

Improvement in self-assessed entrepreneurial competence following participation in the Unternehmergeist Saar Program: A pilot study

Estella Kirsch¹, Michelle Celine Jörgens², Michael Belz³ 

Abstract

PURPOSE: This pilot study evaluated the entrepreneurial development program Unternehmergeist Saar using the well-established Entrepreneurship Competence Framework (EntreComp). Three superordinate competence dimensions and their underlying competences were self-assessed pre- and post-program: (1) Ideas & Opportunities, (2) Resources, and (3) Into Action. The aim of this study was to measure the influence of Unternehmergeist Saar, and to derive possible improvements of the talent program. **METHODOLOGY:** A newly developed questionnaire based on the EntreComp dimensions (ComPE) was developed exclusively for this study, containing 45 statements to be numerically rated by participants. Two separate groups, totaling 92 participants, took part in the competence assessment, with testing conducted both before ($N = 92$) and after participation ($n = 77$). **FINDINGS:** Results showed significant improvements for each self-assessed superordinate competence dimension of ComPE, independently of group affiliation (all $p < 0.01$ to < 0.001). Eight of 15 subordinate competences improved significantly through program participation, with “Valuing Ideas,” “Creativity,” and “Mobilizing Resources” showing the largest improvements (all $p < 0.001$). At the same time, seven competences did not improve significantly, including “Working with Others” and “Learning Through Experience” (both $p_{adj} = 0.999$). **IMPLICATIONS:** The findings led to targeted adaptations of the Unternehmergeist Saar program, including structured self-reflection, motivational impulses led by alumni, intensified group pitch simulations, failure-reflection sessions, weekly micro-goals, and an expanded teamwork module. These changes aim to strengthen competences within the EntreComp dimensions (2) “Resources” and (3) “Into Action” for prospective cohorts. The need for future research to incorporate long-term follow-ups that combine self-assessment and objective assessments of entrepreneurial competence is discussed. **ORIGINALITY AND VALUE:** This pilot study is the first to evaluate Unternehmergeist Saar using a now freely available self-assessment questionnaire in the German language (ComPE), based on the EntreComp framework. **Keywords:** entrepreneurship education, entrepreneurial competence, EntreComp, ComPE, competence assessment, self-assessment questionnaire, instrument development, psychometric evaluation, program evaluation, challenge-based learning, experiential learning, longitudinal pre-post design, entrepreneurial talent program, agile learning, innovation competence.

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INTRODUCTION

Entrepreneurial competences are gaining importance in an ever-evolving society (Venesaar et al., 2021). The talent program *Unternehmergeist Saar*, organized by the *August-Wilhelm Scheer Institut gGmbH*, has contributed to entrepreneurial competence development since 2022. The selection of relevant competences relies on the *European Entrepreneurship Competence Framework (EntreComp)* (McCallum et al., 2018). Oriented towards research (Azim & Al-Kahtani, 2014; Longmuß et al., 2021; Morselli & Orzes, 2023; Schuchmann & Seufert, 2013), an action-oriented learning approach in the form of project work is chosen to enable effective and sustainable competence development. Based on real-world problems, talents work on global topics such as sustainability, health, and education, with close collaboration among talents, research, and the economy. Relying on agile learning, entrepreneurial thinking and behavior are developed through specific use cases to establish relevance.

To evaluate the program, the Competence Profiler Entrepreneurship (ComPE), a German-language entrepreneurial competence assessment tool based on EntreComp, was used for the first time in this pilot study. Participants of *Unternehmergeist Saar* rated their competences before and after participation. Based on these results and additional analysis on personal entrepreneurial traits, promising project teams were assembled. This pilot study presents the first data on the longitudinal change of self-assessed competences before and after participation in the *Unternehmergeist Saar* program.

The paper begins with a comprehensive literature review, followed by a detailed description of the methodology. This includes participant selection, study design, a description of the talent program, and the ComPE assessment tool, as well as the analysis methods. Next, the results are presented and critically discussed. The study concludes with a summary of the key findings and an outlook on future research.

LITERATURE REVIEW

The term competence is defined as the combination of knowledge, skills, and attitudes, which are seen as the prerequisite for performing a job. Entrepreneurial competences are characterized by creating either financial, cultural, or social value, or all the aforementioned (McCallum et al., 2018). To contribute to a common understanding of entrepreneurial competences, the European Commission introduced the EntreComp framework, which is not merely a static competence taxonomy but also one of the eight key competences for life-long learning (Council of the European Union, 2018). Moreover, EntreComp provides insights into its extensive application across domains and use cases (McCallum et al., 2018), making it a well-established and validated framework in practice. The flexible framework lists and describes competences relevant to citizens across all areas of life, is targeted at collecting and allocating entrepreneurial competences within so-called competence areas, thereby laying a foundation for their development. The framework consists of three superordinate competence dimensions, each including five underlying competences. In total, EntreComp encompasses 15 entrepreneurial competences within the dimensions (1) Ideas & Opportunities, (2) Resources, and (3) Into Action. The three superordinate dimensions reflect the process of entrepreneurship: (1) Ideas and Opportunities includes the competences Spotting Opportunities, Creativity, Vision, Valuing Ideas, and Ethical Thinking; (2) Resources encompasses Self-Awareness & Self-Efficacy, Motivation & Perseverance, Mobilizing Resources, Financial & Economic Literacy, and Mobilizing Others; (3) Into Action refers to Taking the Initiative, Planning & Management, Coping with Uncertainty, Ambiguity & Risk, Working with Others, and Learning Through Experience. Each subordinate competence is described by its practical manifestations and is accompanied by the EntreComp progression model, which presents four main competence levels: Foundation, Intermediate, Advanced, and Expert. Each level is broken down into two sublevels, resulting in eight sublevels in total. The progression model can be applied to all entrepreneurial competences and is intended to guide the development from the foundation to the expert level (Bacigalupo et al., 2016a).

