ONLINE-BASED ENTREPRENEURSHIP EDUCATION - ITS ROLE AND EFFECTS: A RANDOMISED CONTROLLED TRIAL ABOUT THE EFFECTS OF AN ONLINE ENTREPRENEURSHIP PROGRAMME BASED ON ROLE MODELS

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ABSTRACT

The purpose of this paper is to analyse the effects of an online-based entrepreneurship programme. A randomised controlled trial has been performed in which 580 randomly selected pupils (aged 14-15) have been randomly assigned to participate in online programmes that focus either on entrepreneurship or on environmental issues. The analysis builds on responses collected before, directly after, and one year after the intervention. The short-term results show that the programme focusing on entrepreneurship had a significantly positive influence on the participants' entrepreneurial intentions, venture creation self-efficacy, entrepreneurial attitudes and perceived knowledge about entrepreneurship. One year after the intervention, the differences between the groups were smaller, but the pupils in the experiment group still had, relative to the control group, significantly higher perceived entrepreneurial knowledge, and significantly more positive attitudes towards entrepreneurship. The influence which the pupils' prior experience with entrepreneurship had on the programmes' effectiveness was limited. This implies that the programme has a significant influence on the participants which goes beyond just increasing their familiarity with the topic. The online programme did not, however, significantly influence the participants' self-efficacy concerning enterprising competences. An analysis of how the participants perceived that the educational focus in their normal education had changed, with regard to teaching focusing on creativity and value creation, demonstrated that this type of education can be an efficient way to foster enterprising self-efficacy.

Keywords: Entrepreneurship Education, Online Education, RCT, Programme Evaluation, Entrepreneurial Role Models, COVID-19.

JEL-Codes: A2, C9

INTRODUCTION

Entrepreneurial skills and attitudes have become increasingly sought-after attributes in today's labour market (Frese et al., 2014; Hannon, 2006; Kyari, 2020), and, to efficiently foster these skills, it has become increasingly popular to focus on lower levels of education since educational interventions are most efficient at an early stage (Chetty et al., 2011; Cunha & Heckman, 2007; Obschonka et al., 2010). However, implementing entrepreneurship education at lower educational levels has been found to be challenging since pupils at this level are viewed as not having reached a sufficient maturity level to engage in entrepreneurial endeavors (Lackeus, 2016). Many teachers are also unfamiliar with the topic (Jones & Iredale, 2010). Nevertheless,

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recent studies have demonstrated that entrepreneurship education can have a significantly positive influence on secondary level students' entrepreneurial activities (Elert et al., 2015; Peterman & Kennedy, 2003; Streicher et al., 2019), and that it can even significantly influence primary level students' perceived entrepreneurial competences (Huber et al., 2014).

In order for entrepreneurship education to be implemented broadly at the lower levels of education, it is important to address challenges with teachers' low level of familiarity with the topic. One potential solution to this is online education. Due to the widespread digitalization, it is today possible to provide high quality lectures by leading experts and tailored role models (Bergman et al., 2012). The COVID-19 pandemic has also demonstrated the immense importance of having the capacity and flexibility to shift to distance education (e.g. Krishnamurthy, 2020; Liguori & Winkler, 2020; Marshall & Wolanskyj-Spinner, 2020; Ratten & Jones, 2020). Meta-studies of online education conclude that it can be at least as effective as in-class education (Bernard et al., 2004, 2009; Means et al., 2010; Nguyen, 2015). However, when it comes to online-based entrepreneurship education, our knowledge about its effectiveness is very limited (Eesley & Wu, 2017; Liguori & Winkler, 2020; Ratten & Jones, 2020).

In order to further our understanding about the influence of online-based entrepreneurship education, we designed a randomized controlled trial (RCT). The entrepreneurship programme's main focus was on entrepreneurial role models. It also included assignments where the participants were asked to reflect on their interests, ambitions, competences, and network, and to relate these to the role models' presentations. The trial included 580 randomly selected Danish pupils at lower secondary level (age 14-15 at the start of the experiment). The sample was randomly divided into two groups. One group was provided the online-based entrepreneurship programme (treatment group), the other was provided an online-based educational programme focusing on environmental issues (control group). Both programmes were designed to be accessed in an asynchronous manner and took approximately 3-5 hours to complete. In order to assess the effect, a questionnaire that included measures of entrepreneurial self-efficacy, attitudes and intentions, was distributed before and after the educational intervention. In order to also assess the longitudinal effects, the data collection was repeated one year after participation in the programme.

The study advances our knowledge in at least two ways. By applying a rigorous RCT method we demonstrate that online-based entrepreneurship education can have a significant influence on young pupils' entrepreneurial attitudes and career ambitions, even when the scope of the programme is limited and the content is asynchronous. Our focus on how the participants experience their normal school education, and how they perceive that it has changed between the baseline and the endline assessments, also makes it possible for us to analyze how teacher-led entrepreneurship education influence the participants' ESE and other entrepreneurial outcomes. The COVID-19 pandemic has demonstrated the importance of furthering our knowledge about online-based approaches to entrepreneurship education. By comparing online-based and teacher-led entrepreneurship education we can illustrate both its strengths and its weaknesses.

The article is divided into seven sections. It starts with a presentation of the theoretical background and then moves on to a presentation of the programme design and the hypotheses. This is followed by a presentation of the methodology and the experimental design. The analysis is divided into two parts: experimental findings and additional tests. The results of the analysis are then discussed and compared to the initial hypotheses. The article ends with a discussion of the studies' limitations and suggestions for further research.

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THEORETICAL BACKGROUND

The theoretical background is mainly based on theories about identity formation (e.g. Ibarra, 1999; Marcus & Nurius, 1986; Yost, Strube & Bailey, 1992) and socialization (e.g. Foote, 1951; Kram, 1988; Van Maanen & Schein, 1979). Social learning theory (Bandura 1971a,b, 1977), with its focus on explaining how individuals learn by observing and engaging in social activities, covers both of these processes (Günzel-Jensen et al., 2017), and it has played a prominent role within the field of entrepreneurship education (Krueger, 2009). The focus on creating and enacting new value creation has also given the field a strong alignment with sense-making theory (Weick, 1995) with its prime example being effectual theory (Sarasvathy, 2001, 2008). The combination of social learning theory and effectual theory is thus a natural theoretical foundation for our study of entrepreneurial role models' influence.

The framework is complemented with intention theories (Ajzen 1991, 2002; Lent et al., 2000) and studies of online and distance education (Bernard et al., 2004, 2009; Means et al., 2010). In the following, our theoretical framework is presented. This is followed by a description of the programme and how it was designed based on this theoretical framework. The section ends with a presentation of five hypotheses about the expected effects of the programme.

Socialisation and Role Models

Multiple studies have shown that children of self-employed parents are more likely than others to pursue a career as self-employed (e.g. Dunn & Holtz-Eakin, 2000; Dyer, 1994; Fairlie & Robb 2007; Hout, 1984; Hout & Rosen, 2000; Laspita et al., 2012; Lentz & Laband 1983, 1990; Matthews & Moser, 1996; Scherer et al., 1989; Scott & Twomey, 1988). These studies show that it is mainly through socialisation and transfer of preferences that parents influence their children (Fairlie & Robb, 2007; Hoffmann & Junge, 2013; Hoffmann et al., 2014; Lindquist et al., 2015). This indicates that entrepreneurial role models can have a strong influence on young individuals' career preferences (Van Auken et al., 2006a; Van Auken et al., 2006b).

Social learning theory (Bandura 1971a,b, 1977) has greatly influenced studies of role models and socialisation since it acknowledged the importance of learning by observing others' behaviour, that is, learning vicariously. This can be viewed as especially important to entrepreneurship education, since venture creation and self-employment are perceived as risky behaviour by many (Gunzel-Jensen et al., 2015). By observing others successfully performing this behaviour, defensive and fearful thought processes can be overcome (Wilson et al., 2007). Although the consensus in the field of entrepreneurship education is that it should be action-oriented, many researchers acknowledge the importance of providing students with examples of successful role models (e.g. Bechthold & Huber, 2018; Fiet, 2000a,b; Kirby, 1992, 2004; Soutaris et al., 2007). Entrepreneurial role models have been found to positively influence both perceived feasibility and desirability for entrepreneurship (Krueger & Brazeal, 1994; Krueger et al., 2000).

In a seminal paper about provisional selves and identity formation, Ibarra (1999) states that situational influences and individual influences in tandem decide individuals' adaption repertoires when constructing possible future selves. When using role models in education, it is thus important that they focus not only on the task itself, but also on how it influences them as individuals. According to effectuation theory, entrepreneurs, to a large extent, also effectuate new value through their personal resources and the means they have at hand. It is thus also important to focus on how the individual influences the situational (Sarasvathy, 2001, 2008).

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This underlines the importance of having the role models discuss why they found their venture idea to suit them specifically, and how they realized it based on the means they had at hand. This focus on the personal resources, and how they both influence the situational and are influenced by the situational, opens up for potential role-prototyping and identity-matching when engaging with role models, if ample opportunities for reflection and iteration are provided (Ibarra, 1999).

Intention Models

The majority of the assessment studies of entrepreneurship education have focused on assessing the influence it has on participants' entrepreneurial intentions (Nabi et al., 2016). The dominating theoretical foundation is Ajzen's (1991) Theory of Planned Behaviour (Krueger, 2009) and Lent et al., (2000) Social Cognitive Career Theory (Vanevenhoven & Liguori, 2013). The focus of these theories is on desirability (attitudes and social norms) and perceived feasibility (self-efficacy and controllability) (Krueger, 2009; Vanevenhoven & Liguori, 2013). In the field of entrepreneurship education, the focus has been on how educational initiatives alter entrepreneurial intentions by influencing the participants' entrepreneurial attitudes and entrepreneurial self-efficacy (e.g. Barbosa et al., 2007; Bechthold & Huber, 2018; Bazzy et al., 2019; Chen et al., 1998; Contreras et al., 2020; Florin et al., 2007; Mueller & Goic, 2003; Letsoalo & Rankhumise, 2020; Segal et al., 2002; Soutaris et al., 2007; Wilson et al., 2007; Zhao et al., 2005). The link to social learning theory is thus strong, and self-efficacy has been a natural part in models of entrepreneurial intentions since the early nineties (Boyd & Vozikis, 1994; Krueger & Brazeal, 1994).

Distance and Online Education

Based on multiple meta-studies, and even second-order meta-studies, the consensus today is that distance and online education is at least as effective as traditional education (Lack, 2013; Nguyen, 2015; Russel, 1999), or slightly more effective (Bernard et al., 2004, 2009; Means et al., 2010). The COVID-19 pandemic has, however, demonstrated that it can be difficult to reach certain groups (Bacher-Hicks et al., 2020; Dorn et al., 2020; García & Weiss, 2020). Bernard with colleagues (2009) found that one key component that to a large extent determined the effectiveness of distance and online education was its level of interaction. This explains why there has been so much focus on engagement techniques during the COVID-19 pandemic (Krishnamurthy, 2020). Moore (1989) proposed that this interaction could be between: 1) Participants, 2) Participants and educators, or 3) Participants and content.

