

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

The International Journal of Management Education

journal homepage: www.elsevier.com/locate/ijme

Redefining entrepreneurship education in the age of artificial intelligence: An explorative analysis

Mariangela Vecchiarini^a, Tatiana Somià^{b,*}

^a The University of North Georgia, 82 College Cir, Dahlonega, GA 30597, USA

^b Free University of Bozen/Bolzano and Visiting Scholar at Ohio University, Ohio, USA

ARTICLE INFO

Keywords:

Artificial intelligence

ChatGPT

Entrepreneurship education

ABSTRACT

AI-powered chatbots, such as ChatGPT, have gained significant attention in the education field due to recent advancements and growing popularity. This article investigates the potential uses of ChatGPT in higher education, specifically within entrepreneurship courses, and explores the benefits and challenges associated with its implementation. To address the need for further research on the use of AI in business education, a survey was conducted among undergraduate students enrolled in entrepreneurship courses. The survey focused on students' awareness and usage of ChatGPT, perceived benefits and limitations, and integration strategies for this tool into entrepreneurship courses. As entrepreneurship education evolves alongside AI advancements, AI technologies like ChatGPT can play a transformative role in various activities, from idea generation, to crafting a business model, writing a business plan, or conducting customer interviews. The study's results indicate that ChatGPT has the potential to streamline processes, increase students' efficiency, and support certain types of creativity. The article also addresses concerns regarding ChatGPT accuracy and reliability, emphasizing the importance of using it critically. This research contributes to the understanding of how AI can enable entrepreneurship education and provides valuable insights for educators, students, and institutions seeking to leverage AI in the classroom.

1. Introduction

Artificial Intelligence (AI) is changing the entrepreneurial landscape by transforming how businesses are created, grown, and operated (Chalmers et al., 2021). AI refers to a wide range of digital technologies that can efficiently process knowledge to assist humans in completing different tasks (Haenlein & Kaplan, 2019). Compared to traditional computers, AI systems can learn and adapt in a flexible way. In other words, traditional software never changes, unless humans update it, while AI keeps learning and improving by itself.

Recent advancements in AI, such as automation, data analytics, and Natural Language Processing (NLP), have simplified operations for many types of companies across industries. Furthermore, AI not only contributes to the development of established companies but also facilitates and supports new ventures' creation, as it might influence individuals' entrepreneurial intentions, opportunity recognition, and the way new business ideas are found and exploited (Chalmers et al., 2021). Additionally, AI can assist entrepreneurs in making strategic decisions (Colson, 2019), supporting the sales function (Gimmon & Levie, 2021), and reducing costs for new

* Corresponding author. The University of North Georgia, 82 College Cir, GA, 30597, USA.

E-mail addresses: mariangela.vecchiarini-piazza@ung.edu (M. Vecchiarini), tsomia@unibz.it (T. Somià).

<https://doi.org/10.1016/j.ijme.2023.100879>

Received 1 May 2023; Received in revised form 22 September 2023; Accepted 3 October 2023

Available online 7 October 2023

1472-8117/© 2023 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

ventures through the implementation of AI-powered bots to manage accounts and operations (Esteva et al., 2019).

With the exponential growth of digital technologies across industries, there is an increasing demand for AI fluency in the business environment. Business schools are recognizing this need and making efforts to incorporate fundamental AI skills and knowledge into their programs and curricula (Govindarajan & Sikka, 2020). However, limited research has been conducted on the specific role of AI, particularly ChatGPT, in teaching entrepreneurship (Ratten and Jones, 2020).

The implementation of AI, and specifically ChatGPT, in higher education can offer numerous advantages. Educators can leverage ChatGPT to design new courses, develop teaching materials, grade assignments, answer students' questions, or conduct research, among other applications. On the other hand, students can benefit from using ChatGPT to receive feedback on assignments, create project outlines, prepare for exams, and gather information more quickly (Cribben & Zeinali, 2023).

Given the growing relevance of AI in the contemporary business environment and the limited research on its role in higher education, there is a clear need to explore and comprehend how AI technologies can be effectively used in teaching business subjects. This study seeks to address this gap by examining the potential applications, benefits, and challenges associated with the integration of ChatGPT in entrepreneurship courses. Through this exploratory study, this research aims to provide valuable insights for educators, students, and institutions seeking to enhance entrepreneurship education through AI-driven approaches, thereby contributing to the advancement of teaching practices in this domain. ChatGPT has the potential to completely transform the way certain activities are traditionally done in entrepreneurship courses, from the idea generation process to crafting a business model, practicing customer interviews, revising a business plan, or refining an elevator pitch.

As the technology behind chatbots continues to evolve, it is important to acknowledge that people's perceptions and expectations might be biased by the current hype surrounding AI, especially when compared to the actual level of productivity that these new technologies can currently provide. Amara's Law refers to the idea that people tend to overestimate the impact of new technologies in the present, and to underestimate their long-term influence (Amara, 1984). This phenomenon has been observed in the adoption of several world-changing technologies in the past, like personal computers and the Internet, and it is likely to be valid also in the case of AI. Despite many are anticipating an "AI Winter", where the AI bubble will burst due to expectations being raised too high, it is evident that the technological productivity of chatbots will continue to increase, albeit that might happen at a slower rate than anticipated.