Having entrepreneurial competences is crucial for identifying and seizing new opportunities in complex contexts (Cubico et al., 2018), making them a key factor for entrepreneurial success (Mitchelmore & Rowley, 2010). Thus, their development is highly relevant in all phases of education (Voigt et al., 2005; Wilson et al., 2009) and is gaining increasing importance in society (Yang et al. 2018). Competence-oriented development puts the learner at the center of the process (Morselli & Orzes, 2023). An important aspect of this is experience, in order to plan, execute, and reflect on actions (Miettinen, 2000). Many of the so-called progressive pedagogical approaches are based on the experiential aspect, including Project-Based Learning (PjBL), Problem-Based Learning (PBL), and Challenge-Based Learning (CBL)

(Kakouris & Morselli, 2020). These approaches are suitable for improving and developing skills. CBL is particularly appropriate for developing entrepreneurial competences, as it goes beyond subject-specific understanding and prepares learners for uncertain and complex settings. The main difference compared to PjBL and PBL is that CBL integrates social dimensions: here, it is important that learners work in groups and that external stakeholders are involved. In addition, the approach incorporates global issues and real-world challenges that focus on complex problems and support different perspectives (Gallagher & Savage, 2023). In essence, the aim of CBL is to prepare learners for the challenges of working life in a dynamic world (Morselli & Orzes, 2023). These characteristics of CBL align with entrepreneurial development programs. The focus of the latter is on interdisciplinary work and close collaboration between learners and their local communities, such as universities and business partners (Gallagher & Savage, 2023).

According to Leutner et al. (2017), assessing competence is crucial for optimizing educational interventions. Souza and Lima (2020) conducted a literature review that identified several approaches to assessing competences in medicine, education, and engineering. These approaches include evaluations by specialists using questionnaires or behavioral observations, self-assessments, and structured or semi-structured interviews. Furthermore, Lackéus and Williams Middleton (2018) collated five different methods for assessing experiential education, which is common in entrepreneurial education: performance assessment, reflective assessment, peer- and self-assessment, e-assessment, and constructive alignment. Each method has advantages and disadvantages. Self-assessment is often less accurate than objective assessment because it is biased by factors such as self-efficacy, and it is also one-dimensional (Sillat et al., 2021). Since external perspectives complement self-perceptions, both should be considered together to assess competences (Alastalo et al., 2023; Sillat et al., 2021).

Initial developments of assessment tools based on the EntreComp framework have been identified (Bacigalupo et al., 2016b). However, these tools often exhibit limitations. Many lack transparency regarding their development process, are exclusively available in English, or have modified the competences outlined by the European Commission. For instance, KompetenzPanel (n.d.) provides a German-language competence assessment tool based on EntreComp, but the development process is not transparent, and the tool is not freely accessible. Morselli and Gorenc (2022) developed and utilized a questionnaire grounded in the EntreComp framework to evaluate two entrepreneurship education courses. However, this tool is available only in English, and only excerpts from the questionnaire are published in their article. Similarly, Armuña et al. (2020) developed a tool for English-speaking participants based on EntreComp, but they modified the original competences of the framework. Next to these self-assessment questionnaires, EntreComp Europe (n.d.) introduced a workshop-based approach to assess entrepreneurial competences. This method emphasizes individual and group reflection aligned with the EntreComp framework and relies on qualitative data analysis, which is generally more time-consuming than quantitative approaches.

In light of limitations outlined for existing assessment tools, particularly with regard to transparency and language alignment (here: German) and the impractical time demands of qualitative assessment formats, none of the aforementioned tools were deemed suitable for evaluating Unternehmergeist Saar. Therefore, we developed the ComPE exclusively for this pilot study. Its items reflect all three superordinate competence dimensions and 15 subordinate entrepreneurial competencies as defined by EntreComp. We hypothesize that participants will improve in all three self-assessed dimensions of the EntreComp framework after participation in Unternehmergeist Saar: (1) Ideas & Opportunities, (2) Resources, and (3) Into Action.

METHODOLOGY

Participants and study design

Participants in the study were talents of the Unternehmergeist Saar program in 2024, with one group participating from May 5 to June 28 (spring cohort) and the other from November 4 to December 6 (autumn cohort).

Items for ComPE (see details below) were implemented on the platform LimeSurvey. All program participants received access keys to the questionnaire via email. They were required to complete the questionnaire before and after the program to allow comparison of their self-assessed competence levels. Responses from the spring cohort were received between May 13 and July 19, while responses from the autumn cohort were collected between October 21 and December 19. In total, $N = 92$ talents participated in the entrepreneurial competence assessment. All participants provided informed consent for the use of their data for this purpose. To ensure anonymity, the final dataset only included the variables

described below. No data that could potentially identify any individual was included. Data were analyzed exclusively at the group level. All data are anonymized and stored on local servers with restricted access, available solely to authorized people directly involved in the analysis and writing of the paper. The data will be retained only for the duration necessary to complete the research and will be securely deleted afterwards.

Description of the entrepreneurial talent program

Unternehmergeist Saar is an innovative program developed and organized by the August-Wilhelm Scheer Institut gGmbH. It follows a talent-centric approach to entrepreneurial development. The program aims to select individuals with an interest in entrepreneurship, referred to as talents, and to support them in developing their entrepreneurial personalities through practice-oriented competence dimensions. The target group includes, on the one hand, talents interested in founding a business, and on the other hand, those facing dynamic changes in the workplace or in their private lives brought about by digital transformation. Since the program's first run in 2022, five batches have included 205 talents working in 40 teams. As shown in Figure 1, the program is based on a 5-week sprint format divided into three main phases: Onboarding, Project Work, and Cool Down.