Bernard with colleagues (2009) found that the programmes with the most positive effects where those with high levels of participant-participant interaction or participant-content interaction. This result indicates that the educator plays a minor role in this type of education. However, according to Anderson (2003a,b), the type of interaction does not matter as long as one of the three forms is at a high level. It should also be noted that one of the clearest findings in meta-analyses focusing on assessment studies of technology-aided learning is that it is more effective when it is used as "*support for instruction*" rather than "*direct instruction*" (Schmid et al., 2009; Tamim et al., 2011).

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The Programme Design

We based the design of our programme on effectual theory (Sarasvathy, 2001, 2008) because it has a strong focus on identity and socialization. We did, however, limit the focus on action and iteration because we were worried about high attrition rates. Instead the focus was on reflective and introspective assignments. For the same reasons we did not include any interaction between participants but instead focused on a high level of interaction with the content. The focus of the assignments was on altering the participants' conception of their available resources and competences, and how these could be used to create value through entrepreneurial activities. The goal of the programme was also to have the participants reflect on which careers aligned with their interests, passions and goals.

The starting point in effectual theory is to ask yourself who you are, what you know and whom you know (Sarasvathy, 2004, 2008). This aligns well with identity theory, which emphasizes that role prototyping and identity matching are most effective when performed in tandem with reflection on personal competences and interests (Ibarra, 1999; Jain et al., 2009). The goal of the role prototyping is to come up with qualities you want others to ascribe to you (Van Maanen & Schein, 1979) and at the same time remain true to yourself (Ibarra, 1999) and your internal audience (Merton, 1968). It is thus important that the students are provided with relatable role models (Bechthold & Huber, 2018; Bosma et al., 2012). However, the students should also be provided with opportunities to reflect on their own lifeworld and how their own interests, competences and convictions relate to the role model.

With this in mind we thus designed four thematic educational sessions and provided the students with assignments in which they were asked to reflect on:

1. Who they are, i.e. which competences and interests they have;
2. Whom they know, i.e. their close and extended network and which resources this network can provide;
3. Who they want to become, i.e. which goals and dreams they have, in which degree these align with their passion and interests, and how they can use their competences and network to reach their goals.

The sessions had the following four themes: Dreams, Network, Passion and Goals. Each session took about one hour to complete. The students started with a short instruction movie that introduced the theme of the session and what they should pay attention to when watching the interview with the role model(s). The role model(s) presented a personal story that addressed one of the four themes. This was followed up with an assignment. When working with "*Dreams*", the participants were asked to make a road map and identify means to reach their dreams and which barriers to overcome. When working with "*Network*", they were asked to specify their relationship to different professionals on a list, for instance an accountant, a blogger, a chef, etc. The participants were then asked to consider whether they knew people who might have access to individuals within these professions. In the session about "*Passion*", they were asked to list their interests and which factors they found motivating about these interests. They were then asked to list jobs that allowed them to work with these motivational factors, and, based on this, asked to identify their dream job. In the final session about "*Goals*", the participants were asked to combine all these exercises and list their goals as well as consider how well their interests and competences aligned with their main goals. They were asked to pay special attention to where their competences and interests would overlap. Finally, they were asked to list available contacts in their network and to find out which contacts they would need to establish in order to reach the goal they had set for themselves.

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Since it is important that the role models are relatable, we used predominantly young entrepreneurs. In three of the sessions, the entrepreneurs were in their early twenties. However, in order to also convey the story of a more experienced entrepreneur, we included a role model who was in his late forties. We included three males and three females. Two of the males and two of the females had started their venture together.

In order to control for factors such as being rewarded for participating in the experiment, the observer effect and other elements important to learning, such as reflection and commitment, we designed an online programme for the control group. The same amount of time and effort was required to complete this programme. It included documentaries about the history of asbestos, the use of lead as a medium in gasoline, and how the use of Freon has affected the ozone layer. To counterweight these themes, we also included a documentary about how a Danish researcher perceives that he has been silenced by the research community since he is questioning whether the increased amount of CO_2 is responsible for climate change or whether the climate change has natural explanations. In this programme the participants were asked factual questions about the content.

HYPOTHESES

We decided to focus on outcomes that can be assessed in the short term, but which have an influence on behaviours in the long term. Task-specific self-efficacy (Bandura, 1997) and attitudes towards a specific activity have been demonstrated to play an important role in deciding individuals' future career choices through its influence on intentions (Ajzen, 1991). We thus decided to focus on assessing how the programme influenced the participants' entrepreneurial self-efficacy (ESE), entrepreneurial attitudes, and intentions to pursue a career as self-employed. Entrepreneurship does however include a broad scope of activities, and in order to mirror this, ESE should be assessed as a multidimensional construct (McGee et al., 2009; Moberg, 2014). We thus assessed the influence the programme had on both venture creation self-efficacy as well as self-efficacy in more generic terms and enterprise-oriented competence domains such as creativity and managing uncertainty. In the following, five hypotheses about the programme are presented.

Expected Influence of the Programme

Bosma with colleagues (2012) have divided the functions role models play into four interrelated categories:

i. inspiration and motivation,
ii. increasing self-efficacy,
iii. learning by example, and
iv. learning by support.

The first three can be performed by role models in a simple asynchronous online format, whereas the fourth requires interaction. It can thus be anticipated that, by just presenting entrepreneurship as a personally rewarding activity and as creating awareness for self-employment as a career option, entrepreneurial role models will influence the participants' attitudes towards entrepreneurship. If this is amplified by having the participants reflect on their

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interests and how these relate to the activities and lifeworld of the role model, it can be expected that their attitudes towards the behaviour will become more positive. Our first hypothesis is thus:

H1: Participation in a role model-focused online programme in entrepreneurship leads to more positive entrepreneurial attitudes.

According to the review by Mwasiblia (2010), there is consensus among researchers within the field of entrepreneurship education that generic knowledge about entrepreneurship can effectively be transferred through passive teaching methods. Many in the participants' age group have very limited experience with entrepreneurship and knowledge about the process. It can thus be anticipated that by just being exposed to entrepreneurial role models and listening to their stories about how they created their ventures, the participants' knowledge about entrepreneurship will increase. Our second hypothesis is thus the following:

H2: Participation in a role model-focused online programme in entrepreneurship leads to a higher level of perceived knowledge about entrepreneurship.

According to Bandura (1997), it is mainly through mastery experience that domain-specific self-efficacy is fostered. However, by observing others successfully engaging in an activity, learners can become inspired and less hesitant to engage in a similar behaviour, even if they initially viewed this behaviour as risky and uncertain (Bandura 1971a,b). Prior studies have shown that role models can have a positive influence on entrepreneurial self-efficacy through vicarious learning (BarNir et al., 2011; Bosma et al., 2012; Souitaris et al., 2007). By watching a presentation of an inspirational achievement and then reflecting on personal competences and interests, the participants in the programme are provided with an opportunity to re-evaluate their competences. The presentations by the entrepreneurs focused on demystifying entrepreneurship and on presenting it in a mundane and relatable manner. It is thus expected that most of the participants will discover that they too have many of the competences necessary to, not only start up a new venture, but also successfully pursue a career as entrepreneur. Our third and fourth hypotheses are thus the following:

H3: Participation in a role model-focused online programme in entrepreneurship has a positive effect on entrepreneurial self-efficacy defined as perceived confidence in Venture creation skills.

H4: Participation in a role model-focused online programme in entrepreneurship has a positive effect on enterprising self-efficacy defined as perceived confidence in Creative skills, Planning skills, Marshalling skills, and managing ambiguity skills.

Attitudes and self-efficacy are important antecedents to intentions (Ajzen 1991, 2002). Since we anticipate that participation in the online programme will have a positive influence on these variables, we also expect, as a logical consequence of this, that participation in the programme will have a positive influence on the participants' entrepreneurial intentions. Our fifth hypothesis is thus the following:

H5: Participation in a role model-focused online programme in entrepreneurship leads to stronger entrepreneurial intentions.

RESEARCH DESIGN

The experimental design was approved by the Danish Data Protection Agency by the end of June 2015, and in September the addresses of 3,000 randomly selected Danish children born in 2000 were retrieved from the Danish Serum Institute. Invitations to participate in the experiment were sent out in the beginning of October. Since the age of the participants was 14-

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15, the invitations were sent to their parents. The invitation letter included information about the experiment, how to participate, and the different reward levels for participating in the study. In order to incentivize participation in the experiment, the participants were rewarded a cinema ticket if they replied to the questionnaire. In order to mitigate high levels of attrition, it was decided that the reward for completion should be twice as high. The participants received a guarantee that their responses would be anonymous and used for research purposes only. A link to the survey was provided in the invitation. We used Survey monkey as our data collection tool.

Out of the 3,000 invited children, 591 agreed to participate in the experiment. In total, 580 of the participants provided completed questionnaires. The respondents were divided at random into treatment and control groups. The randomization was segmented in gender (male/female) and age (14/15). This was done by including all respondents of a certain age (14 or 15) and gender (male or female) in an Excel sheet. The respondents' row number in the sheet was based on the order in which they replied to the questionnaire, that is, according to the time at which they were allocated an identification number by Survey monkey. All respondents in rows with uneven numbers were assigned to the treatment group; and all respondent in rows with even numbers to the control group.

A follow-up questionnaire was sent via email to all participants in November 2015, after the educational programme was finished. Three reminders were sent in order to increase the response rate. Of the 580 respondents who participated in the educational programme, 366 completed follow-up questionnaires were collected (time 0,1). An endline questionnaire was sent to the participants in October 2016. In this round, 366 completed questionnaires were retrieved from pupils that had participated in the educational programmes. Out of these 366 endline responses, 269 had replied to both the baseline and the follow-up questionnaires (time 0,1,2), whereas the other 97 respondents had only replied to the baseline questionnaire (time 0,2). An overview of the sample is presented in Table 1.

Table 1
OVERVIEW OF MATCH RESPONSES FOR BASELINE, FOLLOW-UP AND ENDLINE QUESTIONNAIRES

Overview of the data	Number of respondents
Initial random sample	**3,000**
Accepted to participate in the study	**591**
Randomly divided into Treatment group	*295*
Randomly divided into Control group	*296*
Completed baseline questionnaire (time 0)	**580**
- *Treatment group*	*288*
- *Control group*	*292*
Completed baseline and follow-up questionnaire (time 0,1)	**366**
- *Treatment group*	*184*
- *Control group*	*182*
Completed baseline, follow-up and endline questionnaire (time 0,1,2)	**269**
- *Treatment group*	*139*
- *Control group*	*130*
Completed baseline and endline questionnaire (time 0,2)	**366**
- *Treatment group*	188
- *Control group*	178

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Measurement Tool

The questionnaire we used is based on the ASTEE assessment tool (Moberg et al., 2014). This is an assessment tool that has been tested and validated in 13 European countries. However, we adapted the questionnaire to the specific study and added some measures. The focus of the questionnaire was: entrepreneurial attributes, educational focus, and demographic variables.

