043			0.014	0.043
Empl.: Job Seeking			-0.063**			-0.085*			-0.052**	0.019
Intercept	-0.112	0.170	0.066	0.073	0.201	0.054	-0.204	0.176	0.072	0.148
R ²	0.100		0.226	0.129		0.252	0.067		0.154	
Observations	395		350	395		350	395		350	

[#] $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$. Estimated coefficients are shown. SE = heteroskedasticity-robust standard error. Empl. = Employment Status (wage work as reference category).

engaging in entrepreneurial behavior (0.018; 95% CI = [0.001; 0.033]). In addition, we found a significant positive indirect effect of entrepreneurship education on entrepreneurial intentions via entrepreneurial self-efficacy (indirect effect = 0.433; 95% CI = [0.245; 0.580]). Hence, an important difference between the two studies is that we find positive indirect effects through entrepreneurial self-efficacy and entrepreneurial intentions in the follow-up study. This reveals an important distinction between conducting a longitudinal study (field quasi-experiment as initial study) and a cross-sectional study (Prolific survey as follow-up study) in terms of mediation effects.

Discussion

The aim of the present research is to contribute to a growing body of research on entrepreneurship education (Duval-Couetil, 2013; Eesley & Lee, 2021; Nabi et al., 2017; Rideout & Gray, 2013) by evaluating the effects of CEE on behavioral outcomes over time. While the commonly held belief that entrepreneurship education supports flourishing entrepreneurs has led to the adoption of CEE in university curricula worldwide (Katz, 2016), we call on policymakers, (business) school administrators, and educators to carefully reevaluate this assumption. Our results reveal that the effectiveness of CEE is more nuanced than previously assumed. Specifically, we find that CEE increases entrepreneurial behavior, including activities related to initiating entrepreneurial behavior, but only immediately after the mandatory educational intervention. This result was replicated in a follow-up study, which adds confidence to the generalizability of our main results. Contrary to what was hypothesized, engaging in entrepreneurial behavior was also affected by CEE immediately. The field quasi-experiment showed no effects in the long term (i.e., 8 and 24 months after the course ended).

Notably, we found differences between the two studies in the mechanism driving the CEE-entrepreneurial behavior relationships. The field quasi-experiment did not support the mediation effects as hypothesized. All indirect effects that run via entrepreneurial self-efficacy were non-significant, while we found negative indirect effects from entrepreneurship education on entrepreneurial behavior running through entrepreneurial intentions, again stressing the need to reevaluate the effectiveness of CEE. The follow-up study indicated that entrepreneurial intentions and entrepreneurial self-efficacy mediate the relationship between entrepreneurship education and entrepreneurial behavior according to our expectations. Hence, there is a clear difference between what we find cross-sectionally and longitudinally. Yet, we consider the field quasi-experiment to be more persuasive in terms of its design and internal validity as it allows us to follow students over time. Below we unpack the theoretical implications of our findings.

Contributions

This study makes three contributions to entrepreneurship research. First, our study adds to the discussion about the timing of effects (Arenius et al., 2017; Eller et al., 2022; Gielnik et al., 2014), as we supply detailed insight into entrepreneurial behavior across time. In line with Eller et al. (2022) who “consider the factor time to acknowledge the process-oriented nature of entrepreneurship” (p. 211), our results show that students immediately after participating in CEE showed initiating entrepreneurial behavior. However, we do not find sustained entrepreneurial behavior beyond that point in time and conclude that effects of CEE wear off over time. This finding is similar to the work of Gielnik et al. (2015), who showed that entrepreneurship training—voluntary rather than compulsory as in our study—had an effect on students’ business creation within 12 months after the intervention started and that the effects diminish beyond that point in time. Our findings suggest that the role of time has to be considered when studying the effects of CEE (Kolvereid, 1996; Rauch & Hulsink, 2015) and that the effects of entrepreneurial education may last dramatically shorter than commonly assumed.

Second, we further detail behavioral outcomes in order to better understand the timing of effects. Although practically useful to dichotomize entrepreneurial behavior and conceptualize it as firm formation (e.g., Breznitz & Zhang, 2022), this precludes us from deeply understanding the micro-momentary activities that entrepreneurial behavior comprises. We contribute to this lack of nuance as entrepreneurial behavior includes all those activities that lead to the creation of a new venture (Gartner, 1988). Some of these behaviors, such as discovering new opportunities to initiate entrepreneurial behavior, occur early in the process of firm formation, while others, such as exploiting opportunities to engage in entrepreneurial behavior, occur later. As such, these behaviors are impacted differently by CEE across time. For example, we find that immediately after the course students in the treatment group engaged in quantitatively more entrepreneurial behavior activities than at a later point in time compared to the control group (i.e., they showed more discrete activities). Previous studies suggest that nascent entrepreneurs typically organize a team, save money for their business, and write a business plan during their first 3 months and typically delay other activities related to engaging in entrepreneurship after operating for longer (Alsos & Kolvereid, 1998). On the contrary, compared with students in the control group, we found that students in the treatment group were more likely to be involved in activities related to engaging in entrepreneurship (i.e., more advanced activities) already directly after the course, which typically occur at a later stage in the venturing process, such as looking for and acquiring facilities, equipment, as well as raw materials and inventory; hiring employees; or starting marketing activities (Gartner et al., 2010). We thus contribute to the discussion of which type of

entrepreneurial behavior related to firm formation occurs over time (Arenius et al., 2017; Lichtenstein et al., 2007).