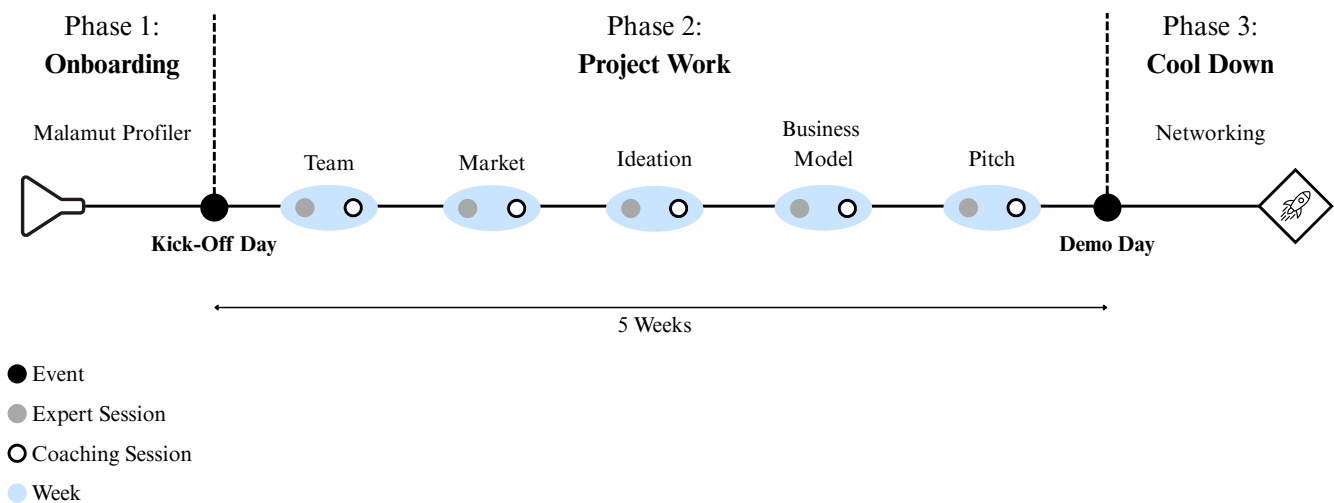


Figure 1. Visualization of the Unternehmergeist Saar Program

In the Onboarding phase, a specific entrepreneurial personality test, combining personality and team role analysis (Malamut Team Catalyst GmbH, 2012; Strack et al., 2013), is used to identify talents and assemble diverse, thus promising, teams. The program is based on agile methods as well as lean startup principles. Instead of knowledge sharing, the program focuses on action-based competence development by being actively engaged in relevant entrepreneurial real-world challenges. The guiding principle behind it is CBL, which focuses on the key competence of entrepreneurship. The talent program Unternehmergeist Saar uses this approach as a foundation for the learning process. Therefore, in the Project phase, the teams work on real-world challenges, inspired by input from the economy and research partners. The challenges are placed in the fields of GreenTech, HealthTech, EdTech, and Digital Sports (see Table 1 for examples). To enable the talents to act within their teams and solve the challenges, they participate in accompanied workshops, coaching, and expert sessions.

Table 1. Translated examples for real-world challenges (original language: German)

Field	Real-world challenge
GreenTech	How can guests be involved in saving resources (e.g., energy, electricity, and water) in the hospitality industry?
HealthTech	How can digital technologies be used to support/enable gender-sensitive care?
EdTech	How can AI be used to create or implement interactive and collaborative learning formats in the digital space?
Digital Sports	How can digital technologies be used to get fans more involved in the sports experience and keep them coming back?

Over five weeks, the program follows five themes, referred to as milestones, that guide the teamwork: Team, Market, Ideation, Business Model, and Pitch (see Figure 1). These milestones are closely linked to the competence areas and competences of EntreComp. For example, during the first week, the topic “Team” is focused on. Here, the spotlight is on the entrepreneurial competences Vision, Self-Awareness & Self-Efficacy, and Planning & Management. The sessions and methods during this week are intended to support the development of these competences. To achieve this, milestones such as “Creating a Team Agreement” are defined. A team agreement requires all members to articulate a shared vision. This collective understanding strengthens the team’s ability to shape a vision and align strategically. Throughout the process, each team member reflects on their needs, working styles, strengths, and limitations. This reflection enhances self-awareness and builds self-efficacy. Additionally, the team agreement establishes structure, responsibilities, and decision-making processes. It provides a solid framework for efficient planning and management throughout the entire project. Each defined milestone directly contributes to developing the targeted competences. Additional milestones within the Team focus topic include “Developing a deep understanding of team roles” and “Establishing effective project planning and organization for the program.”

To purposefully develop entrepreneurial competences, the program managers selected methods and tools that are well-established in this area. In Week 1, the primary tool for developing competences is the Team Canvas (Ivanov & Voloshchuk, 2015). Based on the individual results of the personality test, teams collaborate to complete the Team Canvas and use it as a guiding framework throughout the program. The tool helps participants clarify team roles, align expectations, and strengthen collaborative competence. In Week 2, the focus is on the market. Participants work with methods and tools such as the Mom Test (Fitzpatrick, 2013), Discovery Board, and Target Groups Profiles. These instruments support understanding user needs, market segments, and problem-solving skills. Additional methods and tools used in the remaining weeks include Design Thinking, the Business Model Canvas (Osterwalder, 2004), as well as Elevator and Startup Pitches. These tools were chosen to encourage creativity and iterative problem-solving, as well as to improve the ability to structure business models and enhance communication and persuasion. All of these methods align with the program’s milestones and, consequently, with the underlying competence framework. Together, these methods provide an optimal setting for agile learning, hands-on experience, and peer-to-peer learning. The Project phase concludes with a demonstration event, in which the teams pitch their developed solutions for their assigned use case. After that, the Cool Down phase is used for networking and taking entrepreneurial initiatives.

Description of the Competence Assessment Tool

The entrepreneurial competence assessment tool ComPE is based on the renowned competence framework EntreComp (McCallum et al., 2018) to systematically represent entrepreneurial thinking and acting. In total, ComPE comprises 45 items in German language allocated to the three superordinate competence dimensions suggested by EntreComp: (1) Ideas & Opportunities, (2) Resources, and (3) Into Action. Each area covers five subordinate entrepreneurial competences, while each competence is represented by three statements (e.g., “I can recognize problems that need to be solved”). A 5-point numeric scale with two anchors is used to rate each statement (1 = “do not agree at all” to 5 = “agree completely”). Table 2 presents a detailed overview of all translated items. Participants were required to rate all 45 statements to complete the assessment.

Table 2. Overview of translated questionnaire items (original language: German)

Items	Competences
Competence Dimension 1: Ideas & Opportunities	
1.1 “I recognize and seize opportunities that arise in order to create value.”	Spotting Opportunities
1.2 “I can identify problems that need to be solved.”	
1.3 “I forge new connections and combine different resources or ideas to create additional value.”	
2.1 “I develop new ideas and opportunities to create value.”	Creativity
2.2 “I can explore and try out innovative approaches.”	
2.3 “I combine knowledge and resources to achieve novel results.”	
3.1 “I can develop a clear vision to translate ideas into concrete, actionable steps.”	Vision
3.2 “I am able to imagine future scenarios and plan concrete actions based on them.”	
3.3 “I can imagine future scenarios in order to define and steer targeted measures and actions.”	