The majority of the entrepreneurial attributes measure focuses on entrepreneurial self-efficacy (ESE). In this questionnaire, ESE is divided into five constructs that measure the respondents' confidence in performing enterprising skills such as creativity, resource marshaling, managing uncertainty, and planning. In order to limit the jargon-bias, the items of these four constructs do not include any references to entrepreneurship or business management. The fifth ESE construct is more specific in its focus on entrepreneurship, as it is a measure of venture creation self-efficacy, that is, whether the respondent feels confident in his/her ability to establish new organizations and pursue a career as self-employed. In addition to the five ESE constructs, the questionnaire also includes constructs that measure entrepreneurial intentions, entrepreneurial attitudes and perceived entrepreneurial knowledge. Two constructs measure to what degree the respondents perceived that there had been a focus on business-oriented skills and enterprise skills in their education.

Each of the measures includes three items which are assessed on Likert scales ranging from 1 to 7 (1=strongly disagree, 7=strongly agree). The measures demonstrated sufficiently high internal consistency and had similar Cronbach's alpha values in all the time periods for participants in both the treatment group and the control group. All had Cronbach's alpha values above 0.70, which is commonly identified as the threshold value (Nunnally, 1978). The complete set of measures used in the analysis, and their Cronbach's alpha values, can be found in the Appendix.

ANALYSIS

In order to assess whether the randomization had resulted in groups with similar characteristics, we tested whether there were any significant differences in five demographical variables:

1. Gender,
2. Ethnic background,
3. Educational background of the family,
4. Socioeconomic background of the family, and
5. Geographical location.

Since familiarity with entrepreneurship can influence the effects of the programme, we assessed this with two measures: "*Experience with entrepreneurial activities in the past"* and *"Entrepreneurial interest among friends*". In addition to the demographical variables, we also tested whether there were any differences between the groups concerning their baseline levels of the variables in the analysis. The groups only differed significantly in one variable. Compared to the treatment group, significantly more respondents in the control group perceived that their family income was below average. However, given the limited number of respondents who selected this response option (15 in the treatment group, 28 in the control group), the influence of

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this variable on the results can be considered as limited. The results of the analysis are presented in the Appendix.

Difference-in-Difference Analysis

We used difference-in-difference (DiD) analysis to assess the influence of the programme. By subtracting the respondents' baseline values from their follow-up values, we created their short-term difference scores, that is, how the respondents had changed in the variables directly after participation in the experiment. We did the same when calculating their long-term difference scores, but this time we subtracted the respondents' baseline values from their endline values. In order to assess the influence of the entrepreneurship programme, we coded it as a binary variable (treatment=1, Control=0). It was then regressed on the respondents' difference scores. In order to control for ceiling effects, we also included the respondents' baseline values in the regression. The results of the analyses of the programme's short and long-term effects are presented in Table 2. In order to ease the interpretation, the data was standardized (mean=0, standard deviation=1).

Table 2
DIFFERENCE-IN-DIFFERENCE ANALYSIS FOR BASELINE-FOLLOW-UP AND BASELINE-ENDLINE.

	Baseline-Follow up (n=366)			**Baseline-Endline (n=269)**		
Difference in ATTITUDES (H1)	**Coef.**	**Std.Err**	**P-value**	**Coef.**	**Std.Err**	**P-value**
Treatment	0.241	0.098	0.014	0.205	0.099	0.039
Baseline	-0.365	0.050	0.000	-0.466	0.052	0.000
Difference in ENT.KNOWLEDGE (H2)						
Treatment	0.738	0.085	0.000	0.337	0.092	0.002
Baseline	-0.448	0.042	0.000	-0.465	0.054	0.000
Difference in STARTUP SELF-EFFICACY (H3)						
Treatment	0.305	0.092	0.001	0.238	0.162	0.143
Baseline	-0.406	0.041	0.000	-0.447	0.045	0.000
Difference in GENERAL ENT. SELF-EFFICACY (H4)						
Treatment	0.058	0.096	0.545	0.052	0.092	0.528
Baseline	-0.409	0.049	0.000	-0.475	0.047	0.000
Difference in ENT. INTENTIONS (H5)						
Treatment	0.276	0.100	0.006	0.186	0.105	0.076
Baseline	-0.276	0.048	0.000	-0.381	0.051	0.000
**The results are based on standardised data (mean=0, standard deviation=1)*						

As we can see, the results demonstrate clear support for two of the hypotheses (H1 and H2). Participants in the treatment group perceive that they have higher levels of entrepreneurial knowledge and more positive attitudes towards entrepreneurship, not only immediately after the programme, but also a year after the programme has been completed. With regard to "*Start-up self-efficacy*" (H3) and "*Entrepreneurial intentions*" (H5), the results demonstrate only partial support since the significant differences between the groups, which are present directly after the programme, become insignificant a year after. This may, however, also be due to the small sample size in the endline test. The only hypothesis that the results completely fail to support is H4. There are no significant differences between the groups with regard to their general enterprising self-efficacy. Since this construct includes four individual competences, we also

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performed the analysis on each of them separately. Neither of them demonstrated any significant differences between the groups. The results of this analysis are presented in the Appendix.

Non-Response Bias Tests

Since the attrition rate was between 27% and 37% in the follow-up and in the endline questionnaires, it is important to assess whether it was a specific type of respondents who left the experiment, and whether there were any significant difference between the treatment group and the control group. We also performed non-response tests on the initial sample to assess whether the 580 participants differed significantly from the 3,000 individuals who were contacted. These tests were based on the respondents' gender, age and geographical location. There were significantly more females who chose to participate in the experiment. This is a common problem in studies with voluntary participation and can be viewed as problematic, since boys and girls tend to engage differently in educational assignments (Wentzel & Brophy, 2014), especially when the focus is on entrepreneurship (Wilson et al., 2007). Since we used segmented randomization to assign the participants to the two programmes, this should not influence the internal validity.

With regard to differences between respondents and non-respondents for the sample as a whole, significantly fewer boys replied to the endline survey. There is also a significantly higher drop-out rate in the follow-up survey of participants who perceive that there has been a high focus on business education in their education.

When it comes to differences concerning drop-outs in the two programmes, the only significant variable was age. In the control group, significantly more 14-year-old participants dropped out (35 out of 110 in the control compared to 20 out of 104 in the treatment group). The results of these analyses are presented in the Appendix Tables A1-A8.

Possible Interaction Effects

Since the non-response bias tests demonstrated a significant difference between individuals who stayed in the experiment and individuals who dropped out in regard to gender, age and focus on business education, it is important to test whether this leads to biased results. We therefore tested whether these variables interacted with the educational programmes. We also extended these tests to include variables of prior experience with entrepreneurship in different forms, since entrepreneurship is something that is expected to be unfamiliar to most pupils of this age group. It is therefore likely that the results we saw in Table 2 are simply the results of participants' increased familiarity with the concept per se rather than the results of actual learning. Interaction effects of the following four measures of prior experience with entrepreneurship were thus tested:

1. Prior focus on enterprising education,
2. Prior focus on business education,
3. Prior participation in activities focusing on entrepreneurship, and
4. Friends' interest in entrepreneurship.

The two former measures were each assessed by three items. The third measure was assessed by "*Yes/No/Don't know*" and recoded as a dummy where Yes=1. The fourth measure was a single item assessed on a range from 1 to 7. Since prior research has demonstrated that

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males and females react differently to entrepreneurship education (Beckthold & Huber, 2018; Lyons & Zhang, 2018; Moberg et al., 2018; Wilson et al., 2007), we included gender in the interaction analyses where prior experience with entrepreneurship was tested. The age of the participants was tested separately in order not to overload the analysis.

The only significant interaction effect we could identify was that participants who, prior to participation in the entrepreneurship programme, perceived that they had experienced a high level of focus on enterprising education, developed less positive attitudes towards entrepreneurship in the short term. There are many possible explanations for this, but since the effect was not present in the long term, and no other interaction effects could be identified, the probable explanation is that the effect is spurious, i.e. a result of the sheer number of tests that have been performed. In the Appendix the results of these analyses are presented.

The Influence of Teacher-Led Education in Entrepreneurship

The results of our analyses demonstrate that the online-based entrepreneurship programme has a significantly positive influence on the participants' entrepreneurial attitudes, perceived entrepreneurial knowledge, start-up self-efficacy, and entrepreneurial intentions in the short term, and that the effect on entrepreneurial attitudes and perceived entrepreneurial knowledge also remained in the long term. It was moreover demonstrated that prior experience with entrepreneurship did not significantly influence the results. However, with regard to enterprising self-efficacy the programme did not have a significant effect.

Even though the majority of programme evaluations within the field of entrepreneurship education have focused on entrepreneurial intentions (see Nabi et al., 2016), the benefit of embedding entrepreneurship education broadly in the education system is often proposed to be its influence on non-cognitive entrepreneurial competences, which are important in the labour market today (see Bacigalupo et al., 2016). Some prior studies of teacher-led entrepreneurship programmes have demonstrated that entrepreneurship education also has a positive influence on participants' enterprising skills (e.g. Elert et al., 2015; Huber et al., 2014). Whether this is the case for our sample as well would be interesting to assess. Since we included measures of the participants' perception of focus on business education or enterprising education in their ordinary education, both in the baseline and in the endline questionnaires, it was possible to use these as proxies for teacher-led entrepreneurship education. In order to assess the influence of teacher-led entrepreneurship education, change-score variables for the constructs "*focus on enterprising education"* and *"focus on business education*" were constructed and regressed on the five dependent variables. The variables "*friends' interest in entrepreneurship*" and "*prior participation in activities focusing on entrepreneurship*", which were assessed at the baseline, were also included in these analyses together with the respondents' baseline values in the dependent variables as well as their gender. The analyses were performed on participants in the experiment who had responded to baseline, follow-up and endline questionnaires (n=269), but also on participants who had only responded to the baseline and the endline questionnaires (n=366). In order to ease the interpretation, the data was standardized. In Table 3 the results of these tests are presented.