Based on these considerations and awareness, the present study explores the implications of using an AI-powered chatbot, ChatGPT, in entrepreneurship education for a business model canvas development activity, with an exploratory survey of 53 students from a public university in the Southeast region of the United States. To the authors' best knowledge, this is the first empirical study looking at the practical implications of adopting ChatGPT in entrepreneurship courses and especially for activities related to the business model canvas. The article provides a comprehensive review of the literature on ChatGPT, its benefits and limitations, and proceeds with a discussion of how this technology has been implemented in higher education so far, and in what way it could benefit entrepreneurship education. Subsequently, the authors present the methodology adopted and the results of the study, drawing a comparison between the responses obtained by the participating students and the existing literature on the topic. Finally, the theoretical and practical implications of this study are discussed, together with a reflection on the study's limitations and future research opportunities.

2. Review of the literature

2.1. Using ChatGPT in higher education: benefits and limitations

Chatbots (*chatting robots*) are software applications that use AI to talk to humans in natural language through voice or text conversations (Essel et al., 2022). With the recent advances in Natural Language Processing, there has been a significant increase in the use of chatbots in higher education, aimed at developing knowledge for individual students on specific topics (Han & Lee, 2022; Pérez et al., 2020). The existing studies on the adoption of chatbots in higher education generally showed positive results, with students actively using them to access information, ask questions, and receive support with different assignments and tasks (Hiremath et al., 2018; Mendoza et al., 2020; Mikic-Fonte et al., 2018). Chatbots can help solve the challenge of insufficient student-instructor interaction, particularly in large universities or in online courses, by providing automatic and fast responses to students' questions, which can assist educators with their workload and deliver a more engaging learning experience to students (Essel et al., 2022).

Currently one of the most popular chatbots available to the public is ChatGPT, an AI language model based on the Generative Pre-trained Transformer technology, a deep learning technique that creates text like human writing. A free preview of ChatGPT was released in November 2022 by OpenAI, a lab doing research on different AI systems, including machine learning, robotics, and natural language processing. At the time of this writing, ChatGPT is one of the largest language models available, trained on 175 billion parameters for GPT3 and 100 trillion for GPT4 (the most recent and premium version released in March 2023), but this could change quickly (García-Peñalvo, 2023).

ChatGPT is trained on a vast amount of text through self-supervised learning, which allows it to understand language at a deep level and perform a wide range of natural language processing tasks with high accuracy. In simple words, ChatGPT can interact with humans in a conversational way, generating text on various topics. In addition to that, ChatGPT keeps improving through Reinforcement Learning from Human Feedback, where the chatbot processes human feedback on the accuracy and quality of its responses (Choi et al., 2023). ChatGPT can engage in conversation and respond to individuals' queries, but it can also create music, poems, explain complex concepts, or write and fix computer code, to name a few. One of the current limitations of ChatGPT is that it does not have access to real-time information and its current cutoff is in September 2021 (Qadir, 2022).

After being launched, ChatGPT reached one million users in less than a week, becoming a hot topic across social media and news

outlets worldwide (Baidoo-Anu & Ansah, 2023), and causing a mix of emotions ranging from catastrophic prophecies to uncontrolled euphoria (Rudolph et al., 2023). The debate has been particularly controversial in academia (García-Peñalvo, 2023). The use of ChatGPT in education and scientific production has raised concerns about its accuracy and ethical implications (Stokel-Walker, 2022). Although ChatGPT can be used to write a research paper, it lacks critical thinking and tends to present information redundantly (Thorp, 2023). One major issue with ChatGPT is that, at its current state of development, tends to suffer from “artificial hallucinations”, occasionally producing information that does not exist, which is referred to as “deep fake text” (Else, 2023), together with books or academic articles that were never written or published (Dwivedi et al., 2023; Rudolph et al., 2023). ChatGPT also has limited contextual understanding, which can lead to irrelevant responses when the question asked is ambiguous or incomplete. Additionally, it lacks common sense, leading to the possible misinterpretation of certain words depending on the context, such as in Choi et al.’s (2023) study, where the authors administered ChatGPT a Law School exam and the term “lump sum payment” was interpreted by the chatbot literally rather than for its technical meaning.

Another common concern is that the use of ChatGPT in education is a threat to academic integrity and the debate on what constitutes “AI plagiarism” is ongoing (Dwivedi et al., 2023), while some have also observed that students relying too heavily on chatbots to complete coursework could become passive learners (Stokel-Walker, 2022). In other words, the line between students using ChatGPT as a tool that facilitates, supports, and enhances their learning experience and students using it to plagiarize and avoid completing coursework on their own, is permeable.

Some universities and educators have already prohibited the use of ChatGPT, but this approach is short-sighted, as students will find ways to use it (Rosenzweig-Ziff, 2023). ChatGPT can also contribute to the spread of misinformation and generate inaccurate or biased responses, based on the quality of the data it accesses, which is the reason why some countries around the world have recently banned its use (Borji, 2023; Dwivedi et al., 2023).