Third, we build on the sparse body of literature on the effectiveness of CEE (Fayolle & Gailly, 2015; Hahn et al., 2020; Karimi et al., 2016; Oosterbeek et al., 2010; Von Graevenitz et al., 2010) and add to the discussion by shedding light on its behavioral outcomes. This is especially important given the predominant focus of studies on the effectiveness of voluntary entrepreneurship education. Depending on intended goals and course aims, CEE may lead to a variety of aspired outcomes (Hahn et al., 2020; Karimi et al., 2016). Much of the current discussion focuses on whether trying to create entrepreneurs is desirable, and scholars argue that outcomes of voluntary entrepreneurship courses may differ from compulsory ones (Hahn et al., 2020; Rauch & Hulsink, 2015). While to date research has largely neglected behavioral outcomes of CEE over time, this study shows that CEE effectively stimulates entrepreneurial behavior, yet only partly. Thus, it is suggested that behavioral effects found in settings where students self-select into entrepreneurship education cannot be transferred fully to CEE.

Given a lack of consensus and conclusive evidence on the behavioral effectiveness of CEE, we considered methodological recommendations by Souitaris et al. (2007), Nabi et al. (2017), and Yi and Duval-Couetil (2021) to ensure methodological rigor. In doing so, we included two separate studies. First, we opted for a field quasi-experimental pretest-posttest design comparing two groups of business students following almost identical curricula (with the sole exception of an entrepreneurship course) at the same university. Differences between treatment and comparison group were minimized as we employed propensity score matching. Additionally, to add to the study's external validity, we replicated the findings in a broader population employing a study using a posttest design. As we only found a mediation effect as expected in the follow-up study with a simplified design, this requires further discussion. Methodologically, the follow-up study relied on a posttest-only design, which imposes limitation to its internal validity. Moreover, it included students following electives and, therefore, the study might face selection effects. However, CEE does not suffer from selection effects and consists of students who do not necessarily aim to become entrepreneurs. These students discover that they either like or dislike entrepreneurship (Von Graevenitz et al., 2010). As a consequence, students will become, on average, more realistic about their career aspirations. While discouraging some, others may be activated by CEE. As the majority of students will not aim to become an entrepreneur,⁸ gaining a more realistic understanding about an entrepreneurial career through CEE might result in even lower intentions to become an

⁸The 2018 Global Entrepreneurship Monitor showed that in the Netherlands only about 7.7% and in the United States only about 12.2% of their populations has entrepreneurial intentions (Global Entrepreneurship Monitor, 2018).

entrepreneur (as is also validated empirically by the significant negative indirect effects via entrepreneurial intentions in our quasi-experimental design). However, other students who followed CEE—even if they represent a minority—will still aspire to become entrepreneurs. Through CEE, they will acquire the necessary knowledge and skills to persist in their career goals and continue demonstrating entrepreneurial behavior. With reference to Von Graevenitz et al. (2010), who state that for a “comprehensive assessment of entrepreneurship education ... gains from improved matching between students and career paths need to be considered” (p. 91), CEE may indeed allow a large body of students to assess their preference and fit for an entrepreneurial career to act accordingly (Burton et al., 2016; Hsu et al., 2019; Von Graevenitz et al., 2010) and provide a “reality check” when it comes to the often glorified entrepreneurial pursuit portrayed in media and society. This would explain why other studies using a similar design also report insignificant results or even negative ones (cf. Oosterbeek et al., 2010).

Practical implications

Following the discussion above, our study also has important practical implications. Most importantly, our findings show that CEE increases entrepreneurial behavior. However, this effect starts to disappear with time. While policymakers and higher education institutions view entrepreneurship education as a universally beneficial vehicle for increasing entrepreneurial behavior, we contribute to the discussion by offering a note of caution. Even though academic literature has hinted at the limits of entrepreneurship education (Oosterbeek et al., 2010; Von Graevenitz et al., 2010), the actual practices we observe among policymakers, (business) school administrators, and educators drastically differ. Whereas the European Commission has created HEInnovate, an initiative of the in partnership with the OECD to encourage entrepreneurship in higher education institutions by means of “extensive training and support materials, including workshop guides, practical case studies, guidance notes and action cards” (HEInnovate, 2023), the rate of new entrepreneurs in the US (for 2021 as average percentage of US adult entering into entrepreneurship, reported by Statista, 2023) is more than twice as high for individuals with less than a high school degree (0.66%) compared to individuals with a college degree (0.31%). While we do not want to dismiss the benefits that entrepreneurship education brings, a one-time mandatory entrepreneurship course may be insufficient to stimulate entrepreneurial behavior. Future research should investigate whether follow-up interventions can help sustain levels of entrepreneurial behavior among those enrolled in CEE. Alternatively, educators may opt to offer voluntary follow-up courses inside or outside the university setting to help students develop their new businesses and prevent early venture termination. In any case, educators

should not assume that a single educational intervention is sufficient to stimulate entrepreneurial behavior enduringly.