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Table 3 THE INFLUENCE OF DIFFERENT VERSIONS OF TEACHER-LED ENTREPRENEURSHIP EDUCATION						
	Pre-Post (n=269)			Pre-Post (n=366)		
Difference in ATTITUDES	**Coef.**	**Std.Err**	**P-value**	**Coef.**	**Std.Err**	**P-value**
Difference in Enterprising focus	0.063	0.045	0.157	0.044	0.039	0.261
Difference in Business focus	0.055	0.034	0.110	0.068	0.032	0.035
Gender (male)	0.012	0.140	0.933	-0.056	0.125	0.653
Prior experience with entrepreneurship (baseline)	0.368	0.145	0.011	0.318	0.135	0.019
Friends interested in entrepreneurship (baseline)	0.110	0.043	0.012	0.070	0.040	0.081
Baseline	-0.589	0.061	0.000	-0.610	0.055	0.000
Difference in ENT.KNOWLEDGE						
Difference in Enterprising focus	0.051	0.052	0.323	0.061	0.042	0.141
Difference in Business focus	0.050	0.040	0.214	0.052	0.035	0.138
Gender (male)	0.166	0.162	0.306	0.238	0.134	0.077
Prior experience with entrepreneurship (baseline)	0.893	0.167	0.000	0.828	0.142	0.000
Friends interested in entrepreneurship (baseline)	0.229	0.051	0.000	0.251	0.044	0.000
Baseline	-0.640	0.057	0.000	-0.619	0.049	0.000
Difference in STARTUP SELF-EFFICACY						
Difference in Enterprising focus	-0.042	0.052	0.426	0.041	0.044	0.354
Difference in Business focus	0.088	0.041	0.031	0.078	0.036	0.031
Gender (male)	0.025	0.165	0.881	0.122	0.140	0.383
Prior experience with entrepreneurship (baseline)	0.530	0.166	0.002	0.478	0.146	0.001
Friends interested in entrepreneurship (baseline)	0.227	0.053	0.000	0.265	0.047	0.000
Baseline	-0.525	0.054	0.000	-0.583	0.048	0.000
Difference in GENERAL ENT. SELF-EFFICACY						
Difference in Enterprising focus	0.097	0.028	0.001	0.125	0.025	0.000
Difference in Business focus	-0.037	0.021	0.083	-0.041	0.020	0.044
Gender (male)	0.102	0.085	0.231	0.051	0.079	0.522
Prior experience with entrepreneurship (baseline)	0.126	0.086	0.144	0.027	0.083	0.746
Friends interested in entrepreneurship (baseline)	0.091	0.026	0.001	0.083	0.025	0.001
Baseline	-0.459	0.044	0.000	-0.463	0.041	0.000
Difference in ENT. INTENTIONS						
Difference in Enterprising focus	-0.066	0.052	0.206	-0.042	0.043	0.327
Difference in Business focus	0.094	0.040	0.020	0.111	0.035	0.002
Gender (male)	0.318	0.164	0.053	0.309	0.138	0.025
Prior experience with entrepreneurship (baseline)	0.215	0.163	0.188	0.164	0.142	0.249
Friends interested in entrepreneurship (baseline)	0.177	0.053	0.001	0.196	0.046	0.000
Baseline	-0.426	0.049	0.000	-0.448	0.043	0.000

We can see that a perceived increased focus on business education has a positive influence on similar variables as the online programme. In the smaller sample (n=269), it has a significantly positive association with "*start-up self-efficacy*" and "*entrepreneurial intentions*". In the larger sample (n=366), it also has a significantly positive association with "*entrepreneurial attitudes*", but here there is also a significantly negative association with general enterprising skills.

The opposite is true for perceived focus on enterprise education. Pupils who perceive that there was an increase in focus on this type of education have significantly increased their enterprising self-efficacy, but not the other four areas. In order to understand the specific influence of this type of education, we assessed its influence on the individual competence areas. In Table 4 the results of this analysis are presented.

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Table 4
THE INFLUENCE OF DIFFERENT VERSIONS OF TEACHER-LED ENTREPRENEURSHIP EDUCATION ON SELF-EFFICACY IN FOUR ENTERPRISING COMPETENCES

	Pre-Post (n=269)			Pre-Post (n=366)		
Diff_Managing Ambiguity Self-efficacy	**Coef.**	**Std.Err**	**P-value**	**Coef.**	**Std.Err**	**P-value**
Difference in Enterprising focus	0.045	0.038	0.236	0.088	0.033	0.009
Difference in Business focus	-0.030	0.029	0.301	-0.029	0.027	0.282
Gender (male)	0.126	0.119	0.291	0.085	0.107	0.427
Prior entrepreneurship education (baseline)	0.142	0.120	0.235	-0.019	0.111	0.864
Friends interested in entrepreneurship (baseline)	0.060	0.036	0.098	0.051	0.034	0.130
Baseline	-0.456	0.051	0.000	-0.438	0.047	0.000
Diff_Creativity Self-efficacy						
Difference in Enterprising focus	0.130	0.042	0.002	0.172	0.035	0.000
Difference in Business focus	-0.020	0.032	0.544	-0.048	0.028	0.088
Gender (male)	0.156	0.130	0.232	0.129	0.110	0.243
Prior entrepreneurship education (baseline)	0.001	0.132	0.995	-0.068	0.115	0.557
Friends interested in entrepreneurship (baseline)	0.096	0.040	0.017	0.092	0.035	0.009
Baseline	-0.420	0.049	0.000	-0.436	0.042	0.000
Diff_Planning Self-efficacy						
Difference in Enterprising focus	0.143	0.043	0.001	0.145	0.037	0.000
Difference in Business focus	-0.056	0.032	0.084	-0.042	0.030	0.159
Gender (male)	0.113	0.133	0.395	0.023	0.116	0.844
Prior entrepreneurship education (baseline)	0.041	0.132	0.758	-0.028	0.121	0.816
Friends interested in entrepreneurship (baseline)	0.064	0.040	0.115	0.073	0.037	0.048
Baseline	-0.563	0.051	0.000	-0.559	0.044	0.000
Diff_Marshalling Resources Self-efficacy						
Difference in Enterprising focus	0.049	0.039	0.207	0.077	0.034	0.024
Difference in Business focus	-0.040	0.029	0.174	-0.050	0.028	0.073
Gender (male)	-0.029	0.119	0.810	-0.069	0.108	0.521
Prior entrepreneurship education (baseline)	0.338	0.120	0.005	0.254	0.112	0.024
Friends interested in entrepreneurship (baseline)	0.157	0.037	0.000	0.130	0.035	0.000
Baseline	-0.497	0.050	0.000	-0.537	0.045	0.000

A perceived change in focus on enterprising education seems to have the largest effect on creativity and planning self-efficacy. In the larger sample there is also a significant influence on the participants' confidence in their ability to manage uncertainty and to marshal resources.

DISCUSSION

The results of this practical trial demonstrate that it is possible to significantly influence young individuals' entrepreneurial awareness through an online programme which requires only few resources to set up. In regard to self-employment-oriented outcomes such as entrepreneurial attitudes, perceived knowledge, intentions and start-up self-efficacy, the programme has similar results as teacher-led programmes (e.g. Peterman & Kennedy, 2003; Sánchez, 2012). The short-term effects of the programme support four out of five of our hypotheses, but the long-term effects only demonstrate support for two of these. However, the study by Huber with colleagues (2014) demonstrates that small effects can be expected in assessment studies of entrepreneurship programmes for this age group. The influence of the programme on the participants'

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entrepreneurial intentions and start-up self-efficacy was close to being significant, also in the long term. It might be that the attrition rates we experienced in this practical trial decreased the statistical power to a level where we could not assess the proper magnitude levels of these outcomes. In regard to more generic enterprising competences, which advocates for a broad implementation of entrepreneurship education in the educational system argue are very important (e.g. Bacigalupo et al., 2016), we do not find any significant effects. The results of our analysis of whether the respondents perceive a change in focus on either enterprise education or business education in their normal education demonstrate that teacher-led education focusing on creativity and value creation (enterprise education) can foster self-efficacy in these competences.

These results thus indicate that asynchronous online education with a focus on role models can be used to influence self-employment oriented dimensions, but in order to foster confidence in performing enterprising competences, such as managing uncertainty and marshalling resources, a more action-oriented and teacher-led approach will have greater effect. It remains to be tested whether it would be possible to achieve these outcomes also through teacher-led and action-oriented online programmes in entrepreneurship.

The long-lasting effects of this asynchronous online programme demonstrate that it can be used as a complement to teacher-led entrepreneurship education. This is especially important for teachers who do not have the means to invite relatable and suitable entrepreneurial role models into their classroom. The time spent in the classroom can instead be used for more experiential and action-oriented entrepreneurial assignments. The COVID-19 pandemic has also demonstrated that it is important that we have the means to efficiently teach entrepreneurship in online-based formats. In Table 5, the level of support for our hypotheses is presented.

Table 5
AN OVERVIEW OF THE LEVEL OF SUPPORT FOR THE FIVE HYPOTHESES

	Hypothesis	Support
H1	Participation in a role model-focused online programme in entrepreneurship leads to more positive entrepreneurial attitudes.	Yes
H2	Participation in a role model-focused online programme in entrepreneurship leads to a higher level of perceived knowledge about entrepreneurship.	Yes
H3	Participation in a role model-focused online programme in entrepreneurship has a positive effect on entrepreneurial self-efficacy defined as perceived confidence in venture creation skills.	Partial
H4	Participation in a role model-focused online programme in entrepreneurship has a positive effect on enterprising self-efficacy defined as perceived confidence in creative skills, planning skills, marshalling resources skills, and managing ambiguity skills	No
H5	Participation in a role model-focused online programme in entrepreneurship leads to stronger entrepreneurial intentions.	Partial

LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

Most assessment studies within the field of entrepreneurship education typically lack methodological rigor and do not randomize the educational treatment (Rideout & Gray, 2013). Our goal with this study was to use a rigorous methodology in order to limit threats to the internal validity and, at the same time, go beyond controlled laboratory experiments and test something that can be implemented in the real world. Because we in some degree wanted to control for placebo and observer effects, we engaged the control group in a similar educational programme as the treatment group. This is important in education, since factors such as reflection and commitment, as well as being rewarded for completing assignments, is most likely

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to influence the results. However, since the control group's programme focused on environmental issues, there is a possibility that the participants' perceptions of entrepreneurship could have been influenced. This may have been in a positive direction, i.e. "*I need to do something about this*", or in a negative direction, i.e. "*striving for economic growth will destroy the planet*". It would therefore have been preferable to also include an "*untreated*" control group in the study.

Since we only tested one type of entrepreneurship programme, it is also difficult to discern whether it is this programme's design or just being exposed to entrepreneurship education in general that explains the results of this experiment. The programme design and the hypotheses tested draw on robust theoretical considerations, but in order to truly assess the outcomes of specific dimensions in entrepreneurship education, we would need a comparative experimental design in which multiple educational formats were tested (Fayolle, 2013).

The initial sample in this study was based on the total study population, and the respondents were randomly selected. This is an uncommon feature in RCTs, which often have a pre-defined initial population. This typically limits the reliability of many RCTs (Deaton & Cartwright, 2016). However, our design did entail drawbacks such as a higher participation of females. It can also be anticipated that some self-selection occurred, since the name of the organization behind the experiment, "*The Danish Foundation for Entrepreneurship*", was included in the invitation letter.