Despite the current limitations, if implemented in a controlled environment and under the guidance of educators, some of these challenges can be addressed, and ChatGPT can potentially help higher education students and instructors across disciplines in many ways, as it is discussed in the next paragraphs. Some scholars have praised ChatGPT as a tool that could enhance learning and change the traditional role of instructors, by acting as a 24/7 “very patient tutor, explaining a concept in a number of different ways” (Dwivedi et al., 2023, p. 41). When used with the goal of learning, ChatGPT can increase students’ adaptability and provide a better autodidactic experience (Firat, 2023). Although the controversy around the utilization of ChatGPT in education is ongoing, it is important to look at how this technology could be used in ways that would help students meet their learning objectives, while also preserving academic integrity.

2.2. Artificial intelligence chatbots in entrepreneurship education

AI is considered an enabler for entrepreneurs, as it can support new venture processes in different ways (Chalmers et al., 2021), so the question is: how can AI enable entrepreneurship education? Since its inception, the development of entrepreneurship education has been driven by the evolution of the business environment and technological advancement (Vecchiarini et al., 2023). As entrepreneurship itself continues to change and develop under the enabling force of AI, we can expect that also entrepreneurship education will evolve and adapt to the new technological standards, as universities are facing the increasing pressure of delivering entrepreneurially minded graduates that can help modern society with the current needs and challenges (Kawamori et al., 2020; Ribeiro et al., 2020).

The use of chatbots has been studied in several educational contexts, such as medical and nursing training (Chang et al., 2022; Khan et al., 2023), engineering (Qadir, 2022), computer science (Okonkwo & Ade-Ibijola, 2020), and law (Choi et al., 2023), but there is a lack of studies on the use of AI-powered Chatbots in business education, including entrepreneurship education. While the use of AI in entrepreneurship education is a topic of growing interest in the academic community, more studies are needed to understand how different AI technologies can be implemented to support entrepreneurship educators and students (Chen et al., 2021; Ratten & Jones, 2021b). AI systems could be used in entrepreneurship education in several manners. AI could be implemented to provide personalized feedback to students on their business plans and pitch presentations. Students could gain faster access to relevant information such as licenses and permits, intellectual property, entrepreneurial finance, or market data. AI chatbots, such as ChatGPT, could help students identify and interpret patterns in large datasets, for a more effective assessment or identification of business opportunities (Mavlutova et al., 2020).

As AI systems offer an easier access to more structured and focused information compared to traditional search engines, and they can also provide specific feedback, they could be used for brainstorming and idea generation activities in entrepreneurship courses (Luan et al., 2023). Students could also test their knowledge before taking a test, ask questions on entrepreneurship-related topics, and receive help to complete different types of assignments (Dwivedi et al., 2023). AI can also be used to create simulation games that allow students to test their business ideas and experience the start-up world in a virtual environment before doing that in the real world (Fox et al., 2018). The future of entrepreneurship education will likely involve a technology-driven classroom featuring immersive interactions through AI and augmented reality (Ratten & Jones, 2021a). New business graduates are required to be familiar with the technology advancements that are disrupting the way businesses are created, operated, and scaled, and therefore it is crucial to include such technologies and perspectives in the classroom (Giuggioli & Pellegrini, 2022).

The present study looks at the strengths and weaknesses of adopting ChatGPT in business education, through a survey of 53 undergraduate college students from entrepreneurship courses at a state university in the Southeast region of the United States, who used ChatGPT to improve a business model canvas they had previously developed in class without the aid of AI. The present research aims to answer the following questions:

1. What is the current level of awareness among students about ChatGPT and for what purpose are they using it?
2. What are the perceived benefits and limitations of using ChatGPT to support entrepreneurship education, more specifically business model development?
3. How can ChatGPT be effectively integrated into entrepreneurship courses, and what are the challenges and opportunities associated with its implementation?

3. Methodology

The students involved in the study were enrolled in face-to-face and online undergraduate entrepreneurship courses at a public university in the Southeast region of the United States during the Spring semester of 2023. Prior to being introduced to ChatGPT by their instructor, the students created a business model canvas, which is a framework explaining how an organization “creates, delivers, and captures value” (Osterwalder & Pigneur, 2010 p. 14). To build a business model canvas, the students need to describe the business’ value proposition, customer segments, customer relationships, channels, revenue streams, key partnerships, key resources, key activities, and cost structure.

The business model canvas was chosen for this study because it is one of the most used frameworks in modern entrepreneurship education. According to an April 2023 study from [TeachingEntrepreneurship.org](https://teachingentrepreneurship.org), a leading organization in the entrepreneurship education field, 88% of instructors teach using some version of a Canvas and only the 8% uses the traditional business plan format in their courses. The first version of the business model canvas developed by the students without using AI, was presented and discussed in class in the first half of the semester. Traditionally students would then proceed to interview potential customers to test their product and validate their business hypotheses. However, students were given the option to further improve their business model canvas by using ChatGPT prior to engaging in customer interviews.

The instructor introduced the students to ChatGPT and provided a demo on how to use it. After the introduction, students were given 1 h to use ChatGPT with their teams or on their own, depending on who was involved in their semester-long startup project. Students asked ChatGPT different questions concerning the nine building blocks of their business model canvas. The ChatGPT activity was done during class time, so that the instructor could help, if needed, but the students took the survey outside of class to ensure anonymity. The students were given the freedom to decide whether to include ChatGPT’s feedback in their business model canvas, or ignore it, based on their perception of how valuable, accurate, and needed it was for improving their business idea. The ChatGPT activity was not mandatory, and students were offered an alternative assignment in case they were not interested in using the OpenAI chatbot. The students who decided to use ChatGPT were given the option of taking a completely anonymous survey on their learning experience. Out of 70 students enrolled in the two classes, 53 completed the survey. After finishing the activity, students were given one week to take the anonymous online survey, administered through Qualtrics.