Furthermore, entrepreneurship education may serve a wide variety of purposes that are seldom included in program evaluations (Duval-Couetil, 2013). For example, Eesley and Lee (2021) concluded after examining two major entrepreneurship programs at Stanford University that those courses “help students better identify their potential as entrepreneurs” (p. 834) even though the program did not have any impact on entrepreneurship rates. We, too, have come to find that CEE does not necessarily increase students’ belief in their own entrepreneurial capabilities or the intention to start their own venture. That is, even negative indirect effects on entrepreneurial behavior via reduced entrepreneurial intentions were found in the field quasi-experiment. Yet, this offers an opportunity to see whether being an entrepreneur fits them (Von Graevenitz et al., 2010). Although CEE is not always aimed at creating more ventures, it allows students to learn more about entrepreneurship, even if they are not interested in this career and acquire entrepreneurial skills that can also benefit them in future careers other than entrepreneurship (Hahn et al., 2020). While the effectiveness of CEE may be judged not only by the number of new ventures created, being exposed to and experiencing entrepreneurship themselves offers students an insight into this particular career path, and entrepreneurial self-efficacy, entrepreneurial intentions, or entrepreneurial behavior are influenced accordingly (Duval-Couetil & Long, 2014). However, adopting this view on entrepreneurship education will need to change the narrative about what CEE can actually achieve.

Limitations and future research

As with all research, our results need to be interpreted with the study limitations taken into account. To start with, context matters. The present research was administered in the Netherlands, a country with strong economic conditions during the time the field quasi-experiment was running. For example, the Netherlands were placed among the top five European countries, with a GDP per capita of 53,024 USD in 2018 (World Bank, 2018a). Unemployment rates were as low as 3.8% in 2018, which places the Netherlands among the five European countries with the lowest unemployment rates (World Bank, 2018b). As a consequence, students have ample job opportunities and opportunity costs are high. It might well be the case that CEE is more effective in counties where students have less favorable career prospects (Walter & Block, 2016). Among the 49 countries included in the 2018 entrepreneurship data collected by the Global Entrepreneurship Monitor, the Netherlands ranks in the bottom quintile for entrepreneurial intentions, while they are leading when it comes to the perception of entrepreneurship as a good career option (Global

Entrepreneurship Monitor, 2018). This illustrates the need for taking the national context into account.

Second, judging the effectiveness of CEE may also call for alternative parameters of success that we did not consider in this study. This is because its effectiveness cannot exclusively be assessed by considering the type of entrepreneurial behavior we examined (i.e., related to new venture founding; Debarliev et al., 2022). For instance, future research could examine whether students are more entrepreneurial in their future (corporate) jobs; have a higher tolerance for ambiguity as an important newly acquired skill in the face of increased job insecurity; develop other related skills or entrepreneurial competences more broadly (e.g., creativity); actually apply what they have learned when developing new ventures; or benefit from those courses to improve start-up performance. We pose that scholars should broaden their scope and move beyond considering entrepreneurial self-efficacy, entrepreneurial intention, and new venture creation in evaluating the success of entrepreneurship education. Future research could focus on exploring positive indirect effects that run from CEE to entrepreneurial behavior via possible mediating variables such as measures for fear of failure or opportunity recognition.

Third, future research may find it useful to dig deeper into the effectiveness of different types of education for various purposes, in particular asking what works for whom and for which types of educational outcomes (Neck & Greene, 2011). Similarly, researchers may want to use an even longer time frame for follow-ups, especially if entrepreneurial outcomes later in the students' careers are focused on. Additionally, future research may find it useful to closely examine the treatment design used in our and similar educational studies. Entrepreneurship theory offers a broad variety of perspectives to be taught (Corbett, 2011; Neck & Corbett, 2018), but especially applied tools and concepts often stem from practitioners and lack empirical testing. For instance, the lean start-up method (Blank, 2013; Ries, 2011) is often used by entrepreneurs in the real world (Maurya, 2012; Yang et al., 2019), but it has also found its way into the classroom (Harms, 2015). Nonetheless, the appropriateness of such tools—in the real world or inside the classroom—has not been sufficiently scrutinized yet. Similarly, the effectiveness of different other types of teaching materials remains unclear, be it the use of entrepreneurs as guest lecturers or simulation games that are largely employed by educators without their effect on entrepreneurship education outcomes being fully established. Consequently, studies are needed that examine in detail the content and tools that entrepreneurship educators use actually meet their desired outcomes and thus gain a better understanding of the effects that different treatment interventions have.