Items	Competences
4.1 "I am able to assess the value of an idea from a social, cultural, and economic perspective."	Valuing Ideas
4.2 "I recognize how much potential an idea has to create value."	
4.3 "I find suitable ways to get the most out of an idea and make the best use of it."	
5.1 "I can assess the impact of ideas for value creation on society and the environment."	Ethical
5.2 "I am able to reflect on how sustainable long-term social, cultural, and economic goals and the chosen course of action are."	Thinking
5.3 "I act responsibly."	
Competence Dimension 2: Resources	
6.1 "I am able to reflect on my short-, medium-, and long-term needs and goals."	Self-Awareness & Self-Efficacy
6.2 "I recognize and evaluate strengths and weaknesses in myself and my group."	
6.3 "I can influence the course of events despite obstacles and setbacks."	
7.1 "I successfully put ideas into practice, thereby satisfying my need for achievement."	Motivation & Perseverance
7.2 "I can work patiently and persistently to achieve both my own goals and the long-term goals of the group."	
7.3 "Difficult situations and temporary setbacks do not impair my ability to act."	
8.1 "I am able to procure and manage the various resources needed to implement ideas."	Mobilizing Resources
8.2 "I can make the most of the limited resources available to me."	
8.3 "I procure and manage urgently needed expertise—in technical, legal, tax, and digital areas (e.g., through partnerships or networks)."	
9.1 "I can judge the costs involved in turning an idea into a value-adding measure."	Financial & Economic
9.2 "I am able to plan financial decisions and evaluate them over time."	
9.3 "I manage finances sustainably in order to maintain value-adding activities in the long term."	Literacy
10.1 "I inspire and motivate stakeholders (interest groups) to actively participate in my project."	Mobilizing
10.2 "I am able to obtain the necessary support to achieve valuable results."	Others
10.3 "I can lead, communicate, persuade, and negotiate effectively both within and outside the group."	
Competence Dimension 3: Into Action	
11.1 "I take the initiative and directly initiate processes to generate value."	Taking the Initiative
11.2 "I set myself challenges."	
11.3 "I act and work independently to achieve goals and carry out planned tasks."	
12.1 "I regularly set myself long-, medium-, and short-term goals."	Planning & Management
12.2 "I am able to set priorities and draw up implementation plans."	
12.3 "I successfully adapt to unforeseen changes."	
13.1 "Even when the outcome is uncertain or the information available is unclear, I am able to make decisions."	Coping with Uncertainty, Ambiguity & Risk
13.2 "I analyze value-adding processes in a structured manner at an early stage in order to reduce the risk of failure."	
13.3 "I can deal with complex and dynamic situations quickly and flexibly."	
14.1 "I cooperate with others to develop ideas and implement them together."	Working with Others
14.2 "I am able to network."	
14.3 "I successfully resolve conflicts and face competition."	
15.1 "I see every initiative to generate value as an opportunity to learn something new."	Learning Through
15.2 "When the opportunity arises, I enjoy learning from others."	
15.3 "I reflect and learn from my own successes and failures as well as those of others."	Experience

In addition to the self-assessment of competence, this study collected demographic data, including age, gender, professional background, and current professional status. Moreover, participants rated their founding experience on a 5-point ordinal scale (1 = "no points of contact" to 5 = "already founded"). Furthermore, the personal reason for participating in the program was assessed, which could be "participation as part of a study program," a "recommendation by the employer," or "intrinsic motivation."

Statistical analysis

The data were analyzed using the statistical software SPSS®, version 31. Descriptive statistics including frequencies, mean values (M), standard deviations (SD), and correlations (r ; depending on the scale level: Pearson correlations (metric), rank correlations (ordinal) and four-field Phi coefficients (binary)) were calculated for specific items based on their scale level. To assess internal consistency, Cronbach's α was calculated for the three competence dimensions of ComPE. A confirmatory factor analysis (CFA) was performed using SPSS® AMOS, version 31 (please see results section for details). Pairwise comparisons are reported separately in the results section and corresponding tables. The analysis of the three primary endpoints, represented by the competence dimensions (1) Ideas & Opportunities, (2) Resources, and (3) Into

Action, was conducted using three general linear models (GLM) for repeated measures. Participants' numerical ratings from the pre- and post-assessments were incorporated into the respective models as two-level within-subject factors. To evaluate if the self-assessed competence dimensions were affected by the program, the repeated measures effect was tested for significance. Furthermore, the two cohorts, spring and autumn, were compared to each other as a two-level between-subject factor. This procedure was used to identify group differences (between-subject effect) and to exclude differences in competence improvement between the two cohorts (interaction effect), ensuring their comparability. Both the within-subject effect and the interaction effect were tested for significance. An exploratory analysis was conducted to test the impact of confounding variables (e.g., age or motivation) on competence development across the three competence dimensions. Furthermore, an exploratory analysis of changes between pre- and post-assessment was conducted using *t*-tests for repeated measures. The initial significance level was set at $\alpha < 0.05$ (two-sided). To account for alpha error inflation, the *p*-values from the three GLMs for our primary endpoints were corrected using the Bonferroni method. Additionally, all exploratory GLMs, as well as *t*-tests of all competences, were corrected (here: $p_{\text{adj}} = p \times 15$).

RESULTS

Sample description and comparison to baseline

Out of $N = 92$ participants, the majority identified as male ($n = 60$, 65.2%), had an average age of 27.89 years ($SD = 7.54$, min: 19, max: 54), and were located in the fields of law and economics ($n = 55$, 59.8%). Employed participants were the minority ($n = 22$, 23.9%), with students being the majority. Most participants had no prior founding experience ($n = 62$, 67.4%) and participated in the program as part of their studies ($n = 55$, 59.8%). At the respective baselines, $n = 52$ talents participated in the first program run in spring, and $n = 40$ in the second run in autumn 2024. No significant differences in demographic data and baseline additional variables were found between the cohorts (Table 3). In total, 77 of the 92 talents took the post-assessment, resulting in a drop-out rate of 16.3%. With respect to the drop-out rates, no significant differences were found between the cohorts ($p = 0.386$). Details of the sample are shown in Table 3 ($M \pm SD$, frequencies).

Table 3. Description of participants (baseline)

Variables	Total sample ($N = 92$)	Program 1 ($n = 52$)	Program 2 ($n = 40$)	p^b
Gender (% male ^a)	60 (65.2%)	31 (59.6%)	29 (72.5%)	0.198
Age (in years)	27.89 \pm 7.54	27.10 \pm 4.75	28.97 \pm 10.19	0.268
Study Program vs. Profession (% Study Program)	70 (76.1%)	38 (73.1%)	32 (80.0%)	0.440
Professional Background				– ^d
Law/Economics	55 (59.8%)	35 (67.3%)	20 (50.0%)	
Natural Sciences/Engineering	13 (14.1%)	07 (13.5%)	06 (15.0%)	
IT	10 (10.9%)	06 (11.5%)	04 (10.0%)	
Education/Social Sciences	02 (02.2%)	02 (03.8%)	00 (00.0%)	
Arts and Culture	03 (03.3%)	00 (00.0%)	03 (07.5%)	
Other	09 (09.8%)	02 (03.8%)	07 (17.5%)	
Founding Experience ^c				0.984
No points of contact	62 (67.4%)	35 (67.3%)	27 (67.5%)	
Yes, already working on own idea	13 (14.1%)	06 (11.5%)	07 (17.5%)	
Yes, entrepreneurial activities	02 (02.2%)	01 (01.9%)	01 (02.5%)	
Yes, member of a start-up team	06 (06.5%)	05 (09.6%)	01 (02.5%)	
Already founded	09 (09.8%)	05 (09.6%)	04 (10.0%)	
Motivation for Participation				0.505
Study program	55 (59.8%)	29 (55.8%)	26 (65.0%)	
Recommendation by employer	13 (14.1%)	07 (13.5%)	06 (15.0%)	
Intrinsic motivation	24 (26.1%)	16 (30.8%)	08 (20.0%)	