By randomly deciding whether the participants should be in the treatment group or in the control group, problems with self-selection biases were limited. Nevertheless, it can be assumed that participants in the control group would most likely have expected a different type of educational programme. It is also likely that certain aspects of the study design (such as the name of the organization behind it) have influenced the responses of the participants in the experiment group. In addition to this, the fidelity of the trial was limited to verifying that participants had completed the given assignments and replied to the control questions. We do not have any assessment of the time and effort spent. However, since we designed the experiment as a practical trial with the intention of assessing the kind of influence of this type of programme when it is implemented in a similar manner, the issue with fidelity is not so problematic.

In order to further our knowledge of the effects of entrepreneurship education, in general, and entrepreneurship programmes with an online format, in particular, it will be important in future studies to apply a comparative assessment design and to include both treated and untreated participants as control groups. In order to more firmly assess the role of the educator in this type of education, it would be interesting to design a field trial that includes a teacher-led in-class programme, a teacher-led online programme and an asynchronous online programme with no teacher involvement.

SUMMARY

In this paper the results of a randomized controlled field trial of an online programme in entrepreneurship, with a focus on role models, have been presented. The results are based on a sample of 580 Danish lower-secondary pupils (aged 14-15) who were randomly assigned to either the treatment group (entrepreneurship programme) or the control group (programme about environmental issues). The participants were surveyed three times: before participation (baseline), directly after participation (follow-up), and one year after participation (endline). Out of the 580 participants, 269 completed their questionnaires in all three survey periods. The

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questionnaire also gauged the level of focus on enterprising education and business education as it was perceived and experienced by the participants in their normal education.

The results demonstrate that a simple asynchronous online programme with a focus on entrepreneurial role models can have a long-lasting influence on young individuals' perception of entrepreneurship. The participants' prior experience with entrepreneurship did not significantly influence the results. This is an important finding since many educators at the lower secondary level are required to teach entrepreneurship even though their familiarity with the topic is limited, and many do not have access to relatable and suitable entrepreneurial role models. The COVID-19 pandemic has also demonstrated the importance of having the option to teach entrepreneurship in an online-based format. A role model-focused online programme can thus be used as an efficient complement to teacher-led education in order to influence pupils' entrepreneurial perceptions. However, in order to foster more general enterprising competences, teacher-led education with a focus on creativity and value-creation is more efficient. In future, it is important to perform comparative studies that compare the effects of multiple entrepreneurship programmes, as this will allow us to further our knowledge about the way in which specific elements in the educational design influence the participants.

ACKNOWLEDGEMENT

This study was made possible by the generous support by Nesta/IGL and the Nordea fund.

The research was performed with assistance from Casper Jørgensen, analysis leader at the Danish Foundation for Entrepreneurship, and Raeed Hamodi Hashem Ali, student assistant. The author is also grateful to Dennis Christensen who played an important role in designing the interviews with the entrepreneurs, and who developed the initial teaching materials connected to the videos.

APPENDIX

Table A1
INTERNAL CONSISTENCY OF THE CONSTRUCTS

Variable	Baseline (n=580, T=288, C=292)	Follow-up (n=366, T=184, C=182)	Endline (n=269, T=139, C=130)
Entrepreneurial attitudes	0.88 / T=0.86 / C=0.89	0.88 / T=0.84 / C=0.90	0.88 / T=0.82 / C=0.90
Entrepreneurial knowledge	0.85 / T=0.86 / C=0.82	0.89 / T=0.86 / C=0.89	0.88 / T=0.90 / C=0.84
Venture creation self-efficacy	0.89 / T=0.89 / C=0.89	0.91 / T=0.89 / C=0.92	0.93 / T=0.91 / C=0.93
Entrepreneurial intentions	0.91 / T=0.92 / C=0.90	0.92 / T=0.92 / C=0.93	0.90 / T=0.88 / C=0.91
Enterprising self-efficacy (general)	0.76 / T=0.77 / C=0.75	0.76 / T=0.74 / C=0.78	0.71 / T=0.70 / C=0.72
Creativity self-efficacy	0.91 / T=0.90 / C=0.91	0.92 / T=0.90 / C=0.94	0.91 / T=0.90 / C=0.92
Marshalling resources self-efficacy	0.79 / T=0.76 / C=0.81	0.82 / T=0.81 / C=0.84	0.81 / T=0.78 / C=0.83
Managing ambiguity self-efficacy	0.76 / T=0.75 / C=0.76	0.81 / T=0.78 / C=0.83	0.80 / T=0.81 / C=0.80
Planning self-efficacy	0.89 / T=0.89 / C=0.89	0.89 / T=0.88 / C=0.90	0.85 / T=0.82 / C=0.87

**All values presented in this table are Cronbach's alpha values.*
***T=Treatment group, C=Control group*

Table A2
TESTS OF INITIAL RANDOMISATION

Characteristics	Treatment (n=288)	Control (n=292)
Gender		

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- Female	61.80%	61.00%
- Male	38.20%	39.00%
Does anyone in your family speak another language as their first language?		
- The Capital Region of Denmark	27.80%	27.10%
- Central Denmark Region	22.60%	20.20%
- The North Denmark Region	8.70%	11.30%
- Region Zealand	18.80%	15.10%
- Region of Southern Denmark	22.20%	26.40%
Does anyone in your family speak another language as their first language?		
- Me	3.10%	5.80%
- Mother	9.70%	13.40%
- Father	10.80%	14.40%
- Siblings	3.80%	5.10%
Do any of your parents, or the grown-ups you live with, have a higher education degree?		
- Yes	59.40%	58.90%
- No	40.60%	41.10%
How many of your parents or the grown-ups you live with are working?		
- Both of them	83.00%	81.50%
- One of them	14.20%	14.00%
- None of them	2.80%	4.50%
Compared to other families in your country, do you feel that your household income is		
- Above average	34.00%	29.80%
- Average	60.80%	60.60%
- Below average (significantly different p=0.044)	5.20%	9.60%
Perceived educational focus		
Business skills	2.52	2.53
Enterprise skills	3.8	3.92
Difference in baseline variables used in the analysis		
GESE (Creativity, Marshalling, Ambiguity, Planning)	5.17	5.06
Entrepreneurial intentions	2.85	2.79
Entrepreneurial attitudes	5.37	5.37
Entrepreneurial knowledge	3.36	3.38
Venture creation self-efficacy	3.69	3.72
Demographics		
Friends interested in entrepreneurship	3.36	3.4
Prior experience	31.30%	27.70%

Table A3
DIFFERENCE-IN-DIFFERENCE ANALYSIS (BASELINE-FOLLOW-UP AND BASELINE-ENDLINE) FOR SPECIFIC GESE COMPETENCES

	Pre-Mid (n=366)			Pre-Post (n=269)		
Diff_Managing Ambiguity Self-efficacy (H4)	**Coef.**	**Std. Err**	**P-value**	**Coef.**	**Std. Err**	**P-value**
Treatment	0.122	0.095	0.202	0.112	0.103	0.278

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Baseline	-0.428	0.048	0.000	-0.462	0.052	0.000
Diff_Creativity Self-efficacy (H4)						
Treatment	-0.016	0.098	0.875	0.003	0.106	0.980
Baseline	-0.352	0.048	0.000	-0.439	0.051	0.000
Diff_Planning Self-efficacy (H4)						
Treatment	0.033	0.095	0.727	0.062	0.097	0.522
Baseline	-0.436	0.049	0.000	-0.604	0.051	0.000
Diff_Marshalling Resources Self-efficacy (H4)						
Treatment	0.070	0.092	0.447	0.012	0.099	0.901
Baseline	-0.490	0.046	0.000	-0.469	0.051	0.000
**The data is standardised with mean=0, standard deviation=1.*						

Table A4
NON-RESPONSE BIAS TEST (FULL SAMPLE)

Characteristics	Initial Sample (N=3000)	Respondents (n=580)	P-value	Sig. Diff
Gender				
- Female	49.4%	61.70%		
- Male	50.6%	38.40%	0.000	Yes
Age				
- 14 years old	21.6%	22.1%		
- 15 years old	78.4%	77.9%	0.747	No
Geographical Location				
- The Capital Region of Denmark	28.3%	27.5%	0.622	No
- Central Denmark Region	24.1%	21.0%	0.058	No
- The North Denmark Region	10.7%	10.2%	0.622	No
- Region Zealand	15.5%	17.2%	0.223	No
- Region of Southern Denmark	21.4%	24.2%	0.070	No

Table A5
NON-RESPONSE BIAS TESTS (BASELINE-FOLLOW-UP/BASELINE-ENDLINE)

	Non-response-bias (PRE-MID)			Non-response-bias (PRE-POST)		
Characteristics	**Follow-up (MID) (n=366)**	**Not answering follow-up (n=214)**	**Sig**	**Post-answers (POST) (n=269)**	**Not answering post (n=311)**	**Sig**
Gender						
- Male	35.80%	43.50%		32.30%	44.10%	**
Age						
- 14 years old	19.90%	25.70%		19.70%	24.10%	
- 15 years old	80.10%	74.30%		80.30%	75.90%	
Geographical location						
- The Capital Region of Denmark	26.50%	29.00%		28.30%	26.70%	
- Central Denmark Region	21.90%	20.60%		19.00%	23.50%	
- The North Denmark Region	8.40%	12.60%		9.30%	10.60%	
- Region Zealand	16.70%	17.30%		16.00%	17.70%	
- Region of Southern Denmark	26.50%	20.60%		27.50%	21.50%	
Constructs						
- Enterprising skills	4.51	4.61		4.51	4.57	
- Business skills	2.44	2.68	*	2.45	2.6	

Citation Information: Moberg, S.K. (2021). Online-based entrepreneurship education - its role and effects: A randomised controlled trial about the effects of an online entrepreneurship programme based on role models. *Journal of Entrepreneurship Education, 24*(2).