Fourth, this paper focused on one particular way in which entrepreneurial behavior manifests. However, there are other models for entrepreneurial

behavior more broadly that could be fruitfully explored in future studies. For instance, some scholars recently stressed the value of applying individual-level entrepreneurial orientation to determine whether entrepreneurial behaviors vary across dimensions such as autonomy, proactiveness, innovativeness, competitiveness, and risk-taking propensity (Pidduck et al., 2021). Others argued that entrepreneurial behaviors vary in different contexts; for example, tolerance for ambiguity, opportunism, ability to pivot, and non-system-bound orientation are central in non-traditional and heterodox contexts (Glavas et al., 2023). Thus, our study can be extended to settings focused on non-education-based entrepreneurship or contexts in which individuals cannot rely on standard routines, and we encourage scholars to examine how insights from our work inform additional research on entrepreneurial behavior more broadly.⁹

Last, we ran a quasi-experiment complemented by a follow-up study. A quasi-experiment can be subject to concerns regarding internal validity as participants are not truly randomized. Therefore, we matched samples on a number of variables and also carefully examined those matched and unmatched samples. In addition, we have no reason to believe that students made their choice for an undergraduate study program based on one course (i.e., entrepreneurship). In that way, we could prevent self-selection, which is another common threat to internal validity present in many existing studies on entrepreneurship education. Nonetheless, researchers are advised to consider randomized controlled trials when designing their experiments, even though we considered methodological recommendations by Martin et al. (2013) to permit reasonable causal inferences and refrain from overestimating its impact. In addition, we followed up with an additional study to confirm our previous findings of the relationship between CEE and entrepreneurial behavior in a different population, which increases our confidence in the quasi-experimental outcomes.

Conclusion

With this study, we not only examined *whether* entrepreneurial behavior can be stimulated through CEE but also explored *what kind* of entrepreneurial behavior occurs upon participating in CEE and *when*. Thus, should we bother teaching entrepreneurship? Our findings indicate that CEE can indeed drive entrepreneurial behavior, but that this cannot be sustained over time. Moreover, we found that entrepreneurial behavior related to engaging in entrepreneurship occurred right after the course, where we would have expected to see initiating entrepreneurial behavior only. Consequently, it is crucial for policymakers, (business) school administrators, and educators to adopt a more nuanced view when implementing CEE by considering the

⁹We would like to thank our editor for offering this excellent suggestion.

timing and nature of the desired outcomes. Nonetheless, it is essential to build on our work and further explore the impact of CEE on entrepreneurial behavior, for instance, in terms of other dimensions of entrepreneurial behavior or further mediating mechanisms. Ultimately, while CEE can be a powerful tool for promoting entrepreneurship and economic development, it is not a one-size-fits-all solution. A more comprehensive understanding of the complex interplay among CEE, entrepreneurial behavior, and other desired outcomes is necessary to maximize the potential benefits of entrepreneurship education and ensure its long-term success.

Disclosure statement

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Appendices

Appendix A. Extract from course syllabus

The following provides an abridged version of the course syllabus, translated from Dutch into English.

1. Course Overview Entrepreneurship

Trimester 5	Monday	Thursday	Points of Attention
Week 1		Lecture 1	
Week 2	Tutorial 1	Lecture 2	<i>Extra lecture on academic writing on Wednesday</i>
Week 3			
Week 4	Tutorial 2	Lecture 3	<i>Hand in Essay Assignment 1</i>
Week 5			
Week 6	Tutorial 3	Lecture 4	<i>Hand in Essay Assignment 2</i>
Week 7			<i>Deadline Entrepreneur</i>
Week 8	Tutorial 4		<i>Hand in Essay Assignment 3</i>
			<i>Extra lecture on qualitative research on Thursday</i>
Week 9	Tutorial 5		<i>Outline Individual In-Depth Study</i>
Exam Week			
Exam Week			
Trimester 6	Monday	Thursday	Points of Attention
Week 13			<i>Hand in Individual In-Depth Study</i>
Week 14	Tutorial 6	Lecture 5	
Week 15	Tutorial 7	Lecture 6	
	Tuesday	Wednesday	Points of Attention
Week 16	Lecture 7	Tutorial 8	
Week 17	Lecture 8		
Week 18			<i>Perusal Individual In-Depth Study on Monday</i>
Week 19			
Week 20		Tutorial 9	<i>Hand in Pecha Kucha Presentation</i>
Week 21			Finals Entrepreneurship Challenge on Wednesday

2. Course Description and Content

The Entrepreneurship course zooms in on various forms of entrepreneurship and the specific context in which it occurs. During Trimester 5, entrepreneurship will first be defined from multiple perspectives and schools of thought. Although it may seem easy to define entrepreneurship at the outset, there are hundreds of definitions. As a result, we will have to start determining what entrepreneurship actually is. In this course, entrepreneurship will be positioned as a form of behavior and “regular entrepreneurship,” “intrapreneurship,” and “social entrepreneurship” will be reviewed. The common thread of this course is therefore an approach to entrepreneurship as a form of behavior, in which the identification and exploitation of opportunities is central. Entrepreneurial behavior can be motivated by economic and/or social value creation and is not limited to setting up a company or organization. Both “regular” and social entrepreneurial initiatives can also arise within existing companies and organizations.