Note: \pm = standard deviations; ^a Gender was recorded as m/f/d, participants only indicated binary categories (m/f); ^b Pairwise comparisons between the subsamples Program 1 vs. 2 depending on scale level, *p*-values for: *t*-test (1 \times), χ^2 -tests (3 \times), and *U*-test (1 \times) for the ordinal-scaled variable ^c Founding Experience; ^d a significance test was not performed for the variable Professional Background due to the small number of cells (6 cells with expected frequency < 5 ; 50% of all cells).

Characteristics of ComPE

The competence assessment took $M = 4.90$ min ($SD = 3.18$ min). At the baseline, the three competence dimensions showed good internal consistency: Ideas & Opportunities ($\alpha = 0.84$), Resources ($\alpha = 0.81$), and Into Action ($\alpha = 0.81$). Pre-test values were in the top third of the 5-point numerical scale, indicating that participants already rated their competence dimensions as high before the program ($M_1 = 3.77$, $M_2 = 3.65$, $M_3 = 3.94$ of 5). A significant positive correlation was found among the superordinate competence dimensions ($r = 0.662$ to 0.778 , all $p < 0.001$). In addition, the competence dimensions were correlated with demographic data and additional variables, along with founding experience (ordinal, from 1 = “no points of contact” to 5 = “already founded”), as shown in Table 4 (* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$).

Table 4. Correlations of the EntreComp competence dimensions (baseline)

Variable	1	2	3	4	5	6	7
Program Run: Spring (1) vs. Autumn (2)	–						
Gender (1 = male, 2 = female)	-0.134	–					
Age (in years)	0.123	0.144	–				
Study Program (1) vs. Profession (2)	-0.080	0.019	0.610***	–			
Founding Experience	-0.017	-0.178	0.246*	0.210*	–		
Dimension 1: <i>Ideas & Opportunities</i>	-0.142	-0.146	0.181	-0.006	0.358***	–	
Dimension 2: <i>Resources</i>	-0.035	-0.036	0.193	-0.016	0.188	0.722***	–
Dimension 3: <i>Into Action</i>	-0.002	-0.098	0.199	0.096	0.245*	0.662***	0.778***

A significant correlation was identified between the founding experience and the competence dimensions (1) Ideas & Opportunities ($r = 0.358$, $p < 0.001$) and (3) Into action ($r = 0.245$, $p = 0.019$).

A CFA was performed on the baseline sample ($N = 92$) using a model based on the EntreComp framework (see below). Due to the limited sample size, the model was simplified to two levels: mean ratings for the 15 subordinate entrepreneurial competences (see Table 2; mean values included three items per dimension) were entered as indicator variables. Three superordinate competence dimensions were entered as latent factors ((1) Ideas & Opportunities, (2) Resources, (3) Into Action). Five subordinate competence dimensions were then assigned to each latent factor. The maximum likelihood method was used for model estimation. Estimated factor loadings and estimated correlations between the latent factors are shown in Figure 2.

Overall, the estimated correlations between the latent factors were high (all exceeding 0.8). Factor loadings exceeded 0.5 in all cases except for the subordinate competences “Financial & Economic Literacy” for factor (2) Resources (0.348). The root mean square error of approximation (RMSEA; Xia & Yang, 2019) was used as the absolute fit index and was found to be 0.135. This was thus outside the limit of ≤ 0.06 for a good model fit (Hu & Bentler, 1999). The comparative fit index (CFI; Bentler, 1990) was used as an incremental fit index, and reached 0.774. Therefore, it failed to meet the 0.95 threshold for a good fit of the hypothesized model relative to a baseline model (Hu & Bentler, 1999).