The survey included questions aimed at exploring the participants’ current knowledge and use of ChatGPT, and their experience employing this tool to develop their business model canvas.

The format used was a mix of multiple-choice and open-ended questions. None of the questions were mandatory and respondents had the freedom to skip one if they wanted. A list of the questions included in the survey is available in [Appendix 1](#). The present study has an exploratory nature and does not seek statistical significance, but the authors anticipate observing comparable patterns in similar populations (Smith et al., 2022).

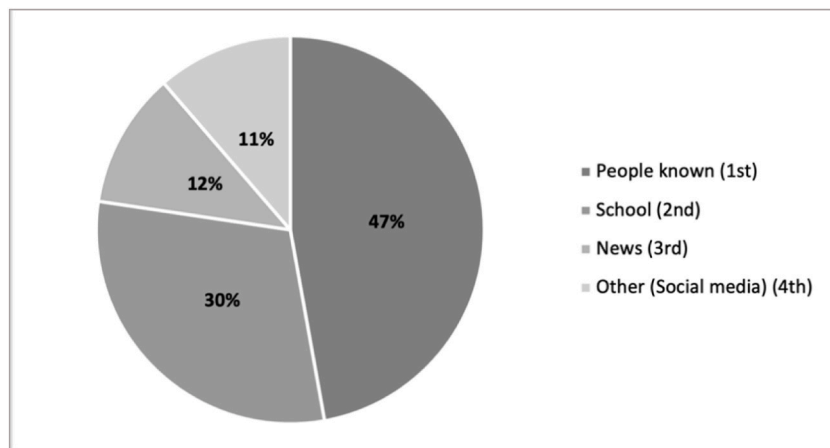


Fig. 1. Where students learned about ChatGPT.

Source: Authors’ elaboration

4. Findings

4.1. Sample description

All respondents are pursuing a Bachelor of Business Administration with majors in Management, Marketing, Accounting, or Information Systems. The sample included 18 female students and 35 males of ages 18–24 (84.9%), 25–34 (11.3%), and 35–44 (3.8%). The sample was composed by 30 seniors, 18 juniors, and 5 sophomores, 35 of which attend school in a hybrid format (taking some classes online and some in person), 14 fully in person, and 4 completely online.

4.2. Students' knowledge and use of ChatGPT

Before participating in the classroom activity, 66% of students knew what ChatGPT was and heard about it from people they know (47%), at school (30%), from the news (12%), or from social media (TikTok, twitter, YouTube, Podcasts) and online advertising (11%) (see Fig. 1). Although 2/3 of the students were already familiar with ChatGPT, only 40% used it, mainly for school or fun.

4.3. Students' exposure to ChatGPT in the university environment and current uses

According to the students' who completed the survey, most of their instructors did not talk about ChatGPT in class (62%), but those who did presented it mainly as a good opportunity to support teaching and learning (53%), while only 32% mentioned it as a threat to higher education and a way for students to "cheat" on tests and assignments (see Fig. 2). Only 19% of students had instructors who prohibited the use of ChatGPT in their classes and 48% of professors used it mainly to support assignments and class activities in entrepreneurship, project management, and digital marketing courses.

4.4. Students' perception of the advantages and disadvantages of utilizing ChatGPT

Students were asked to rate the overall benefit of using ChatGPT to further develop their business model canvas from 1 (very poor) to 5 (excellent). The average rating of benefits of using ChatGPT was 4.19, more than "Good" (4). Students were also asked to assess the overall limitations of using Chat GPT to improve their business model canvas from 1 (very weak) to 5 (very strong). On average, students rated the limitations of using ChatGPT rather weak (2.57) (see Fig. 3). The standard deviation is 0.81 for both means, which therefore represents the data relatively well.

Students were also asked open-ended questions on the benefits and limitations of using ChatGPT to develop a business model and make business decisions. Table 1 presents a summary of the main benefits and limitations noted by students when they used ChatGPT to improve their business model canvas. For each aspect, sample responses from the students are provided. It is worth noting how students have different and sometimes opposing views on the pros and cons of using this tool, which is consistent with the mixed opinions expressed in recent academic publications and media coverage (Dwivedi et al., 2023).

4.5. Benefits and limitations observed by the students

Table 1 summarizes some of the main benefits and limitations of using ChatGPT observed by the respondents and offers some excerpts of their answers as examples of each factor discussed. Coherently with the contrasting opinions emerged from recent

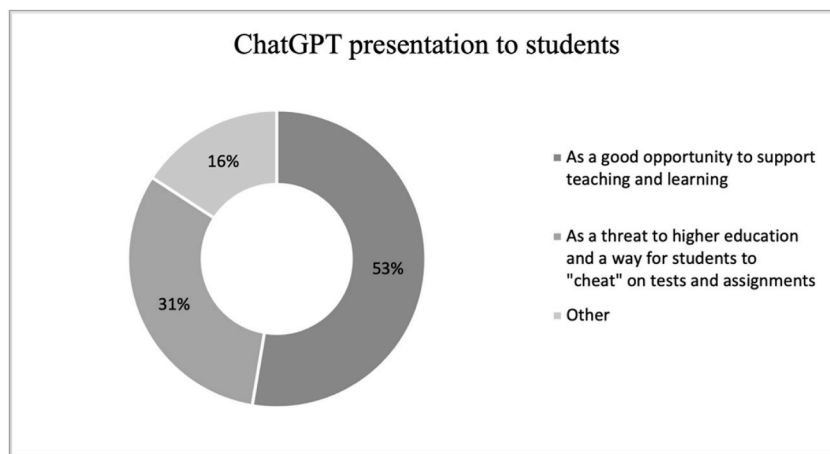


Fig. 2. How other instructors introduced ChatGPT to the students.