In Trimester 5, various teaching methods are used to shed light on entrepreneurship from an academic perspective. During the lectures, the prescribed articles (to be found in Attachment 1) will be discussed and extra attention will be paid to the way in which theory is expressed in practice. Guest lectures by renowned entrepreneurs play an important role in this. In addition, during the tutorials, there will be room to discuss the literature in an interactive way in order to increase knowledge, understanding and insight. Prior to Tutorials 2, 3, and 4, an essay must be handed in based on a movie related to the literature and a quote linked to it. The essay assignment serves to apply knowledge and also offers the opportunity to reflect on the literature. The assignment will also serve as preparation for the tutorials. Trimester 5 concludes with in-depth study carried out individually. During this in-depth study, students will have to make a choice between further studying “regular” entrepreneurship, intrapreneurship, or social entrepreneurship. Based on this choice, a self-selected research question must be formulated. This question should relate to the prescribed literature and should be answered through the literature as well as a face-to-face interview with a “regular” entrepreneur, intrapreneur, or social entrepreneur. Further details regarding the essay assignment and the individual in-depth study follows under the heading “8. Examination Trimester 5 – Entrepreneurship.”

Trimester 6 will be specifically devoted to the “Entrepreneurship Challenge.” During the Entrepreneurship Challenge, students are challenged to develop a business in groups by creating as much economic value as possible with the help of only €5 starting capital. Any form of economic and/or social value creation is permitted as long as it (1) is legal, (2) does not damage the reputation of [university], and (3) is based on a clear revenue model and business model. To support this Challenge, lectures focus on creating a business model, managing entrepreneurial teams and setting up entrepreneurial marketing and various aspects of entrepreneurial finance. In an applied way, students therefore become acquainted with important aspects of entrepreneurship that can ultimately lead to the start of their own successful business. The seminars in Trimester 6 will also be devoted to the Entrepreneurship Challenge and will therefore be completed with an ideation workshop and an elevator pitch workshop. Trimester 6 concludes with a “Pecha Kucha” presentation and a process report, see section “11. Examination Trimester 6 – Entrepreneurship Challenge.” In week 21, the course will finish with the finals of the Entrepreneurship Challenge. The winning group of the Entrepreneurship Challenge will also be announced during the finals.

In short, the Entrepreneurship course ...

- 1) ... provides a general introduction to entrepreneurship as a scientific discipline;

- 2) ... encourages students to become more entrepreneurial through inspiring guest lectures, critical reflections and stimulating interactive tutorials;
- 3) ... introduces students to entrepreneurship in an active way through the Entrepreneurship Challenge;
- 4) ... contributes to the development of general academic skills.

After the course, students are familiar with various forms of entrepreneurship and have knowledge of a wide range of current topics that are important when starting their own business.

3. Assessment

The final mark for the Entrepreneurship course is determined as follows:

Trimester 5 (individual grade):	- Individual Essay Assignments (3 x 7.5% = 22.5%) - Individual In-depth Study (30%)	47.5%
Trimester 5 & 6:	- Participation (5%)	5%
Trimester 6 (group grade):	- Presentation <i>Entrepreneurship Challenge</i> (12.5%) - Process Report <i>Entrepreneurship Challenge</i> (35%)	47.5%

4. Study Load and Time Commitment

Lectures + tutorials:	8 lectures (of 1 ½ hours) and 9 tutorials (of 1 ½ hours)	26 hrs.
Preparation lectures:	200 pages	20 hrs.
Assignments:	A. Individual Essay Assignments	24 hrs.
	B. Individual In-depth Study	26 hrs.
	C. Entrepreneurship Challenge	28 hrs.
	D. Group Report & Group Presentation	16 hrs.
Total	5 ECTS	140 hrs.

5. Support Activities and Support Materials

To support you in writing the essays and carrying out the individual in-depth study, two lectures on writing skills and methodology are planned respectively, namely on [date] from [time] to [time] in [room] and [date] from [time] to [time] in [room]. In addition, Blackboard contains three style guides that provide guidance when working on the essays, the individual in-depth study and the process report. An individual feedback moment for the in-depth study is scheduled for each student on [date]. This session serves to provide students with personalized feedback on their work. We recommend that everyone takes advantage of this opportunity!

6. Learning Objectives Trimester 5

After the lectures, tutorials, and individual in-depth study, the student is able to:

- Explain what entrepreneurship is, what its core elements are, and why entrepreneurship is seen as indispensable in our economy and society;
- Explain the differences and similarities between entrepreneurship and management and between “regular” entrepreneurship, intrapreneurship, and social entrepreneurship in particular;
- Explain the nature, role, and functions of the different types of entrepreneurs and their businesses (“regular” entrepreneurs, intrapreneurs, social entrepreneurs);
- Critically analyze the main reasons and motives underlying starting a new business (“regular”), initiating new activity within an existing business (“intra”), and starting a social enterprise (“social”);

- Participate in discussions in an active and professional manner, and apply literature on topics covered in the course during discussions and assignments;
- On the basis of prescribed literature, produce a well-founded and structured essay that meets the guidelines of academic writing set in this course;
- Carry out qualitative research in the form of in-depth study based on interviews and a self-devised research question with regard to one of the three forms of entrepreneurship discussed.