Speak another language as their first language						
- Me	3.80%	5.60%		3.30%	5.50%	
- *Mother*	11.50%	11.70%		10.80%	12.20%	
- Father	11.50%	14.50%		10.00%	14.80%	
- Siblings	4.40%	4.70%		3.70%	5.10%	
Parents, higher education						
- Yes	61.20%	55.60%		61.00%	57.60%	
Parents, working						
- Both of them	82.00%	82.70%		81.40%	83.00%	
- One of them	14.50%	13.60%		15.20%	13.20%	
- None of them	3.60%	3.70%		3.30%	3.90%	
Income, compared to other						
- Above average	31.70%	32.20%		32.30%	31.50%	
- Average	59.00%	63.60%		57.30%	63.70%	
- Below average	9.30%	4.20%		10.40%	4.80%	

Table A6
SEPARATED NON-RESPONSE BIAS TESTS FOR THE TREATMENT GROUP AND THE CONTROL GROUP

Characteristics	**Non-response between PRE-MID (n=214)**			**Non-response between PRE-POST (n=311)**		
	Treatment	**Control**	**Sig.**	**Treatment**	**Control**	**Sig.**
Non-response	**(n=104)**	**(n=110)**		**(n=149)**	**(n=162)**	
Gender						
- Male	49.00%	38.20%		47.00%	41.60%	
Age						
- 14 years old	19.20%	31.80%	**	22.80%	25.30%	
- 15 years old	81.80%	68.20%	**	77.20%	74.70%	
Geographical location						
- The Capital Region of Denmark	26.90%	31.00%		28.90%	24.70%	
- Central Denmark Region	22.10%	19.10%		23.50%	23.50%	
- The North Denmark Region	12.50%	12.70%		8.70%	12.30%	
- Region Zealand	19.20%	15.50%		19.40%	16.00%	
- Region of Southern Denmark	19.2	21.80%		19.50%	23.50%	
Educational focus (baseline)						
- Enterprising skills	4.61	4.6		4.59	4.56	
- Business skills	2.78	2.58		2.66	2.54	
Speak another language as their first language						
- Me	4.80%	6.30%		4.00%	6.80%	
- *Mother*	10.60%	12.70%		9.40%	14.80%	
- Father	13.50%	15.50%		12.80%	16.70%	
- Siblings	3.80%	5.50%		4.00%	6.20%	
Parents. higher education						
- Yes	53.80%	57.30%		56.00%	59.30%	
Parents, working						
- Both of them	80.80%	84.60%		81.90%	84.00%	
- One of them	14.40%	12.70%		14.10%	12.30%	
- None of them	4.80%	2.70%		4.00%	3.70%	
Income, compared to others						
- Above average	3.80%	4.60%		3.60%	6.20%	
- Average	65.40%	61.80%		64.40%	63.00%	

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- Below average	30.80%	33.60%		32.20%	30.90%	

Table A7
INTERACTION EFFECTS (ENTREPRENEURIAL EXPERIENCE)

Baseline-Follow-up with control variables (n=366)

	Entrepreneurial Attitudes			Perceived Entrepreneurial knowledge			Venture creation self-efficacy			General Enterprising self-efficacy			Entrepreneurial Intentions		
Variable	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**
Treatment	0.236	0.089	0.009	1.140	0.126	0.000	0.416	0.119	0.001	0.031	0.077	0.690	0.324	0.114	0.005
Enterprising focus	0.086	0.035	0.015	0.181	0.049	0.000	0.187	0.047	0.000	-0.005	0.031	0.875	0.063	0.045	0.161
Business focus	-0.047	0.035	0.181	0.013	0.051	0.801	-0.054	0.048	0.269	-0.005	0.030	0.872	-0.054	0.046	0.238
Gender (Male)	0.168	0.094	0.075	0.151	0.133	0.256	0.129	0.126	0.306	-0.111	0.080	0.170	0.153	0.121	0.208
Prior EE	0.284	0.100	0.005	0.377	0.140	0.007	0.228	0.131	0.083	0.169	0.083	0.044	-0.092	0.124	0.460
Friends	0.087	0.029	0.003	0.150	0.042	0.000	0.120	0.040	0.003	0.031	0.025	0.211	0.088	0.039	0.025
Baseline	-0.360	0.042	0.000	-0.613		0.000	-0.459	0.043	0.000	-0.362	0.045	0.000	-0.220	0.037	0.000

Baseline-Follow-up with control variables and interaction effects (n=366)

	Entrepreneurial Attitudes			Perceived Entrepreneurial knowledge			Venture creation self-efficacy			General Enterprising self-efficacy			Entrepreneurial Intentions		
Variable	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**
Treatment	0.983	0.357	0.006	0.350	0.521	0.490	0.103	0.556	0.853	0.609	0.306	0.047	0.362	0.458	0.430
Enterprising focus	0.152	0.048	0.002	0.096	0.070	0.168	0.032	0.075	0.669	0.047	0.042	0.271	0.093	0.062	0.131
Business focus	-0.015	0.054	0.786	-0.002	0.073	0.979	-0.002	0.077	0.981	-0.035	0.046	0.445	-0.038	0.070	0.583
Gender(Male)	0.121	0.134	0.369	0.289	0.191	0.130	0.186	0.204	0.362	-0.083	0.115	0.472	0.016	0.172	0.926
Prior EE	0.298	0.143	0.038	0.657	0.200	0.001	0.313	0.213	0.143	0.213	0.121	0.079	-0.207	0.181	0.255
Friends	0.078	0.042	0.063	0.238	0.060	0.000	0.267	0.065	0.000	0.050	0.035	0.158	0.078	0.055	0.159
Baseline	-0.362	0.042	0.000	-0.664	0.051	0.000	-0.609	0.050	0.000	-0.365	0.045	0.000	-0.223	.038	0.000
Treatment* Enterprising	-0.145	0.070	0.038	-0.120	0.102	0.240	-0.051	0.109	0.642	-0.114	0.061	0.059	-0.057	0.090	0.527
Treatment* Business	-0.052	0.072	0.471	0.065	0.098	0.511	0.012	0.105	0.911	0.054	0.061	0.373	-0.011	0.092	0.907
Treatment* Gender(Male)	0.049	0.191	0.797	-0.044	0.267	0.871	-0.114	0.286	0.689	-0.047	0.164	0.773	0.261	0.246	0.290
Treatment* Prior EE	-0.078	0.196	0.693	0.418	0.276	0.131	0.387	0.295	0.190	-0.124	0.168	0.460	0.192	0.253	0.447
Treatment* Friends	0.012	0.059	0.838	0.093	0.081	0.252	0.074	0.087	0.396	-0.042	0.050	0.399	0.027	0.075	0.719

Baseline-Endline with control variables (n=269)

	Entrepreneurial Attitudes			Perceived Entrepreneurial knowledge			Venture creation self-efficacy			General Enterprising self-efficacy			Entrepreneurial Intentions		
Variable	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**
Treatment	0.239	0.129	0.065	0.471	0.149	0.002	0.217	0.154	0.160	0.058	0.081	0.472	0.271	0.151	0.074
Enterprising focus	-0.017	0.054	0.754	0.052	0.061	0.397	0.056	0.063	0.382	0.064	0.035	0.070	0.001	0.062	0.986
Business focus	-0.111	0.051	0.032	0.044	0.061	0.477	-0.012	0.062	0.842	-0.047	0.032	0.146	-0.037	0.061	0.547
Gender (Male)	0.059	0.141	0.674	0.212	0.163	0.195	0.037	0.168	0.828	0.166	0.088	0.061	0.320	0.167	0.056

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Prior EE	0.418	0.145	0.004	0.888	0.165	0.000	0.528	0.168	0.002	0.152	0.088	0.084	0.213	0.164	0.196
Friends	0.133	0.042	0.002	0.244	0.049	0.000	0.253	0.051	0.000	0.083	0.026	0.002	0.204	0.052	0.000
Baseline	-0.611	0.062	0.000	-0.677	0.060	0.000	-0.544	0.056	0.000	-0.511	0.048	0.000	-0.429	0.050	0.000
Baseline-Endline with control variables and interaction effects (n=269)															
	Entrepreneurial Attitudes			**Perceived Entrepreneurial knowledge**			**Venture creation self-efficacy**			**General Enterprising self-efficacy**			**Entrepreneurial Intentions**		
Variable	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**
Treatment	0.320	0.542	0.556	0.727	0.625	0.246	0.063	0.646	0.922	0.319	0.340	0.349	1.002	0.635	0.116
Enterprising focus	-0.021	0.073	0.772	0.105	0.084	0.212	0.023	0.087	0.790	0.080	0.047	0.090	0.066	0.085	0.438
Business focus	-0.128	0.080	0.107	0.071	0.094	0.452	0.069	0.095	0.466	-0.031	0.050	0.539	-0.036	0.094	0.704
Gender(Male)	0.076	0.208	0.715	0.149	0.239	0.532	-0.014	0.247	0.956	0.145	0.130	0.266	0.162	0.242	0.504
Prior EE	0.611	0.213	0.005	0.727	0.241	0.003	0.341	0.249	0.172	0.139	0.131	0.292	0.134	0.244	0.583
Friends	0.140	0.060	0.020	0.216	0.070	0.002	0.242	0.073	0.001	0.091	0.038	0.016	0.252	0.073	0.001
Baseline	-0.617	0.062	0.000	-0.679	0.060	0.000	-0.541	0.057	0.000	-0.512	0.048	0.000	-0.439	0.050	0.000
Treatment* Enterprising	0.008	0.107	0.941	-0.113	0.124	0.362	0.070	0.128	0.583	-0.035	0.067	0.602	-0.142	0.125	0.260
Treatment* Business	0.028	0.106	0.789	-0.032	0.122	0.794	-0.150	0.126	0.237	-0.025	0.066	0.703	0.032	0.124	0.794
Treatment* Gender(Male)	0.013	0.293	0.965	0.056	0.337	0.868	-0.003	0.348	0.994	0.016	0.183	0.930	0.307	0.342	0.370
Treatment* Prior EE	-0.355	0.285	0.214	0.294	0.329	0.373	0.355	0.339	0.296	0.016	0.179	0.929	0.088	0.333	0.792
Treatment* Friends	-0.022	0.084	0.791	0.063	0.096	0.511	0.026	0.099	0.793	-0.015	0.052	0.780	-0.085	0.098	0.386

Table A8
INTERACTION EFFECTS (AGE)

Baseline-Follow-up with control variables (n=366)															
	Entrepreneurial Attitudes			**Perceived Entrepreneurial knowledge**			**Venture creation self-efficacy**			**General Enterprising self-efficacy**			**Entrepreneurial Intentions**		
Variable	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**
Treatment	0.221	0.092	0.017	1.142	0.132	0.000	0.406	0.124	0.001	0.031	0.076	0.686	0.320	0.115	0.005
Age (14=0, 15=1)	-0.078	0.115	0.499	0.031	0.165	0.853	-0.019	0.155	0.902	-0.239	0.095	0.012	0.062	0.144	0.665
Baseline	-0.294	0.040	0.000	-0.497	0.047	0.000	-0.406	0.041	0.000	-0.355	0.041	0.000	-0.191	0.034	0.000
Baseline-Follow-up with control variables and interaction effects (n=366)															
	Entrepreneurial Attitudes			**Perceived Entrepreneurial knowledge**			**Venture creation self-efficacy**			**General Enterprising self-efficacy**			**Entrepreneurial Intentions**		
Variable	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**
Treatment	-0.067	0.208	0.750	0.726	0.299	0.016	0.367	0.281	0.193	0.162	0.172	0.347	0.267	0.260	0.304
Age (14=0, 15=1)	-0.282	0.175	0.109	-0.264	0.251	0.295	-0.047	0.237	0.844	-0.145	0.146	0.320	0.025	0.219	0.908
Baseline	-0.301	0.041	0.000	-0.504	0.047	0.000	-0.406	0.042	0.000	-0.350	0.042	0.000	-0.192	0.034	0.000
Treatment* Age	0.358	0.233	0.125	0.516	0.333	0.122	0.048	0.313	0.878	-0.165	0.193	0.395	0.065	0.290	0.822
Baseline-Endline with control variables (n=269)															
	Entrepreneurial Attitudes			**Perceived Entrepreneurial knowledge**			**Venture creation self-efficacy**			**General Enterprising self-efficacy**			**Entrepreneurial Intentions**		
Variable	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**
Treatment	0.273	0.133	0.041	0.498	0.163	0.002	0.243	0.162	0.134	0.049	0.083	0.556	0.279	0.155	0.073
Age (14=0, 15=1)	-0.084	0.167	0.615	-0.176	0.205	0.392	0.232	0.204	0.256	0.103	0.104	0.321	0.142	0.197	0.469
Baseline	-0.537	0.060	0.000	-0.501	0.058	0.000	-0.433	0.055	0.000	-0.460	0.045	0.000	-0.341	0.047	0.000
Baseline-Endline with control variables and interaction effects (n=269)															
	Entrepreneurial			**Perceived**			**Venture creation self-**			**General Enterprising**			**Entrepreneurial Intentions**		