Source: Authors' elaboration

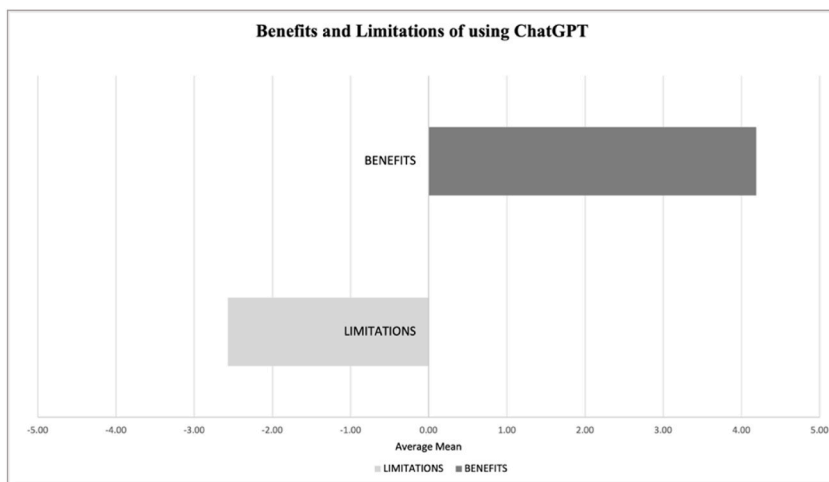


Fig. 3. Students' assessment of benefits and limitation of using ChatGPT.

Source: Authors' elaboration

publications (Dwivedi et al., 2023), some students found that using ChatGPT could help them be more creative and find new ideas, while others thought that the chatbot lacked creativity, and sounded robotic and standardized.

In her 1998 article, Boden states that while it is unlikely that scientists will ever be able to engineer a “new Shakespeare” or a “new Mozart”, some types of creativity can be reproduced by AI. Creativity is the ability to find novel ideas, but the idea itself can be “new” to the person who had it (P-creativity), or an historically new idea (H-creativity), which nobody else has ever had before; AI mostly supports P-creativity, but there are some documented cases of H-creativity generated by AI, with ideas that were awarded a patent (Boden, 1998). H-creativity can be transformational or exploratory. “Transformational” is the highest-valued form of creativity and entails generating something completely new that breaks away from known patterns and knowledge. This form of creativity has been observed only in humans, and there is an ongoing debate on whether AI can display this type of skill.

On the other hand, since AI programs like ChatGPT can analyze large amounts of information, identify patterns, and help people recognize connections among data that may otherwise go unnoticed, they're considered a potential support to “exploratory creativity”, which refers to the creation of new ideas based on the exploration of structured conceptual spaces (Boden, 1998). AI can also aid “combinational creativity” by combining existing concepts in new ways (Han et al., 2018), but there is no guarantee that these new combinations will be interesting or create value (Chen et al., 2018). The observations made by the students are therefore consistent with the existing literature, which suggests that ChatGPT can be viewed as a creative source depending on the definition of creativity we adopt and the desired outcome.

The accuracy and reliability of the text produced by ChatGPT is a general concern in the literature (Borji, 2023), which is an aspect that also emerged from the students' responses to the survey. The quality of the data on which ChatGPT and other NLP technologies are trained, determines the accuracy of the text they produce (Bender et al., 2021). While some students found that ChatGPT provided them with new insights and useful information, others said that they didn't trust it as the sources used are unknown. Some students even received wrong information from ChatGPT, which is something that has been observed in several studies that pointed out the tendency of ChatGPT to generate credible fake text (Else, 2023; Shen et al., 2023).

According to students' feedback, ChatGPT has been found helpful in improving efficiency and productivity by providing outlines, summarizing information, and assisting them with coursework. Coherently with what reported in recent publications (Essel et al., 2022), students appreciated ChatGPT's ability to take over repetitive tasks and reduce workload. However, some respondents complained that incorrect wording of prompts can lead to wrong answers or misinterpretation of questions by the chatbot. Additionally, several students mentioned that ChatGPT is unable to access real-time data and its lack of specificity, with many responses being broad and vague, without providing enough detail and specific information.

4.6. Business model canvas improvement using ChatGPT

The survey asked students what kind of business advice they requested from ChatGPT for the class activity and to provide examples of useful and useless answers provided by ChatGPT to improve the business model canvas. From the results of the survey emerged that students used ChatGPT mainly for asking advice on marketing (cited 27 times), competition analysis (cited 26 times), customers and market research (cited 24 times), legal aspects (cited 24 times), social media and App or Web design (cited 15 times) (see Fig. 4).