7. Overview Trimester 5 – Entrepreneurship

Lecture 1	<u>Introduction to entrepreneurship</u>
	- Some Classic Views on Entrepreneurship (van Praag, 1999) - Entrepreneurship as Emancipation (Rindova et al., 2009) - The Promise of Entrepreneurship as a Field of Research (Shane & Venkataraman, 2000)
Tutorial 1	<u>Introduction, explanation of assignments, group formation and Q&A</u>
	– Syllabus
Lecture 2	<u>Entrepreneurial behavior</u>
	- A Proposed Research Model of Entrepreneurial Motivation (Naffziger et al., 1994) - Using Cognitive Theory to Explain Entrepreneurial Risk-Taking: Challenging Conventional Wisdom (Palich & Bagby, 1995) - Opportunity Recognition as Pattern Recognition (Baron, 2006)
Tutorial 2	<u>Entrepreneurial behavior</u>
	- What Makes Entrepreneurs Happy? (Carree & Verheul, 2012) - <i>Hand in hardcopy Essay Assignment 1</i>
Lecture 3	<u>Intrapreneurship</u>
	- Corporate Entrepreneurship and the Pursuit of Competitive Advantage (Covin & Miles, 1999) - Entrepreneurship/Intrapreneurship (Hisrich, 1990) - A Model of Middle-level Managers' Entrepreneurial Behavior (Kuratko, Ireland, Covin & Hornsby, 2005)
Tutorial 3	<u>Intrapreneurship</u>
	- Multilevel Contingencies in the Relationship Between Personal Initiative and Performance of Middle Managers (Glaser et al., 2015) - <i>Hand in hardcopy Essay Assignment 2</i>
Lecture 4	<u>Social Entrepreneurship</u>
	- Social and Commercial Entrepreneurship: Same, Different, or Both? (Austin et al., 2006) - A Typology of Social Entrepreneurs: Motives, Search Processes and Ethical Challenges (Zahra et al., 2009) - Social Enterprises as Hybrid Organizations: A Review and Research Agenda (Doherty et al., 2014)

8. Examination Trimester 5 – Entrepreneurship

Individual Essay Assignments

Based on the prescribed literature of Lectures 2, 3, and 4 and Tutorials 2, 3, and 4, students are expected to write three essays, each based on a film and three related questions. The prescribed literature and the three questions to be answered must be incorporated into an essay based on a (featured) movie and a quote as provided in the syllabus. The purpose of these assignments is to analyze the content of the movie and the quote in order to give meaning to it through literature. Your views must be scientifically substantiated. Each report may contain a maximum of 900 words (excluding bibliography and title page/including in-text references) and must conform to the APA reference style (font Times New Roman 12, justified, and line spacing 1.5). In total, the average of the three reports will determine 22.5% of the final mark.

Tutorial 4	<u>Social Entrepreneurship</u> - The Marketization of the Nonprofit Sector: Civil Society at Risk? (Eikenberry & Kluver, 2004) - Hand in hardcopy Essay Assignment 3
Tutorial 5	<u>"Stay on top" In-depth Study</u> - Handing in Outline Individual In-depth Study

Essay Assignment 1 regarding the literature of Lecture 2 and Tutorial 2

Movie: "The Social Network" – Fincher, 2010 – [date] [room]

Quote: "My goal was never to just create a company. A lot of people misinterpret that, as if I don't care about revenue or profit or any of those things. But what not being "just" a company means to me is building something that actually makes a really big change in the world." —Mark Zuckerberg

The questions to answer:

1. What motivates Mark Zuckerberg to become an entrepreneur?
2. How did pattern recognition contribute to the creation of Facebook?
3. How does Mark Zuckerberg deal with risk taking?

This essay must be uploaded via Blackboard-Turnitin on [date], the day of Tutorial 2 before [time].

Essay Assignment 2 regarding the literature of Lecture 3 & Tutorial 3

Movie: "Jobs" – Stern, 2013 – [date] [room]

Quote: "The Macintosh team was what is commonly known as intrapreneurship; only a few years before the term was coined—a group of people going, in essence, back to the garage, but in a large company." — Steve Jobs

The questions to answer:

1. Which form(s) of corporate entrepreneurship do you see in the film according to Covin and Miles (1999)?
2. What is hindering intrapreneurship within companies like Apple?
3. How can companies encourage intrapreneurship as is the case with the "Macintosh team"?

This essay must be uploaded via Blackboard-Turnitin on [date], the day of Tutorial 3 before [time].

