Paradigm

AI Tools in Entrepreneurship Education: Insights from a Pilot Course on Developing Entrepreneurial Competences

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Abstract. *This paper is focused on an exploratory pilot study regarding the integration of artificial intelligence (AI) tools in entrepreneurship education. The study investigates how AI-based learning activities can support the development of entrepreneurial competences such as idea generation, planning, communication and pitching. The pilot course involved 41 participants from 6 European countries and combined entrepreneurship education with practical training in AI tools for entrepreneurs. Data were collected through pre- and post-course survey questionnaires exploring participants' perceptions regarding the usefulness of AI tools and their role in supporting entrepreneurial learning processes. Although the post-course sample is limited, the results indicate that AI tools were perceived as particularly useful for idea generation, business plan structuring and pitching preparation. The findings suggest that AI tools function primarily as cognitive and creative support instruments, while human mentoring remains essential for strategic judgement and contextual decision-making. The study contributes to the growing discussions on the pedagogical role of artificial intelligence in entrepreneurship education.*

Keywords: entrepreneurship, education, artificial intelligence, soft skills.

Introduction

The rapid development of artificial intelligence (AI) and digital technologies is transforming the ways in which learning, decision-making and innovation occur in contemporary economic environments. Considering this context, entrepreneurship education is increasingly expected to prepare students not only with business knowledge but also with a broader set of entrepreneurial competences, that are frequently conceptualised through the EntreComp framework (European Commission, 2018), which identifies key competence areas such as opportunity recognition, creativity, vision, mobilising resources, communication, teamwork and responsible decision-making. These competences are widely recognised as essential for navigating complex professional contexts and for supporting innovation and economic development (European Commission, 2018; OECD, 2019a).

At the same time, universities face structural challenges in delivering applied entrepreneurial learning and activities like idea generation, business model development and pitching require repeated practice, iterative feedback and opportunities for reflection, which are

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often difficult to provide consistently within traditional classroom formats. As a result, there is a growing interest in the potential of digital technologies to support competence-based learning approaches that emphasise experimentation, reflection and practical problem solving.

Artificial intelligence (AI) tools are increasingly explored as potential pedagogical supports in entrepreneurship education. Thus, AI tools can assist students in exploring ideas, analysing information, structuring arguments and improving communication, when integrated into structured learning activities. Also, AI-assisted creative tools can facilitate iterative learning processes by allowing students to quickly test alternative ideas, refine business concepts and receive immediate feedback during the early stages of entrepreneurial development (European Commission, 2022). However, current research also emphasises that the educational value of AI depends strongly on how these tools are integrated into pedagogical design and how students are guided to critically evaluate AI-generated outputs (Chen et al., 2024; Kasneci et al., 2023).

Within this perspective, AI should be understood as a complementary cognitive support that can assist learners in developing entrepreneurial competences, and an effective integration of AI in entrepreneurship education, therefore, requires pedagogical models that combine technological tools with reflective learning activities and human feedback.

Although the literature increasingly discusses the potential of AI in education, empirical studies exploring its pedagogical integration in entrepreneurship education remain limited, particularly in the context of competence-based learning environments.

Against this background, the present study reports findings from a pilot entrepreneurship course that explores the integration of AI tools into structured learning activities for students and academic trainers, course that combined traditional entrepreneurship education topics with structured learning activities using AI tools for idea generation, market exploration, business planning and pitch preparation.

Therefore, the purpose of this article is to analyse participants' perceptions regarding the usefulness of AI-supported learning activities contributing to entrepreneurial competence development, specifically, the study addresses two research questions:

RQ1. To what extent do participants perceive AI-supported learning activities as being useful for developing entrepreneurial competences in entrepreneurship education?

RQ2. Which entrepreneurial competence areas do participants perceive to benefit the most from the use of AI tools during the learning process?

By focusing on participants' perceptions within a pilot learning environment, the paper provides exploratory insights into the pedagogical potential of AI tools in entrepreneurship education and contributes to the growing discussion on responsible and competence-oriented uses of artificial intelligence in higher education.