Regarding the responses received, students listed several examples of useful ones, and only a few responses that instead were not helpful.

Marketing and social media: Students looking for marketing advice found it useful when ChatGPT “recommended using low-cost email advertising” or provided them with the “buzz words” to include in their pitch deck and business model to get investors' attention.

Table 1
Benefits and Limitations of using ChatGPT according to students' perspective.

BENEFITS	EXCERPTS	LIMITS	EXCERPTS
Helps generating new ideas	<p><i>It is very helpful for bouncing ideas off. It gives you new and creative ideas.</i></p> <p><i>I feel that it could help come up with ideas that might not be thought about.</i></p> <p><i>Helps expand knowledge on subjects related to the idea.</i></p> <p><i>I think it is very good to get some inspiration and to help develop ideas.</i></p>	Lacks Creativity	<p><i>It is standardized and lacks creativity. It could make up the same things as what other people could get.</i></p> <p><i>Certain key words and phrases are overused. You still have to go in and fine tune the business model to sound less robotic.</i></p> <p><i>It isn't human and sometimes I feel as if it can't really interpret information and trends or make decisions as humans do.</i></p>
Provides new insights	<p><i>It is able to see and understand variables that we might not have considered.</i></p> <p><i>It can provide pointers and advice that someone wouldn't normally think of.</i></p> <p><i>It will generate questions you may not have even thought about asking.</i></p> <p><i>It can be used to create an example of an already existing business model or company in which it explains various concepts that were used to make that model or company successful.</i></p>	Unknown sources and accuracy of data	<p><i>Sometimes it does not give you accurate information due to limited database.</i></p> <p><i>When it can be fed accurate quantifiable information, it does a fantastic job of analyzing the data. It's qualitative assessment, should be taken with more caution.</i></p> <p><i>You don't know where GPT pulls its information from, so you don't truly know if it's credible or not. It could be giving you information from the easiest and most abundant sources like Wikipedia.</i></p> <p><i>I think that it is helpful to an extent. It gives answers but I do not know how much I trust the information given.</i></p> <p><i>There are a lot of unpredictable factors.</i></p> <p><i>I think it has limitations in being reliable. When receiving answers, I doubt the validity of the claims ChatGPT makes and leave the final judgement to myself.</i></p> <p><i>I think it is important to note that it can provide a good outline but not the correct answers.</i></p>
Provides a faster access to information and increases students' efficiency and productivity	<p><i>It gives a simple overview of the answer to your question.</i></p> <p><i>It really helps with giving you a great outline to follow.</i></p> <p><i>It can provide you with summaries and options to help with business decisions.</i></p> <p><i>I believe it streamlines the processes that don't require much thought but do require time and effort by automating basic computer tasks.</i></p> <p><i>It removes the busy work of the process and streamlines it so that human time can be used more efficiently.</i></p> <p><i>It helps us receive information instantly, and it is written thorough.</i></p> <p><i>Exposure to relevant data and information that would otherwise be difficult and time consuming to acquire.</i></p> <p><i>You are able to gather information extremely fast from multiple sources.</i></p> <p><i>It could help you gain information about other businesses to further lock in on what you want to do.</i></p>	Lack of specific and real time data	<p><i>You can't ask it specifics. Specifically, numbers or timelines.</i></p> <p><i>Can be too broad, may not cater to specific questions, does not necessarily access a database for specific information.</i></p> <p><i>A good portion of the information is not backed up by actual sources and can be unsubstantiated for assignments.</i></p> <p><i>It can't offer real time information about your area in terms of surveys/demand and statistics, which would be nice for aiding in the customer development portion of starting a business.</i></p> <p><i>It may not recognize the way you word a question.</i></p>
		Requires wording a prompt correctly	<p><i>It's mostly just finding a way to word a prompt correctly. I may mean something different than what the AI interprets.</i></p> <p><i>If you are not extremely specific with the questions you ask, the AI could gather irrelevant information that does not pertain to you and can affect your results.</i></p>

Source: Authors' elaboration

Marketing advice provided by ChatGPT and considered by the student as not particularly fitting for a small business food truck service was using "influencers on social media". Another student instead discussed how he used ChatGPT to generate filler text for the website of his business.

Competition analysis: Students considered beneficial the fact that ChatGPT explained them what channels are used by their main competitors, what are some additional customer segments they could consider for their business model canvas ("I asked for some customer segments for my business of choice, and it gave me five more, that I did not think of"), together with providing valuable insights on their "customers' needs and preferences". At the same time, a student pointed at the fact that ChatGPT can be unreliable, as he asked for competitors and their relative size and "some were posted twice under very similar names, and some were foreign to the market the business would be operating in".