Essay Assignment 3 regarding the literature of Lecture 4 & Seminar 4

Movie: "TONY" – Forrer, 2016 – [date] [room]

Quote: "If you think you're too small to have an impact, try going to bed with a mosquito in the room" – Anita Roddick

The questions to answer:

1. Which type of social entrepreneur do you recognize in Teun van de Keuken?
2. What motivates social entrepreneurs like Teun van de Keuken to do business?
3. What makes Tony's Chocolonely a hybrid company? How is this reflected in the film?

This essay must be uploaded via Blackboard-Turnitin on [date], the day of Tutorial 4 [time].

Individual In-depth Study

The individual in-depth study concerns a further elaboration of one of the three forms of entrepreneurship discussed: “regular” entrepreneurship, intrapreneurship, or social entrepreneurship. In the in-depth study, a research question related to the literature must be formulated, which can be answered with the aid of the prescribed articles, self-selected articles, and a case study. Central to the research is a self-chosen case about an entrepreneur and their company as the object of study in order to further study the phenomenon of regular, internal, or social entrepreneurship. The case serves as an illustration of how the theory is expressed in practice and must be relevant to answering the research question. To collect information for the case study, students are required to interview a “regular” entrepreneur, an intrapreneur, or a social entrepreneur, depending on their topic. Before an entrepreneur may be approached, permission must be obtained from the tutor.

The word count for the report is 3000 ($\pm 10\%$ margin, excluding references/title page, including in-text references) and the report must conform to the APA reference style (Times New Roman 12 font, justified, and line spacing 1.5). The structure of the report should be as follows: *Title Page* (with a selfie of yourself and the entrepreneur), *Introduction* (maximum 300 words), *Literature Review* (minimum 500 words), *Research Method* (maximum 400 words), *Case Description* (maximum 500 words), *Case Analysis* (minimum 500 words), *Conclusion* (maximum 300 words), *References*, and *Appendix* with the interview transcript. In addition to the literature from Lecture 1 and three in-depth articles as prescribed in Attachment 2, three additional self-selected articles from specific academic journals must be used as detailed in Attachment 2. Before [date], the tutor must be asked for permission so that the entrepreneur can be approached. The assignment must be uploaded via Blackboard-Turnitin no later than [date] at [time] and submitted as a hard copy during Tutorial 6.

Participation

Students are expected to participate actively during the tutorials. Participating in discussions and group assignments is therefore required. Please note that any individual contribution will be assessed on quality; after all, quality counts more than quantity. Arguments in discussions or answers to questions should therefore always be substantiated with material from your readings/lectures. To emphasize the professional character of the tutorials, professional behavior will also be included in the assessment, and the tutor will make clear what this means to them. In total, the participation mark will determine 5% of the final mark.

9. Learning Objectives Trimester 6 – Entrepreneurship Challenge

After the lectures, tutorials and the Entrepreneurship Challenge, the student will be able to:

- Develop a business model using the lean start-up method;
- Explain and apply some important aspects of entrepreneurial teams, entrepreneurial marketing, and entrepreneurial finance;
- Explicate how an individual can develop into a (successful) entrepreneur; how to set up a business; and how this company can develop successfully;
- Present their own company or business idea by means of a “Pecha Kucha” presentation.

10. Overview Trimester 6 – Entrepreneurship Challenge

Tutorial 6	<u>“Knowledge Café”</u>
Lecture 5	<u>Entrepreneurial business models</u>

(Continued)

Tutorial 6	<u>"Knowledge Café"</u>
Lecture 5	<u>Entrepreneurial business models</u> - Why the Lean Start-up Changes Everything (Blank, 2013) - Reinventing Your Business Model (Johnson et al., 2008)
Tutorial 7	<u>Ideation workshop</u> - Attendance is extremely important; bring writing materials
Lecture 6	<u>Entrepreneurial teams</u> - Don't Start a Company with your Business School Pals (Fertik, 2013) - Advanced Entrepreneurship: Teaming Up for Success (Robbins, 2010)
Lecture 7	<u>Entrepreneurial marketing</u> - What Entrepreneurs Get Wrong (Onyemah et al., 2013) - Traditional Marketing Planning Is Wrong for Your New Venture (Whalen & Holloway, 2012)
Lecture 8	<u>Entrepreneurial finance</u> - Bootstrap Finance: The Art of Start-ups (Bhide, 1992) - What do Investors Look for in a Business Plan? (Mason & Stark, 2004)
Tutorial 8	<u>Elevator pitch workshop & update Entrepreneurship Challenge</u> - Pitch preparations - Update Entrepreneurship Challenge
Tutorial 9	<u>Entrepreneurship Challenge</u> - Presentation Entrepreneurship Challenge
Finals	<u>Entrepreneurship Challenge</u> - The three best groups will compete against each other in the finals

11. Examination Trimester 6 – Entrepreneurship Challenge

Divided into groups of three to four students, each team receives €5 starting capital with the goal to generate as much profit as possible within five weeks with their chosen business idea. The challenge is to (1) work creatively, (2) arrive at an innovative business model based on the lean start-up method, (3) actively apply knowledge from the literature, and (4) ultimately, achieve the highest profit among the cohort. The three most profitable teams will have the chance to compete in the finals of the Entrepreneurship Challenge for eternal glory and a great prize! An additional reason to perform well is that the total proceeds from the Entrepreneurship Challenge will be donated to a local charity chosen by the students.