Literature review

Artificial intelligence and entrepreneurship education

The rapid expansion of artificial intelligence (AI) is nowadays reshaping educational practices across disciplines, like entrepreneurship education, where AI tools are increasingly explored as instruments that can support idea development, information analysis, and decision-making processes during the early stages of entrepreneurial learning (Chen et al., 2024; Alpürk, 2025), technologies having the potential to enhance competence-based learning environments by enabling students to experiment with ideas, analyse market information and structure entrepreneurial concepts more efficiently.

Entrepreneurship education aims to develop a set of transversal competences, such as creativity, opportunity recognition, problem-solving, communication, teamwork and the ability to manage uncertainty, that extend beyond traditional business knowledge and research suggests that educational environments that integrate practical activities and experiential learning, tend to strengthen these competences and support the development of an entrepreneurial mindset among students (Azeem & Ilyas, 2025; Yang & Khan, 2024).

Within this context, AI-assisted tools are increasingly seen as potential cognitive supports that can facilitate exploratory learning processes, with the potential to assist students in generating ideas, structuring information and refining arguments during entrepreneurial tasks such as business model development or pitching preparation (Chen et al., 2024; Dwivedi et al., 2021).

AI tools as learning instruments

Recent studies highlight that AI tools can play a supportive role in entrepreneurship education by enabling iterative learning processes, and AI-assisted analytical tools allow learners to quickly explore alternative solutions, analyse information and receive immediate feedback during creative and analytical tasks. Considering the discussion about competencies, these are particularly relevant in entrepreneurship education, where learning often involves experimentation, reflection and progressive refinement of ideas (Kasneci et al., 2023).

However, the educational value of AI depends significantly on the pedagogical context in which it is used, thus, when integrated into structured learning activities, generative AI systems can support reflection and idea development, but when used in an unstructured way, they may lead to superficial engagement or over-reliance on automated outputs. This is the reason why several authors emphasise the importance of combining AI-supported learning with critical evaluation and human mentoring in order to maintain learners' agency and judgement (Chen et al., 2024; UNESCO, 2021).

AI tools can contribute particularly to early entrepreneurial learning processes such as idea generation, information structuring and communication preparation and, in these contexts, the technology is used primarily as a cognitive assistant that supports exploratory thinking and iterative improvement not replacing the human expertise (Dwivedi et al., 2021; Park et al., 2025). Previous studies suggest that AI tools can support several entrepreneurial learning activities associated with competence development. Table 1 illustrates examples of entrepreneurial competences that may be supported through AI-assisted learning activities.

Table 1. Examples of entrepreneurial competences supported through AI-assisted learning activities

Entrepreneurial competence	AI tools used	Learning activity
Creativity and opportunity recognition	ChatGPT, IdeeaMap, stratup.ai	brainstorming and generating business ideas
Market analysis and opportunity evaluation	Perplexity, ChatGPT, Qualtrics	market research and analysis of customer needs
Strategic planning and business modelling	IdeaBuddy, PrometAI, Upmetrics	structuring business plans and developing business models
Financial literacy and financial decision-making	QuickBooks, Puzzle	analysing financial data and monitoring business performance
Collaborative problem-solving and teamwork	Notion AI, ChatGPT	coordinating tasks and developing solutions collaboratively
Entrepreneurial communication and pitching	Gamma, Canva AI	preparing and delivering business presentations

Source: Authors' own elaboration

These tools were integrated into selected learning activities within the pilot course to support competence-based entrepreneurship learning.

Competence development in AI-supported entrepreneurship learning

Entrepreneurial competence development involves both cognitive and social dimensions, including creativity, communication, planning and collaborative problem-solving and educational approaches based on experiential learning and constructivist principles emphasise active engagement with real-world problems, reflection on experience and iterative improvement of solutions (Biggs & Tang, 2011; Kolb, 1984). Also, recent research also highlights the growing role of artificial intelligence in supporting the development of students' entrepreneurial competences (Somià & Vecchiarini, 2024).

The integration of AI tools into such pedagogical models may enhance learning, by accelerating exploratory phases of the entrepreneurial process, and, as students can use AI-assisted tools to generate ideas, analyse potential markets, structure business plans and prepare presentations, all of these activities can support the development of business planning, communication, opportunity recognition competences, while encouraging students to critically evaluate AI-generated outputs.