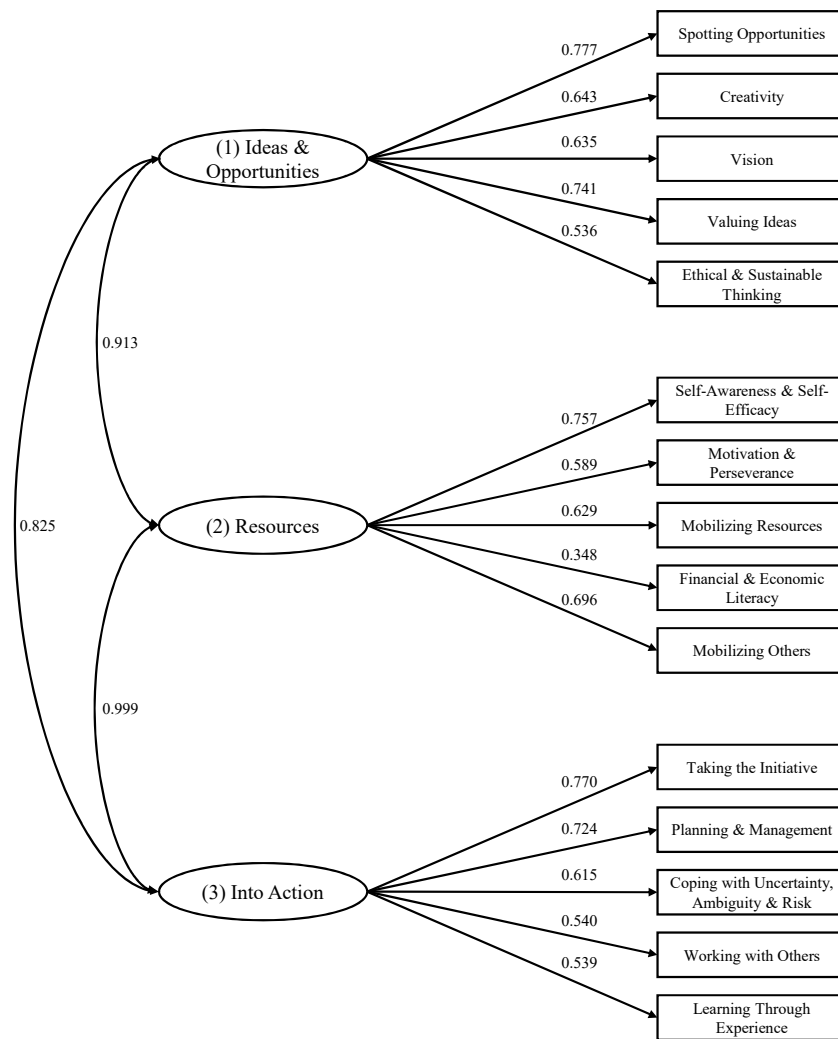


Figure 2. Confirmatory factor analysis of ComPE

Note: CFA according to the EntreComp framework; (1) *latent factors*: three superordinate competence dimensions *Ideas & Opportunities*, *Resources*, *Into Action*, numbers represent estimated correlations between the latent factors; (2) *indicator variables*: ratings (mean values) for 15 subordinate competences, numbers represent estimated factor loadings (standardized regression coefficients); RMSEA = 0.135, CFI = 0.774 ($N = 92$).

Changes in self-assessed competence dimensions over time

Numerical improvements were identified across the three competence dimensions, as indicated by pre- and post-assessment values. The assessed competence level of the competence dimension (1) *Ideas & Opportunities* significantly improved from pre- ($M = 3.73$, $SD = 0.48$) to post-assessment ($M = 4.03$, $SD = 0.48$). A detailed overview is provided in Figure 3.

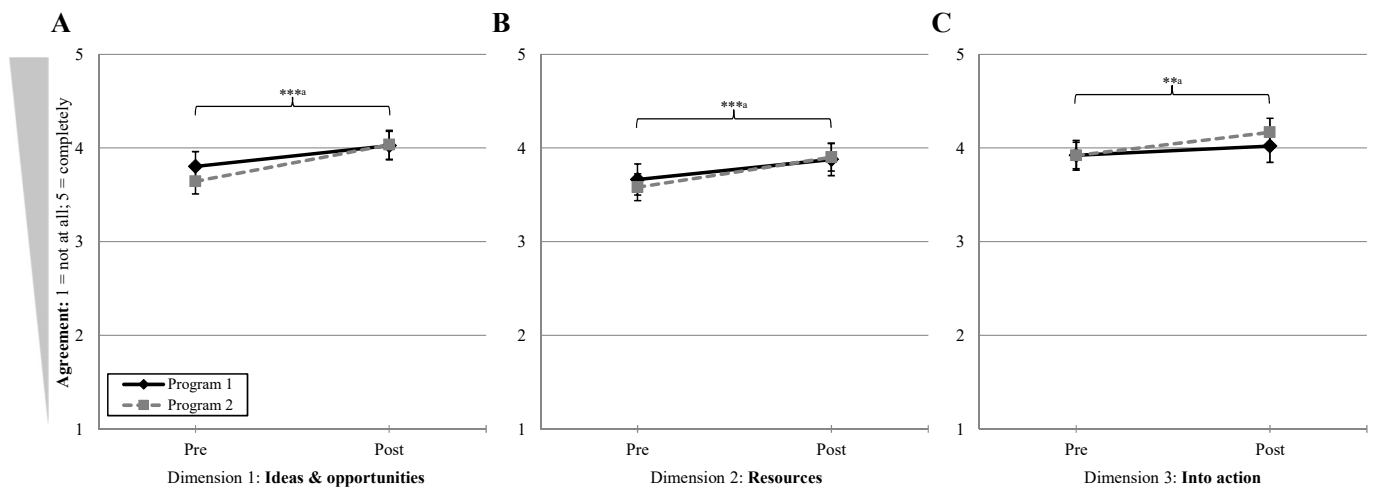


Figure 3. Changes in competence dimensions over time

Note: Mean values with 95% confidence intervals. Ratings from 1 = “do not agree at all; 5 = “agree completely” for the pre- and post-time points (before and after program participation), differentiation between Program 1 (spring 2024, $n = 42$) and Program 2 (autumn 2024, $n = 35$); A: Competence Dimension 1: Ideas & Opportunities; B: Competence Dimension 2: Resources; C: Competence Dimension 3: Into Action. a Stated significance refers to the repeated measures effect (GLM) for the total sample from pre- to post-time point (** $p < 0.01$ *** $p < 0.001$, $n = 77$).

An associated repeated measures effect was found in the GLM ($F(1, 75) = 36.34, p < 0.001$, partial $\eta^2 = 0.33$). Furthermore, no systematic or competence improvement differences between the two cohorts were identified. Both the between-subject effect (GLM: $F(1, 75) = 0.60, ns$) and the interaction effect (GLM: $F(1, 75) = 2.74, ns$) were non-significant, with all pairwise comparisons being non-significant. To summarize, a significant improvement in the competence dimension (1) Ideas & Opportunities was found, with both cohorts and program runs being comparable. A similar result was found for the competence dimension (2) Resources. Participants’ competence levels increased from pre- ($M = 3.63, SD = 0.50$) to post-assessment ($M_t = 3.89, SD = 0.52$), as shown in Figure 3B. The associated repeated measures effect was significant (GLM: $F(1, 75) = 23.35, p < 0.001$, partial $\eta^2 = 0.24$), while no significance was found for between-subject effect (GLM: $F(1, 75) = 0.084, ns$) and interaction effect (GLM: $F(1, 75) = 0.91, ns$). All pairwise comparisons were non-significant. The competence dimension (3) Into Action also showed a positive development. Participants improved from pre- ($M = 3.92, SD = 0.48$) to post-assessment ($M = 4.09, SD = 0.53$). Detailed results are provided in Figure 3C. Similar to the previous competence dimensions, a significant repeated measures effect was found (GLM: $F(1, 75) = 11.37, p = 0.001$, partial $\eta^2 = 0.13$). The between-subject effect (GLM: $F(1, 75) = 0.49, ns$) and the interaction effect (GLM: $F(1, 75) = 2.12, ns$) were both non-significant, along with all pairwise comparisons. In sum, the competences of all competence dimensions examined in this study showed significant improvements.