Presentation Entrepreneurship Challenge

During Tutorial 9, all teams must employ a Pecha Kucha presentation in order to present the process report in a creative way and to announce their end result. A strict requirement is the use of a PowerPoint presentation consisting of 20 images, where each image must be shown for exactly 20 seconds. This means that the total presentation cannot exceed 6 minutes and 40 seconds. The presentation will be judged on presentation skills (including timing) and content, which will need to be linked to the lean start-up method. The presentation determines 12.5% of the final mark and must be emailed to the tutor before the start of Tutorial 9 on [date] before [time].

Process Report Entrepreneurship Challenge

Each team must provide a process report of 3500 words ($\pm 10\%$, excluding references/title page/ appendix, including in-text references) in which *The Idea* (maximum 500 words) is introduced, the *Realization of the Idea* (minimum 750 words) is described, the *Business Model* (minimum

500 words) is mapped out and the application of the *Lean Start-up Method* (minimum 750 words) is described from the emergence of the business idea to the final *Result*. Groups are supposed to describe how the idea was conceived and how the group gave substance to the implementation of the idea. It is important that the group reflects on this process, describes adjustments to the business model, and links it all back to the literature. In particular, Trimester 6 literature should be referenced and a *Title Page*, *Introduction* (maximum 300 words), *Conclusion* (maximum 300 words), *Bibliography* and *Appendix* with an income statement, proof of purchase for costs incurred, and an individual reflection (250 words) for each group member is required. The profit achieved from the Entrepreneurship Challenge will determine 30% of the 35% fraction of the mark. In total, the Process Report determines 35% of the final mark and must be submitted via Turnitin on [date] before [time].

Finals Entrepreneurship Challenge

During the finals of the Entrepreneurship Challenge, the three most profitable groups will automatically compete for the Entrepreneurship Challenge Award. In addition, the tutors will offer a wildcard to the most innovative group chosen by the tutors. The four groups will compete against each other on [date] from [time] to [time] by presenting their Pecha Kucha pitches in front of an expert jury. The winning group chosen by the jury will be awarded the prestigious Entrepreneurship Challenge Award and will also receive a nice prize. In addition to the pitches, renowned entrepreneurs will share their story with the public and drinks will be held at the end of the afternoon to celebrate the success of all students. Participation in the closing event is free of charge and everyone is welcome! In short, it promises to be a festive conclusion to the course.

Attachment1 – Reference List, Entrepreneurship Course

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Attachment 2 – Reference List, Individual In-depth Study

Depending on whether students choose regular entrepreneurship, internal entrepreneurship or social entrepreneurship for their individual in-depth study, the following three subject-related articles should be used:

“Regular” Entrepreneurship

- Exploring start-up event sequences (Carter et al., 1996)
- Initial human and financial capital as predictors of new venture performance (Cooper, Gemino-Gascon & Woo, 1994)
- Novice, portfolio and serial founders: Are they different? (Westhead & Wright, 1998)

Intrapreneurship

- A competency based framework for promoting corporate entrepreneurship (Hayton & Kelley, 2006)
- The politics of innovation: Realizing the value of intrapreneurs (Dovey & McCabe, 2014)
- Intrapreneurship in large firms and SMEs: A comparative study (Carrier, 1994)

Social Entrepreneurship

- Entrepreneurial processes in social contexts: How are they different if at all? (Lumpkin et al., 2013)
- A positive theory of social entrepreneurship (Santos, 2012)
- Venturing for others with heart and head: How compassion encourages social entrepreneurship (Miller et al., 2012)

NB: The three self-selected articles must be from one of the following journals: *Administrative Science Quarterly*, *Academy of Management Journal*, *Academy of Management Review*, *Entrepreneurship Theory and Practice*, *Journal of Business Venturing*, *Small Business Economics*, *Journal of Small Business Management*, *Research Policy*, *Strategic Entrepreneurship Journal*, *Strategic Management Journal*, *Journal of Strategic Management*, *Organization Science of Organization Studies*.

Appendix B. Entrepreneurial behavior measure

Have you ... (yes/no)

1. Spent a lot of time thinking about starting a business?
2. Organized a start-up team?
3. Defined market opportunities?
4. Prepared a business plan?
5. Selected a business name?

6. Saved money to invest in a business?
7. Created a legal entity?
8. Registered with the tax authorities?
9. Invested your own money in a business?
10. Required and received financial support?
11. Searched for facilities and equipment?
12. Purchased or leased major items, like equipment, facilities, or property?
13. Purchased raw materials, inventory, or supply?
14. Developed models or procedures for a product/service?
15. Started marketing or promotional activities?
16. Devoted full-time to the business?
17. Applied for licenses or patents?
18. Hired employees?

Items 1 to 6 denote Initiating Entrepreneurial Behavior.

Items 7 to 18 denote Engaging in Entrepreneurial Behavior.