Nevertheless, current research suggest that AI-based systems are most effective when used in combination with collaborative learning and human mentoring, because AI can support idea exploration, but information processing, strategic decision-making, contextual judgement and ethical considerations remain mostly and strongly dependent on human expertise and reflective discussion (Kasneci et al., 2023; Park et al., 2025).

Although existing studies highlight the pedagogical potential of AI tools in entrepreneurship education (Pastarmadzhieva & Angelova, 2025), empirical research examining how learners perceive the role of AI-supported learning activities in competence development remains limited and, in particular, there is a need for exploratory studies that analyse participants' experiences within structured educational contexts where AI tools are integrated into entrepreneurship learning activities. Recent conceptual work has also begun to discuss the broader implications of AI for entrepreneurial practice, including the emergence of AI-enabled individual entrepreneurship (Ganuthula, 2025).

Methodology

The study employs an exploratory pre–post survey design combining quantitative and qualitative data in order to analyse participants' perceptions regarding the role of AI-supported learning activities in the entrepreneurial competence development. The study is based on the implementation of a pilot entrepreneurship course integrating AI tools into competence-oriented learning activities.

The pilot course was organised at the R&D Institute of Transilvania University of Brașov, Romania, and involved 41 participants from 6 European countries, including both students and academic staff or trainers. This structure reflects the dual learning objective of the course: developing entrepreneurial competences among learners while also familiarising educators with AI-supported teaching practices. The support material for the pilot course is available in open access on Zenodo at https://zenodo.org/records/16983067. The number of downloads reached 100 at the moment of writing the current article, indicating a significant interest in the proposed course.

The pilot course consisted of several modules designed to support the development of entrepreneurial competences and to familiarise participants with AI-supported learning activities. The structure of the pilot course is presented in Table 2.

Table 2. Structure and pedagogical rationale of the SEEN pilot course

Module	Domain	Justification
Entrepreneurship	Business Administration	Provides the conceptual foundations of entrepreneurship and business idea development.
AI Tools for Entrepreneurs	Computer Science	Introduces AI tools that support idea generation, market exploration and business planning in entrepreneurial learning activities.
Research Project Management	Management	Develops project management competences necessary for implementing business ideas and managing entrepreneurial projects.
Human Skills for Entrepreneurs	Pedagogy	Focuses on soft skills such as communication, critical thinking and interpersonal interaction relevant for entrepreneurial activity.
Team and Team Management	Management	Addresses collaborative work and team coordination required in entrepreneurial projects.

Source: Authors' own elaboration.

Data collection regarding the satisfaction/impression/impact/interest in the pilot course relied on two voluntary and anonymous questionnaires administered before and after the pilot course and the questionnaires were designed to explore participants' attitudes toward entrepreneurship, familiarity with AI tools and perceptions regarding the usefulness of AI-supported learning activities for developing entrepreneurial competences. Also, the survey items were designed to capture participants' perceptions regarding the usefulness of AI-supported learning activities and their contribution to the development of entrepreneurial competences, in line with the research questions of the study. Participation in the surveys was voluntary, and no personally identifiable data were collected and the study followed institutional ethical guidelines for educational research, and respondents were informed about the purpose of the data collection.

The number of respondents differed between the two stages of the data collection process, as illustrated in Table 3.

Table 3. Survey participation across the data collection stages

Stage	Participants
Course participants	41
Pre-course respondents	23
Post-course respondents	10

Source: Authors' own results.

Due to anonymous data collection procedures, pre-course and post-course responses could not be matched at the individual level and, consequently, the analysis focuses on descriptive comparisons between the two stages rather than on individual longitudinal changes.

The questionnaires were developed within the framework of the EU funded SEEN project training methodology and included both quantitative and qualitative components. Quantitative items were measured using a five-point Likert scale (1 = very low level; 5 = very high level). In addition, open-ended questions allowed participants to reflect on their experiences with AI-supported learning activities.

The survey explored four main dimensions relevant to entrepreneurship education:

- interest in entrepreneurship and entrepreneurial intentions;
- familiarity with and attitudes toward AI tools;

- perceived development of entrepreneurial competences (idea generation, planning, communication, pitching and teamwork);
- perceived usefulness of the learning activities implemented during the pilot course..