Additional exploratory analyses were conducted to investigate the possible influence of categorical variables on changes in the three competence dimensions from pre- to post-assessment, using subgroups of sufficient size. GLM analyses on gender, professional status, and motivation for participation did not reveal any significant between-subject or interaction effects, and all corrected pairwise comparisons were also non-significant. However, all GLMs showed a significant repeated-measures effect (all $p \leq 0.001$), indicating that all analyzed groups benefited equally from participation in the entrepreneurial program.

Changes in self-assessed entrepreneurial competences over time

Exploratory analyses were conducted to investigate changes in the 15 competences. Results are summarized in Table 5 (* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$, $M \pm SD$, effect size Cohen’s d_{emp}).

Table 5. Changes in competence levels pre- and post-program participation

Competences	Pre-Test	Post-Test	M_{diff}	$t(76)$	p	d_{emp}	Competence dimensions
Spotting Opportunities	3.87 ± 0.60	4.07 ± 0.58	0.20	2.78	0.103	0.32	
Creativity***	3.57 ± 0.74	3.95 ± 0.70	0.38	4.91	< 0.001	0.56	
Vision*	3.84 ± 0.62	4.07 ± 0.59	0.23	3.09	0.042	0.35	Ideas & Opportunities
Valuing Ideas***	3.61 ± 0.64	4.01 ± 0.58	0.41	5.57	< 0.001	0.63	
Ethical & Sustainable Thinking**	3.76 ± 0.59	4.04 ± 0.58	0.28	3.84	0.004	0.44	
Self-Awareness & Self-Efficacy	3.91 ± 0.64	4.10 ± 0.56	0.19	2.44	0.255	0.28	
Motivation & Perseverance	3.80 ± 0.57	3.96 ± 0.63	0.16	2.23	0.428	0.25	
Mobilizing Resources***	3.58 ± 0.65	3.96 ± 0.67	0.37	4.44	< 0.001	0.51	Resources
Financial & Economic Literacy**	3.23 ± 0.87	3.61 ± 0.82	0.37	3.92	0.003	0.45	
Mobilizing Others	3.60 ± 0.81	3.82 ± 0.80	0.22	2.44	0.253	0.28	
Taking the Initiative	3.94 ± 0.74	4.17 ± 0.63	0.23	2.97	0.060	0.34	
Planning & Management**	3.84 ± 0.65	4.09 ± 0.63	0.25	3.72	0.006	0.42	
Coping with Uncertainty, Ambiguity & Risk**	3.57 ± 0.66	3.88 ± 0.65	0.31	4.05	0.002	0.46	Into Action
Working with Others	4.00 ± 0.64	4.09 ± 0.67	0.08	1.28	0.999	0.15	
Learning Through Experience	4.25 ± 0.59	4.21 ± 0.59	-0.04	-0.52	0.999	0.06	

After Bonferroni correction, eight self-assessed entrepreneurial competences showed significant improvements from pre- to post-assessment. The largest increases were identified for the competences “Valuing Ideas, Creativity,” and “Mobilizing Resources” (all $p < 0.001$, d_{emp} 0.51 to 0.63). Overall, four out of five competences of the superordinate competence dimension (1) Ideas & Opportunities showed significant improvements. Both in the competence dimensions (2) Resources and (3) Into Action, two of five competences improved significantly. Numerically, a minimal decrease in the competence “Learning Through Experience” was found, which, however, was non-significant ($p = 0.999$).

DISCUSSION

This pilot study evaluated the influence of the Unternehmergeist Saar entrepreneurial talent program by analyzing longitudinal changes in self-assessed entrepreneurial competences before and after participation. These self-assessed competences were based on the EntreComp framework and were measured via a self-developed questionnaire (ComPE): (1) Ideas & Opportunities, (2) Resources, and (3) Into Action. For both the spring and autumn cohorts, significant improvements across all superordinate competence dimensions were noticed. Furthermore, eight out of 15 subordinate self-assessed entrepreneurial competences showed significant improvement from pre- to post-assessment.

Significant improvements were found in four out of five self-assessed competences within the dimension (1) Ideas & Opportunities. This indicates that the entrepreneurial program may especially foster competences related to identifying opportunities, developing innovative ideas, and realizing them. In line with that, the program focuses on practice-oriented exercises and methods that foster creativity, idea generation, and evaluation. One of the major approaches behind the program is CBL. This approach should particularly promote skills related to innovation and creativity (Yang et al. 2018). For example, participants engage intensively with ideation techniques and methods, such as Design Thinking and Business Model Canvas. These require them to explore problems from multiple perspectives and develop novel solutions iteratively. This observation aligns with previous studies’ findings that methods such as Design Thinking foster key entrepreneurial competencies, such as creativity and the ability to recognize opportunities (Baltador et al., 2024; Linton & Klinton, 2019). Furthermore, the program’s initial milestones in the focus areas Team, Market, and Ideation create a structured environment in which participants are encouraged to question assumptions and translate these insights into specific opportunities. The program’s experiential, iterative design should thus provide favorable conditions for enhancing the Ideas & Opportunities dimension. In sum, this provides a possible explanation why competences related to curiosity, openness, and creativity have shown the largest improvement. The specific improvement of (1) Ideas & Opportunities may thus be carefully interpreted in favor of the program.

For both the competence dimensions (2) Resources and (3) Into Action, significant improvements were observed in only two out of five entrepreneurial competences, which indicates a possible selective competence improvement. In the competence dimension (2) Resources, the competences Self-Awareness & Self-Efficacy, Motivation & Perseverance, as well as Mobilizing Others, showed no significant changes. An explanation could be that these competences are not only classical competences as per definition; instead, they represent long-term attitudes and behavioral patterns (Morselli & Orzes, 2023). Based on experience, both attitudes and behavioral patterns are harder to develop within short-term interventions. In particular, the competence Mobilizing Others strongly depends on mutual motivation and support within the team. The mobilization of others was experienced as especially challenging within the program, which, on the one hand, could be explained by the heterogeneous group composition, and, on the other hand, by the program's short duration and, consequently, the limited time for the team project. Based on the results presented here, we have expanded *Unternehmergeist Saar* by adapting several program components to more effectively foster these competences. For the dimension (2) Resources, to strengthen Motivation & Perseverance, we introduced short motivational impulse sessions led by alumni and facilitated discussions about coping strategies. To improve Self-Awareness & Self-Efficacy, we integrated structured self-reflection formats into the weekly coaching sessions. In these sessions, participants completed guided reflections to gain a clearer understanding of their individual behavioral patterns and personal development processes. To strengthen the competence Mobilizing Others, the program incorporated more intense group pitch simulations, during which participants practice presenting their ideas and receive targeted feedback from their coaches.