Market Research: Students used ChatGPT to conduct additional market research, receiving useful insights to prompts such as

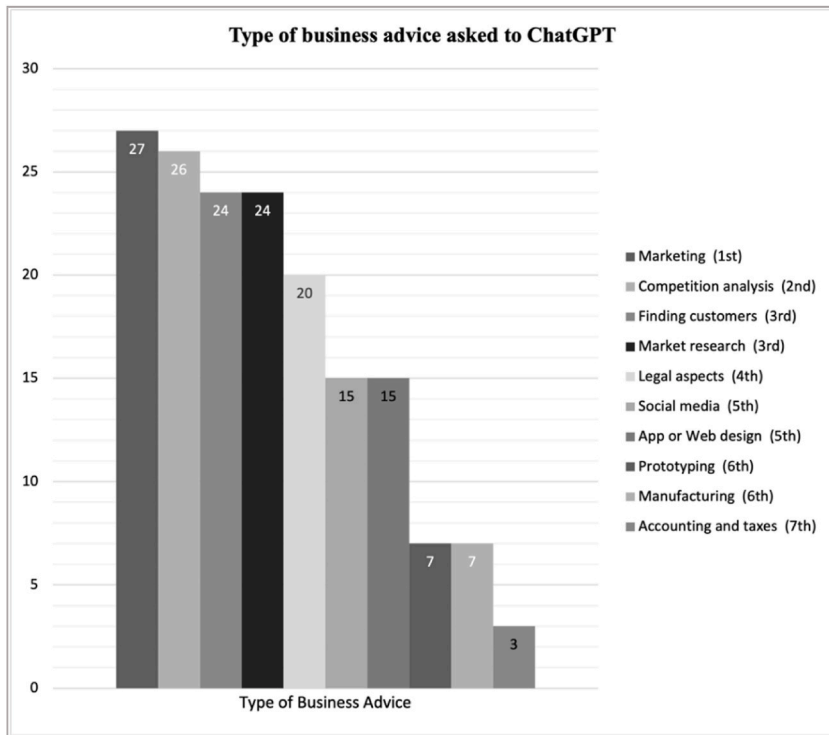


Fig. 4. Type of business advice asked by students to ChatGPT. Source: Authors' elaboration

“what are most coffee shops offering in terms of memberships and food products”, or “how large is the market for a composting business? Is there a need for it?”, but they also complained about it not being able to provide real-time data or local information (“It was not helpful for assessing the demand of a late-night coffee shop in (student’s hometown) because that falls in the real-time data field” or “I asked what the market size was and while the number is reasonable, there is a bit of doubt I hold with using this piece of data. I think this lack of trust within ChatGPT’s responses makes it a tool which should be used with greater due diligence”). A student even obtained inaccurate information after asking who the founder of a famous company was and receiving the wrong name.

Legal Aspects: Some participants found ChatGPT particularly useful for asking legal questions, such as: “I asked about the legal aspects of opening a drive through convenience store in (State where the student lives) and it responded with all I needed to know”, “(I asked how) to publish an application to the App Store, (and it said) you will typically need to obtain the appropriate license(s) from Apple, listing them”, “I had it list out the main permits required for starting a coffee shop in (student’s hometown)”. Other participants instead received poor advice from ChatGPT, who said they didn’t need an insurance for their business, or any licenses to become a contractor in the state where they live.

All the aspects of business model canvas were changed or improved by students after using ChatGPT, even if with different

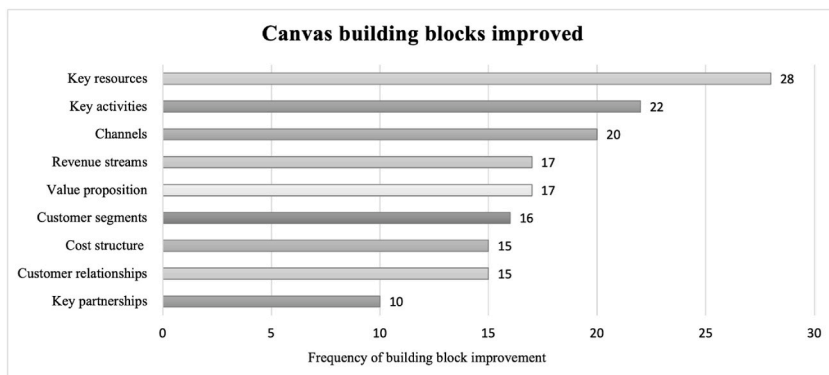


Fig. 5. Canvas building blocks improved by students using ChatGPT. Source: Authors' elaboration

frequency. Respondents decided to change or improve more often: Key Resources (28 students), Key activities (22 students) and Channels (20 students), which are some of the building blocks that are more heavily research based (See Fig. 5).

5. Discussion

This study evaluates students' familiarity, usage, and perception of ChatGPT, and provides valuable insights into its potential applications and limitations in entrepreneurship education. According to the findings of this exploratory research, even though a high percentage of the students were already familiar with ChatGPT, only a few used it, indicating the need for more training on how to effectively use AI tools in educational contexts. Results showed that the adoption of ChatGPT in entrepreneurship courses has the potential to help students be more creative and find new ideas, although some respondents felt that the chatbot lacked creativity and sounded too robotic, which is consistent with the current literature that is divided on the creative potential of AI (Chen et al., 2018). The fact that most students considered ChatGPT helpful in improving efficiency and productivity by taking over repetitive tasks and reducing workload suggests that it could be useful for streamlining certain processes in entrepreneurship education.

Respondents found that ChatGPT improved their business model canvas, especially the Key Resources, Key Activities, and Channels, which are some of the building blocks that usually require more research. They also used ChatGPT to receive advice on marketing, customer segments, and competitors. Students received helpful insights on their customers' needs and preferences, and many found ChatGPT to be a practical tool for asking legal questions and receiving information on business permits and licenses.