Examples of survey items included questions and statements such as:

- How confident do you feel about integrating AI tools into your work or entrepreneurial projects?
- In which areas of entrepreneurship would you be most interested in applying AI tools?
- AI tools help me generate entrepreneurial ideas.
- AI tools are useful for structuring business plans or preparing presentations.

Given the exploratory nature of the study and the limited number of responses, the analysis relies primarily on descriptive statistics (Heumann et al., 2023). Quantitative data were analysed using descriptive statistics, including mean values in order to identify trends in participants' perceptions regarding competence development and the usefulness of AI-supported activities. Qualitative responses were analysed using a thematic approach in order to identify recurring patterns related to the perceived benefits and limitations of AI tools in entrepreneurship learning contexts.

It should be noted that the post-course response rate was limited (10 responses), which restricts the possibility of drawing strong empirical conclusions. Thus, the results should be interpreted as exploratory insights derived from a pilot educational intervention and not as generalisable findings.

Results and discussions

Overall, respondents reported relatively high levels of perceived competence development across several entrepreneurial competences addressed during the pilot course. Table 4 summarises the average post-course scores reported by participants regarding the perceived development of selected entrepreneurial competences.

Table 4. Perceived development of entrepreneurial competences after the pilot course

Competence area	Mean score (post-course)
Pitching skills	4.2
Communication and collaboration	4.2
Project planning and structuring	4.0
Confidence in using AI tools for entrepreneurial tasks	4.4

Source: Authors' own results.

The results suggest that respondents perceived the learning activities implemented during the course as supportive for developing several entrepreneurial competences, pitching skills and communication competences received relatively high scores, with an average value of 4.2 out of 5. These results are consistent with the structure of the course, which included intensive teamwork activities and pitching sessions where learners developed and, at the end of the course, presented entrepreneurial ideas.

A notable result concerns respondents' confidence in using AI tools for entrepreneurial tasks, which reached the highest average score (4.4). This finding indicates that participants perceived AI-supported learning activities as contributing to their confidence in using AI tools for entrepreneurial tasks. Thematic analysis of the open-ended responses regarding participants' intended future use of AI tools revealed several recurring themes. Participants particularly

emphasised the usefulness of AI tools for idea generation, structuring business concepts, and preparing entrepreneurial presentations. For example, when asked how they plan to use AI tools in their future work, several responses highlighted their role in supporting ideation and efficiency: "As a supportive tool for repetitive tasks.", "Ask for solutions and enhancing my own ideas.", "Reduce time, brainstorming when needed, for easy repetitive tasks." or "I am going to use new tools to develop my ideas."

These responses suggest that participants perceive AI tools as practical aids that support the early stages of the entrepreneurial process, enabling them to quickly explore alternative ideas and refine their business concepts.

From a learning perspective, these findings suggest that participants perceived AI as cognitive supports that facilitate exploratory thinking and iterative refinement of ideas during entrepreneurship education activities. In particular, several AI-based tools based were perceived as helpful for brainstorming business ideas, generating structured outlines for business plans, and refining the narrative structure of entrepreneurial pitches, highlighting their potential to support early-stage entrepreneurial learning and innovation processes.

These findings are consistent with previous research highlighting the pedagogical potential of AI tools in entrepreneurship education (Chen et al., 2024).

At the same time, respondents recognised the limitations of AI tools in more complex decision-making processes. Qualitative responses indicated that while AI-supported tools can accelerate idea exploration and content organisation, participants primarily perceived them as supportive instruments rather than decision-making systems. Final decisions regarding feasibility, strategic direction and ethical considerations require discussion with peers and mentors. This observation reinforces the interpretation that AI tools function primarily as complementary instruments within entrepreneurial learning rather than substitutes for human expertise.

Overall, the results provide exploratory support for the first research question (RQ1), suggesting that course participants perceived AI-supported learning activities as useful for developing entrepreneurial competences, particularly in areas related to idea generation, planning and communication. Regarding the second research question (RQ2), the findings indicate that AI tools appear to be most beneficial in the early and intermediate stages of the entrepreneurial process, such as idea exploration, structuring information and preparing presentations.