For the dimension (3) Into Action, no significant improvements were found for the competences Learning Through Experience, Taking the Initiative, and Working with Others, which may be due to the fact that these competences develop over time within a learning process and are particularly shaped by accumulated experiences (Kakouris & Morselli, 2020). Furthermore, Learning Through Experience is not merely a competence, but rather a combination of a learning method, focused on how competences are developed, and the ability to learn in this way (Morselli & Gorenc, 2022). The teams work on real-world challenges, many of which are highly complex (see Table 1), thereby increasing the importance of sharing experiences. Therefore, the aforementioned competences should be further promoted by shifting the program's focus more strongly toward experience-based, cycle-oriented learning and by incorporating targeted reflection phases. For future cohorts, we have modified *Unternehmergeist Saar* by integrating structured failure-reflection sessions to the weekly coaching meetings. These sessions provide participants with a dedicated space to discuss setbacks openly. Systematic reflection enables them to translate insights directly into the next development cycle, enhancing learning through experience. To further strengthen the competence Taking the Initiative, participants were encouraged to set weekly micro-goals to advance specific elements of their projects autonomously. To improve Working with Others, we expanded the first expert session on teamwork to allow for a deeper exploration of individual team roles and how these roles can be leveraged throughout the program. By clarifying expectations and highlighting the strengths associated with each role, teams were better equipped to collaborate effectively.

ComPE demonstrated good internal consistency, satisfactory sensitivity to change, and good measurement accuracy. Objectivity can be assumed due to the use of numerical scales. Further results indicate sufficient (construct) validity, as the ComPE mainly detected competence improvements within the dimension (1) Ideas & Opportunities, which was clearly focused in the program (see above). However, there are major limitations regarding ComPE and the underlying *EntreComp* framework. First, the absolute improvements across the self-assessed competence dimensions and competences were significant, but small (e.g., Ideas & Opportunities: total delta of 0.3 on a numeric scale from one to five). As reported within the results section, associated effect sizes were – except for one case – within the range of medium to large, mainly driven by small variances of intrapersonal measurement-pairs within our dataset (superordinate competence dimensions: partial $\eta^2 = 0.13$ to 0.33 ; subordinate competences: $d_{\text{emp}} = 0.35$ to 0.63 ; see Ellis, 2010). Although statistical significance and sufficient effect sizes were found, the total deltas remained too small to adequately assess the influence of *Unternehmergeist Saar*. One possible explanation may be the high starting values of the self-assessed competence dimensions and entrepreneurial competences, as the talents were selected by experts based on criteria such as motivation and prior knowledge of entrepreneurship. To minimize biases that might lead to overly positive assessments, the instructions for participants could be modified. For example, participants could be instructed to emphasize their own strengths and weaknesses in the competence assessment. Furthermore, another way to reduce bias is to ipsatize the data, though this complicates the categorization of individual scores across the surveyed competence dimensions. Second, self-assessment itself can be considered limited because ability estimates do not necessarily correlate with actual performance (Karpen, 2018; Sillat et al., 2021). In our case, however, developing a short questionnaire seemed the most

suitable way to ensure compliance among participants. Third, the CFA, according to the EntreComp framework, yielded poor fit indices (RMSEA and CFI). What stands out here are very high estimated correlations between the superordinate competence dimensions, which may hint to insufficient discriminant validity: It is possible that these latent factors from the EntreComp framework measure a common construct. In other words, modelling a strong general competence factor rather than the three-factor structure postulated by the EntreComp framework may yield better results. Clearly, more empirical data is needed to draw conclusions on this matter.

This pilot study has general limitations. The competence assessment tool ComPE is based on EntreComp, the most official and widely used entrepreneurial competence framework. It includes a wide range of competences relevant to entrepreneurship. Nonetheless, other research and competence frameworks may include additional competences considered important in the context of entrepreneurship but not included in ComPE. Furthermore, external factors may have affected the results of the study. Some participants indicated that they had invested more time in the program than others. A systematic assessment of the time invested should be added to future assessments to account for this factor in the analysis. Ideally, a control condition should be added to the design presented here to assess the effectiveness of Unternehmergeist Saar, even though this would be challenging to implement. Additionally, competences at post-assessment were recorded right after the program had concluded. Further studies should investigate the long-term effects of the program by conducting a follow-up assessment after a set period to evaluate the sustainability of the competence development. Although it may not be applicable in this setting, implementing a sham program as a control group could help distinguish specific effects from nonspecific ones. Finally, for practical reasons, only quantitative data were collected through a self-assessment. However, enriching the insights would be possible if qualitative data were collected, such as from open-ended questions or interviews. Based on this data, the entrepreneurial program could be further optimized. In addition, a larger sample would allow for the examination of different sub-samples (e.g., gender differences, educational level) from pre- to post-measurement.

CONCLUSION

The results of this study indicate that an entrepreneurial competence development program like Unternehmergeist Saar could have a significant influence on self-assessed competence development, particularly in identifying opportunities and generating ideas. These competences can be fostered within a short period of time by utilizing practice-oriented methods and content. However, to enable holistic competence development, programs must be designed to have a longer duration and be more intensive, targeting the individual needs of participants and purposefully focusing on specific competences. Based on the results, several adaptations have already been implemented for future cohorts: To strengthen Motivation & Perseverance, we added alumni-led motivational impulses and discussions. Self-Awareness & Self-Efficacy are now supported through structured self-reflection and Mobilizing Others through more intense group pitch simulations. Additionally, failure reflection sessions were introduced, weekly micro-goals were added to foster Taking the Initiative, and the team expert session was expanded to improve Working with Others. These adjustments aim to align the program more closely with the EntreComp framework. In addition to these modifications, it remains unclear whether the factor structure postulated by the EntreComp framework can be accurately captured by a questionnaire, or whether it should be simplified, e.g., into a single general competence factor. Along with the program, the ComPE will be further developed, as first data from this pilot study yielded promising results regarding its ability to evaluate self-assessed competence development. The current German version of the ComPE is freely available upon request from the authors of this study.

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Author contributions statement

Estella Kirsch: Literature Investigations, Visualization, Proofreading and Editing, Writing Original Drafts, Resources, Research, and Conceptualization. **Michelle Celine Jörgens:** Literature Investigations, Visualization, Proofreading and Editing, Writing Original Drafts, Resources, Research, and Conceptualization. **Michael Belz:** Proofreading and Editing, Writing Original Drafts, Software, Resources, Formal analysis, Data Curation.

Conflicts of interest

The authors declare no conflicts of interest.

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