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	Attitudes			Entrepreneurial knowledge			efficacy			self-efficacy					
Variable	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**	**Coeff.**	**Std.err**	**P-value**
Treatment	0.099	0.301	0.741	0.831	0.371	0.026	0.142	0.367	0.698	-0.166	0.187	0.376	0.687	0.350	0.051
Age (14=0, 15=1)	-0.201	0.247	0.416	0.050	0.304	0.871	0.164	0.301	0.586	-0.042	0.154	0.784	0.415	0.288	0.150
Baseline	-0.540	0.060	0.000	-0.493	0.058	0.000	-0.433	0.055	0.000	-0.466	0.045	0.000	-0.343	0.047	0.000
Treatment* Age	0.217	0.336	0.519	-0.414	0.414	0.317	0.126	0.409	0.759	0.268	0.209	0.201	-0.508	0.391	0.195

REFERENCES

Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes, 50*, 179-211.

Ajzen, I. (2002). Perceived Behavioral Control, Self-Efficacy, Locus of Control, and the Theory of Planned Behavior. *Journal of Applied Social Psychology, 32(4)*, 665-683.

Anderson, T. (2003a). Getting the mix right again: An updated and theoretical rationale for interaction. *International Review of Research in Open and Distance Learning, 4*(2), 9-14.

Anderson, T. (2003b). Modes of interaction in distance education: Recent developments and research questions. In M. Moore (Edn.). *Handbook of Distance Education*, 129-144.

Bacher-Hicks, A., Goodman, J., & Mulhern, C. 2020. Inequality in household adaption to schooling shocks: Covid-induced online learning engagement in real time. *National bureau of Economic Research Working Paper no. 27555*.

Bacigalupo, M., Kampylis, P., Punie, Y., & Van den Brande, G. (2016). EntreComp: The Entrepreneurship Competence Framework. *JRC Science for Policy Report.*

Bandura, A. (1971a). *Social learning theory*. New York: General Learning Press.

Bandura, A. (1971b). Vicarious and self-reinforcement processes. In R. Glaser (Edn.). *The nature of reinforcement* New York: Academic Press, 228-278.

Bandura, A. (1977a). *Social Learning Theory*. Prentice Hall: Englewood cliffs.

Bandura, A. (1977b). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215.

Bandura, A. (1997). Theoretical perspectives. *Self-efficacy: The exercise of control*, 1-35.

Barbosa, S.D., Gerhardt, M.W., & Kickul, J.R. (2007). The Role of Cognitive Style and Risk Preference on Entrepreneurial Self-Efficacy and Entrepreneurial Intentions. *Journal of Leadership and Organizational Studies, 13*(4), 86-104.

BarNir, A., Watson, W.E., & Hutchins, H.M. (2011). Mediation and Moderated Mediation in the Relationship Among Role Models, Self-Efficacy, Entrepreneurial Career Intention, and Gender. *Journal of Applied Psychology, 41*(2), 270-297.

Bazzy, J.D., Smith, A.R., & Harrison, T. (2019). The impact of abstract thinking on entrepreneurial intentions. *International Journal of Entrepreneurial Behavior & Research, 25(*2), 323-337.

Bechthold, L.A., & Huber, L.R. (2018). Yes, I can! A field experiment on female role model effects in entrepreneurship. *Academy of Management Proceedings, 1*.

Bergmann, N.J., & Sams, A. (2012). Flip your classroom: Reach every student in every class every day. *International society for technology in education.*

Bernard, R.M., Abrami, P.C., Borokhovski, E., Wade, C.A., Tamim, R.M., Surkes, M.A., & Bethel, E.C. (2009). A meta-analysis of three types of interaction treatments in distance education. *Review of Educational research, 79*(3), 1243-1289.

Bernard, R.M., Abrami, P.C., Lou, Y., Borokhovski, E., Wade, A, Wozney, L., Wallet, P.A., Fiset, M., & Huang, B. (2004). How Does Distance Education Compare to Classroom Instruction? A Meta-Analysis of the Empirical Literature. *Review of Educational Research*.

Bosma, N., Hessels, J., Schutjens, V., van Praag, M., & Verheul, I. (2012). Entrepreneurship and role models. *Journal of Economic Psychology, 33*(2), 410-424.

Boyd, N., & Vozikis, G. (1994). The influence of self-efficacy on the development of entrepreneurial intentions and actions. *Entrepreneurship Theory and Practice, 18*(4), 63-77.

Chen, C.C., Greene P.G., & Crick, A. (1998). Does Entrepreneurial Self-efficacy Distinguish Entrepreneurs from Managers? *Journal of Business Venturing, 13*, 295-316.

Citation Information: Moberg, S.K. (2021). Online-based entrepreneurship education - its role and effects: A randomised controlled trial about the effects of an online entrepreneurship programme based on role models. *Journal of Entrepreneurship Education, 24*(2).

Chetty, R., Friedman, J.N. Hilger, N., Saez, E., Schanzenbach, D.W., & Yagan, D. (2011). How does your kindergarten classroom affect your earnings? Evidence from project star. *Quarterly Journal of Economics 126*(4), 1593-1660.

Contreras, F., Espinosa, J.C., Cheyne, A., & Pulgarín, S. (2020). Entrepreneurial intention in business students: The impact of an art-based program. *Journal of Entrepreneurship Education, 23*(6).

Cunha, F., & Heckman, J. (2007). The technology of skill formation. *The American Economic Review, 97*(2), 31-47.

Deaton, A., & Cartwright, N. 2016. Understanding and misunderstanding randomized controlled trials. *NBER working paper series #22595*.

Dorn, E., Hancock, B., Sarakatsannis, J., & Viruleg, E. (2020). COVID-19 and student learning in the United States: The hurt could las a lifetime. McKinsey & Company.

Dunn, T., & Holtz-Eakin, D. (2000). Financial capital, human capital, and the transition to self-employment: Evidence from intergenerational links. *Journal of Labor Economics, 18*(2), 282-305.

Dyer Jr, W.G. (1994). Toward a theory of entrepreneurial careers. *Entrepreneurship: Theory & Practice, 19*(2), 7.

Eesley, C., & Wu, L. (2017). Adaption and social networks in high-tech ventures: Evidence from a randomized experiment on a MOOC Platform.

Elert, N., Andersson, F., & Wennberg, K. (2015). The impact of entrepreneurship education in high school on long-term entrepreneurial performance. *Journal of Economic Behavior and Organization.*

Fairlie, R.W. & Robb, A. 2007. Families, human capital, and small business: Evidence from the characteristics of business owners survey. Industrial and Labor Relations Survey, 60(2), 225-245.

Fayolle, A. (2013). Personal views on the future of entrepreneurship education. *Entrepreneurship & Regional Development.*

Fiet, J.O. (2001a). The theoretical side of teaching entrepreneurship. *Journal of Business Venturing, 16*(1), 1-24.

Fiet, J.O. (2001b). The pedagogical side of entrepreneurship theory. Journal of Business Venturing, 16, 101-17.

Florin, J., Karri, R., & Rossiter, N. (2007). Fostering entrepreneurial drive in business education: An attitudinal approach. *Journal of Management Education, 31*(1), 17-4.

Foote, N.N. (1951). Identification as the basis for a theory of management. *American Sociological Review, 16(1)*, 14-21.

Frese, M., Rousseau, D.M., & Wiklund, J. (2014). The emergence of evidence-based entrepreneurship. *Entrepreneurship Theory and Practice, 38*(2), 209-216.

García, E., & Weiss, E. (2020). COVID-19 and student performance, equity, and U.S. education policyLessons from pre-pandemic research to inform relief, recovery, and rebuilding. *Economic Policy Institute*.

García, E., Weiss, E., & Engdahl, L. (2020). Access to online learing amid Coronavirus is far from universal, and children who are poor suffer from a digital divide. Working Economics Blog (Economic Policy Institute).

Günzel-Jensen, F., Moberg, K., Mauer, R., & Neergaard, H. (2017). Self-efficacy and the entrepreneurial mindset revisited. In *Revisiting the Entrepreneurial Mind*, Springer, Cham, 319-335.

Hannon, P.D. (2006). Teaching pigeons how to dance: sense and meaning in entrepreneurship education. *Education+Training, 48*(5), 296-308.

Henry, C., Hill, F.M., & Leitch, C.M. (2005a). Entrepreneurship education and training: Can entrepreneurship be taught? Part 1. *Education & Training*, 47, 98-111.

Henry, C., Hill, F.M., & Leitch, C.M. (2005b). Entrepreneurship education and training: Can entrepreneurship be taught? Part 2. *Education+Training, 47*(3), 158-169.

Hoffmann, A., & Junge, M. (2013). Attitudes, motivations and entrepreneurship in Denmark, *DEA report.*

Hoffmann, A., Junge, M., & Malchow-Møller, N. (2014). Running in the family: Parental role models in entrepreneurship. *Small Business Economics, 44*(1), 79-104.

Hout, M. (1984). Status, autonomy and training in occupational mobility. *American Journal of Sociology, 89*, 1379-1409.

Hout, M., & Rosen, H. (2000). Self-Employment, family background, and race. *Journal of Human Resources, 35*(4), 670-692.

Huber, L., Sloof, R., & Van Praag, C.M. (2014). The effect of early entrepreneurship education: Evidence from a field experiment. *European Economic Review, 72*(11), 76-97.

Ibarra, H. (1999). Provisional Selves: Experimenting with Image and Identity in Professional Adaptation. *Administrative Science Quarterly, 44*, 764-791

Jain, S., George, G., & Maltarich, M. (2009). Academics or entrepreneurs? Investigating role identity modification of university scientists involved in commercialization activity. *Research Policy, 38*, 922-935

Jones, B., & Iredale, N. (2010). Enterprise education as pedagogy. *Education+Training, 52*(1), 7-19.

Citation Information: Moberg, S.K. (2021). Online-based entrepreneurship education - its role and effects: A randomised controlled trial about the effects of an online entrepreneurship programme based on role models. *Journal of Entrepreneurship Education, 24*(2).

Kickul, J., & Fayolle, A. (2007). Cornerstones of change: revisiting and challenging new perspectives on research in entrepreneurship education. In *Handbook of Research in Entrepreneurship Education*, Edward Elgar Publishing Inc, 1, 1-20.