Given the exploratory nature of the study and the limited number of post-course responses, these findings should be interpreted cautiously, as they only provide initial insights into how AI-supported learning activities can be integrated into entrepreneurship education in ways that support competence-oriented learning.

Limitations

The findings of this study should be interpreted in light of several limitations. First, the study was conducted within a pilot entrepreneurship course implemented as a small-scale educational intervention involving participants from six European countries. As such, the results reflect the specific learning context in which the course was delivered and should not be interpreted as broadly generalisable conclusions.

Second, the number of post-course questionnaire responses was relatively limited. Although the pilot course involved 41 participants, only 10 respondents completed the post-course survey. This relatively low response rate represents a potential limitation, as the findings may primarily reflect the perceptions of those participants who were more engaged in the course activities or more motivated to provide feedback. Consequently, the results should be interpreted

as exploratory insights rather than as conclusive evidence regarding the effectiveness of AI-supported learning activities.

Third, the study relies on participants' self-reported perceptions collected through questionnaires. While perception-based data are valuable for understanding how learners experience educational interventions, they do not allow direct measurement of objective competence development. Future research could therefore complement perception-based analyses with additional methods, such as performance-based assessments, longitudinal studies, or comparative course designs.

Despite these limitations, the study provides useful exploratory insights into how AI tools may be perceived and used within entrepreneurship education settings, particularly in early-stage pedagogical experiments involving AI-supported learning activities.

Conclusion

This paper explored the integration of artificial intelligence tools into entrepreneurship education through the implementation of a pilot course designed to support the development of entrepreneurial competences. The study focused on participants' perceptions regarding the usefulness of AI-supported learning activities in areas such as idea generation, planning, communication and pitching.

The findings provide exploratory insights into how AI tools may support competence-oriented learning processes in entrepreneurship education and participants reported relatively high levels of confidence in using AI-supported tools for entrepreneurial tasks and perceived these technologies as particularly useful during the early stages of the entrepreneurial process. AI tools were mainly associated with idea exploration, structuring business concepts, organising business plans and refining the narrative structure of entrepreneurial presentations. All these activities suggest that AI tools can function as cognitive supports that facilitate iterative learning processes and help students experiment with different entrepreneurial ideas.

At the same time, the results indicate that participants perceived clear boundaries in the role of artificial intelligence within entrepreneurial learning. Thus, while these technologies were considered useful for generating ideas and structuring information, strategic decision-making, feasibility evaluation and ethical judgement were still associated primarily with human mentoring and collaborative reflection. This finding reinforces the perspective considering that AI should be understood as a complementary educational only and not a substitute for human expertise in entrepreneurship education.

From a practical perspective, the study suggests that the integration of AI-supported tools into entrepreneurship education can enrich competence-based learning environments when these technologies are embedded in structured pedagogical activities. AI-supported tools may help students accelerate exploratory phases of the entrepreneurial process, support creative thinking and facilitate the preparation of entrepreneurial communication tasks such as business pitches, but it should be mentioned that effective implementation requires pedagogical guidance that encourages critical evaluation of AI-generated outputs and combines technological tools with collaborative learning and mentoring.

Several limitations should be acknowledged. First, the study is based on a pilot educational intervention with a very limited number of post-course responses, which makes the possibility of drawing strong empirical conclusions impossible. Second, the anonymous nature of the questionnaires did not allow pre- and post-course responses to be matched at the individual level, thus, the findings are and should be interpreted only as exploratory insights.

Future research could expand this line of inquiry by analysing larger cohorts of participants and by using research designs that allow longitudinal tracking of competence development. Future research could also investigate how specific categories of AI tools contribute to different stages of the entrepreneurial process, as well as how pedagogical models combining AI-supported learning and human mentoring can best support competence development in entrepreneurship education.

Overall, the study contributes to the growing discussion on the pedagogical role of artificial intelligence in higher education by highlighting how AI tools can support entrepreneurial learning processes when integrated into structured educational activities. Rather than replacing human expertise, these technologies appear to function most effectively as complementary instruments that support creativity, idea development and communication within entrepreneurship education contexts.

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