Kirby, D.A. (1992). Developing Graduate Entrepreneurs: The U.K. Graduate Enterprise Programme. *Entrepreneurship, Innovation and Change, 1*(2), 165-175.

Kirby, D.A. (2004). Entrepreneurship education: Can business schools meet the challenge? *Education+Training, 46*(8/9), 510-519.

Kram, K.E. (1988). Mentoring at Work: Developmental Relationships in Organizational Life. *University Press of America.*

Krishnamurthy, S. (2020). The future of business education: A commentary in the shadow of the COVID-19 pandemic. *Journal of Business Research, 117*(1), 1-5.

Krueger, N. (2009). Entrepreneurial intentions are dead: Long live entrepreneurial intentions. In Carsrud, A.L., & Brännback, M. (Eds.). *Understanding the entrepreneurial mind: Opening the black box*, Springer, 51-72.

Krueger, N., & Brazeal, D. (1994). Entrepreneurial potential and potential entrepreneurs. *Entrepreneurship: Theory and Practice, 18*, 91-104.

Krueger, N.F. (2000). The cognitive infrastructure of opportunity emergence. *Entrepreneurship Theory & Practice, 24*(3), 5-23.

Krueger, N.F., Reilly, M.D., & Carsrud, A L. (2000). Competing models of entrepreneurial intentions. Journal of Business Venturing, 15(5-6), 411-432.

Kyari, A.K. (2020). The impact of university entrepreneurship education on financial performance of graduate entrepreneurs. *Journal of Entrepreneurship Education, 23*(1).

Lack, K.A. (2013). Current Status of Research on Online Learning in Postsecondary Education. *Ithaka S+R.*

Lackéus, M. (2016). *Value creation as educational practice - towards a new educational philosophy grounded in entrepreneurship?* Thesis for the Degree of Doctor of Engineering, Chalmers University of Technology, Sweden, 1-106.

Laspita, S., Breugst, N., Heblich, S., & Patzelt, H. (2012). Intergenerational transmission of entrepreneurial intentions. *Journal of Business Venturing, 27*(4), 414-435.

Lent, R.W., Brown S.D., & Hackett, G. (2000). Contextual Supports and Barriers to Career Choice: A Social Cognitive Analysis. *Journal of Counseling Psychology, 47*(1), 36-49.

Lentz, B.S., & Laband, D.N. (1983). Like father, like son: Toward an economic theory of occupational following. *Southern Economic Journal, 50*, 474-493.

Lentz, B.S., & Laband, D.N. (1990). Entrepreneurial success and occupational inheritance among proprietors. *Canadian Journal of Economics, 23*, 563-579.

Letsoalo, M.E. & Rankhumise, E.M. (2020). Students' entrepreneurial intentions at two South African universities. *Journal of Entrepreneurship Education, 23*(1), 1-14.

Liguori, E., & Winkler, C. (2020). From offline to online: Challenges and opportunities for entrepreneurship education following the COVID-19 pandemic. *Entrepreneurship Education and Pedagogy, 3(4), 346-351*.

Lindquist, M., Sol, J., & van Praag, C.M. (2015). Why do Entrepreneurial Parents have Entrepreneurial Children? *Journal of Labor Economics, 33*(2), 269-296.

Lyons, E., & Zhang, L. (2018). Who does (not) benefit form entrepreneurship programs? *Strategic management Journal, 39*(1), 85-112.

Markus, H., & Nurius, P. (1986). Possible selves. *American Psychologist, 41*, 954-969.

Matthews, C.H., & Moser, S.B. (1996). A longitudinal investigation of the impact of family background and gender on interest in small-firm ownership. *Journal of Small Business Management, 34*, 29-43.

McGee, J.E., Peterson, M., Mueller, S.L., & Sequeira, J.M. (2009). Entrepreneurial Self-Efficacy: Refining the Measure. *Entrepreneurship Theory and Practice, 33*(4), 965-988.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010). Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies. U.S. Department of Education Office of Planning, Evaluation, and Policy Development Policy and Program Studies Service. Retrieved from: https://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf

Merton, R.K. (1968). Social theory and social structure: 1968 enlarged edition. New York: The Free Press.

Moberg, S.K. (2014). *Assessing the impact of Entrepreneurship Education - From ABC to PhD*. Doctoral Thesis, Copenhagen Business School.

Moberg, S.K., Huber, L., Jørgensen, C., & Redford, D. (2018). *The Impact of Youth Start Entrepreneurial Challenges: Results from a randomized controlled trial of a flexible entrepreneurship programme at primary and secondary level of education*. Project report.

Citation Information: Moberg, S.K. (2021). Online-based entrepreneurship education - its role and effects: A randomised controlled trial about the effects of an online entrepreneurship programme based on role models. *Journal of Entrepreneurship Education, 24*(2).

Moberg, S.K., Vestergaard, L., Fayolle, A., Redford, D., Cooney, T., Singer, S., Sailer, K., & Filip, D. (2014). How to assess and evaluate the influence of entrepreneurship education: A Report for the ASTEE Project with a User Guide to the Tools, 1-50.

Mueller, S.L., & Goic, S. (2003). East-West differences in entrepreneurial self-efficacy: Implications for entrepreneurship education in transition economies. *International Journal of Entrepreneurship Education, 1*(4), 613-632.

Nabi, G., Liñán, F., Krueger, N., Fayolle, A., & Walmsley, A. (2016). The impact of entrepreneurship education in higher education: A systematic review and research agenda. *Academy of Management Learning & Education, 16*(2), 277-299.

Nguyen, T. (2015). The Effectiveness of Online Learning: Beyond No Significant Difference and Future Horizons. *Journal of Online Learning and Teaching, 11*(2), 309-319.

Nunnally, J.C. (1978). *Psychometric theory* (2nd Edn.) Mcgraw-hill. Hillsdale, NJ, 416.

Obschonka, M., Silbereisen, R.K., & Schmitt-Rodermund, E. (2010). Entrepreneurial intentions as developmental outcome. *Journal of Vocational Behavior, 77*(1), 63-72

Peterman, N., & Kennedy, J. (2003). Enterprise education: influencing students' perceptions of entrepreneurship. *Entrepreneurship Theory and Practice, 28*, 129-144.

Rideout, E.C. & Gray, D.O. (2013). Does entrepreneurship education really work? A review and methodological critique of the empirical literature on the effects of University-based entrepreneurship education. *Journal of Small Business Management, 51*(3), 329-351.

Russell, T.L. (1999). The no significant difference phenomenon: A comparative research annotated bibliography on technology for distance education: As reported in 355 research reports, summaries and papers. *North Carolina State University.*

Sanchez, J.C. (2011). University training for entrepreneurial competencies: Its impact on intention of venture creation. *The International Entrepreneurship and Management Journal, 7*(2), 239-254.

Sarasvathy, S. (2001). Causation and effectuation: toward a theoretical shift from economic inevitability to entrepreneurial contingency. *Academy of Management Review, 26*(2), 243-263.

Sarasvathy, S. (2008). Effectuation: Elements of Entrepreneurial Expertise. UK, Cheltenham: Edward Elgar Publishing Limited.

Scherer, R., Adams, J., Carley, S., & Wiebe, F. (1989). Role model performance effects on development of entrepreneurial career preferences. *Entrepreneurship Theory and Practice 13*(3), 53-71.

Schmid, R.F., Bernard, R.M., Borokhovski, E., Tamim, R., Abrami, P.C., Wade, C.A., ... Lowerison, G. (2009). Technology's effect on achievement in higher education: A Stage I meta-analysis of classroom applications. *Journal of Computing in Higher Education, 21*(2), 95-109.

Scott, M.G., & Twomey, D.F. (1988). The long-term supply of entrepreneurs: students' career aspirations in relation to entrepreneurship. *Journal of Small Business Management, 26*(4)

Segal, G., Borgia, D., & Schoenfeld J. (2005). Self-efficacy and goal setting as predictors of performance: An empirical study of founder-managed natural food stores. *Journal of Business and Entrepreneurship 17*(1), 71-83.

Souitaris, V., Zerbinati, S., & Al-Laham, A. (2007). Do entrepreneurship programmes raise entrepreneurial intention of science and engineering students? The effect of learning, inspiration and resources. *Journal of Business Venturing, 22*, 566-591.

Streicher, M., Huber, L., Moberg, S.K., Jørgensen, C., & Redford, D. (2019). Filling in the Blanks? The Impact of Entrepreneurship Education on European High School Students. In *Academy of Management Proceedings 2019*(1), 14096.

Tamim, R.M., Bernard, R.M., Borokhovski, E., Abrami, P.C., & Schmid, R.F. (2011). What forty years of research says about the impact of technology on learning: A second-order meta-analysis and validation study. *Review of Educational Research, 81*(3), 4-28.

Van Auken, H., Fry, F.L., & Stephens, P. (2006a). The influence of role models on entrepreneurial intentions. *Journal of Developmental Entrepreneurship 11*(2), 157-167.

Van Auken, H., Stephens,P., Fry, F.L. & Silva, J. (2006b). Role model influences on entrepreneurial intentions: A comparison between USA and Mexico. *International Entrepreneurship and Management Journal 2*(3), 325-336.

Van Maanen, J., & Schein, E.G. (1979). Toward a theory of organizational socialization. In Staw B.M., & Cummings L.L. (eds,). *Research in Organizational Behavior*, Greenwich, CT: JAI Press, 1, 209-264.

Vanevenhoven, J., & Liguori, E. (2013). The Impact of Entrepreneurship Education: Introducing the Entrepreneurship Education Project. *Journal of Small Business Management, 51*(3), 315-328.

Citation Information: Moberg, S.K. (2021). Online-based entrepreneurship education - its role and effects: A randomised controlled trial about the effects of an online entrepreneurship programme based on role models. *Journal of Entrepreneurship Education, 24*(2).

Weick, K.E. (1995). *Sensemaking in organizations*. SAGE publications, Thousand Oaks.

Wentzel K.R., & Brophy, J.E. (2014). Motivating students to learn (4th edition), Routledge.

Wilson, F., Kickul, J., & Marlino, D. (2007). Gender, entrepreneurial self-efficacy, and entrepreneurial career intentions: Implications for entrepreneurship education. *Entrepreneurship Theory & Practice, 31*(3), 387-406.

Yost, J.H., Strube, M.J., & Bailey, J.R. (1992). The construction of the self: An evolutionary view. *Current Psychology: Research and Reviews, 11*, 110-121.

Zhao, H., Seibert, C., & Hills, C. (2005). The mediating role of self-efficacy in the development of entrepreneurial intentions. *Journal of Applied Psychology, 90*(2), 1265-1272.

Citation Information: Moberg, S.K. (2021). Online-based entrepreneurship education - its role and effects: A randomised controlled trial about the effects of an online entrepreneurship programme based on role models. *Journal of Entrepreneurship Education, 24*(2).