As previously discussed, ChatGPT has been praised for its ability to accelerate the completion of simpler tasks such as conducting research, summarizing information, or interpreting data, but its impact goes way beyond that. AI can also be used by entrepreneurship students for varied and more complex tasks, such as creating a minimum viable product, developing a marketing strategy, generating financial projections, or getting ready for interviewing customers. In a recent article, Blank (2023), a key figure the Lean Startup movement, stated that AI and ChatGPT will eventually automate every part of the customer discovery and business model validation processes, and help entrepreneurs with tasks such as creating a pitch presentation for investors, or making complex business decisions. Such applications are likely to also benefit entrepreneurship students, as they experience entrepreneurship through education and get ready to start a business in the real world (Vecchiarini et al., 2023).

ChatGPT limitations, such as its inability to access real-time data and its lack of specificity in some responses, should also be considered when deciding whether and how to use it. The concerns raised by students about the accuracy and reliability of the text produced by ChatGPT also highlight the importance of using this tool critically and verifying the information it provides, especially at its current stage of development. Nevertheless, these limitations are likely to disappear as new and improved versions of ChatGPT will be released.

6. Conclusions

Preliminary research has shown that when AI is used and taught in the classroom, students are more willing to learn about a subject (Giuggioli & Pellegrini, 2022) and participate in entrepreneurial activities (Khalid, 2020). ChatGPT can enhance various aspects of entrepreneurship education, such as exploring new business ideas, validating existing ones, preparing for pitch presentations, or conducting customer development interviews. Although ChatGPT might not be able to produce innovation itself, it can provide real-time guidance to students who are looking to create something new. Students could use ChatGPT to identify potential challenges and obstacles in their industry, while also getting advice on how to overcome them, or conduct sentiment analysis and interpret public opinions and trends regarding their business.

This research confirmed that by including chatbot technologies in course activities and assignments, students can receive additional support in learning about entrepreneurship and developing crucial skills of curiosity and inquiry. This work has important theoretical and practical implications. By leveraging AI technology like ChatGPT, educators can create a more interactive and personalized learning environment, fostering students' curiosity and active participation. The use of AI in the classroom can facilitate experiential learning and provide students with interactive learning experiences, allowing them to explore and apply knowledge in a real-world context (Vecchiarini et al., 2023). These activities can deepen their understanding of the business environment, promote critical thinking and improve problem-solving skills.

The integration of AI, particularly ChatGPT, into entrepreneurship education has shown potential in fostering students' entrepreneurial mindsets and competencies. Using ChatGPT, students can explore and validate their entrepreneurial ideas. By engaging in interactive conversations with AI, they can receive feedback, suggestions and insights in real time, improve their ideas, benchmark themselves against competitors, and identify potential market opportunities. This practical application of AI can save time and resources in the ideation process and encourage students to think critically.

Any study must be seen in light of its limitations. The main limitation of this research is that being exploratory in nature, it is based on a small sample of students from only one university in the United States. Furthermore, the study relies solely on students' perception of their learning experience with chatbot technologies. Considering these limitations, future research could expand on the present findings by conducting larger scale studies across multiple universities and countries. This could provide a more comprehensive understanding of the potential benefits and limitations of integrating chatbots into entrepreneurship education. Moreover, future research could also include a more formal assessment of the impact of chatbot technologies on students' objective academic performance. This would provide a more well-rounded assessment of the effectiveness of chatbots in supporting learning outcomes.

It is important to note that this study reflects users' perceptions during a specific phase of ChatGPT's development. As AI technologies continue to evolve and new applications are found, students' attitudes and perceptions may also shift accordingly. In fact,

Chatbot technologies are advancing at a rapid pace, with new and improved versions of ChatGPT and similar products being released to the public, resulting in an increased productivity of these technologies that is likely to cause a change in perception among students, educators, and society at large. As of May 2023, there are six large language models available to the public: ChatGPT 3.5, ChatGPT 4, Bing AI, Google Bard, and Anthropic Claude. Google Bard and Anthropic Claude have not yet gained a user base comparable to the more successful competitor, ChatGPT. While Bing AI is connected to the Internet and can provide real-time data, it is less powerful than ChatGPT, whose most recent version (ChatGPT 4) remains the most advanced model. ChatGPT 3.5, the free version of ChatGPT, remains to date the most popular chatbot (Mollick & Mollick, 2023).

As students and instructors become more familiar with ChatGPT and other AI tools and begin to implement them for various pedagogical purposes, ChatGPT is likely to play an increasingly important role in higher education. In the near future, in fact, we can expect business education to be heavily influenced by emerging technologies like augmented reality and AI, which have the potential to transform the way we teach and learn, in both traditional and online environments (Ratten and Jones, 2021b; Tarabasz et al., 2018; Tkachenko et al., 2019). While some universities currently prohibit the use of ChatGPT and implement AI plagiarism detectors, the recognition of the potential advantages of these technologies to support educational efforts may result in a change in their stance. Additionally, ongoing technological advancements are likely to address privacy concerns and fears of misinformation that led some countries to ban ChatGPT.

Funding

Dr. Somià, was supported by the European Union's Horizon 2020 Marie Skłodowska-Curie Global Fellowship [No 892825].

CRedit author statement

Mariangela Vecchiarini: Conceptualization; Methodology; Investigation; Writing - Original Draft; Writing - Review & Editing.
Tatiana Somià: Conceptualization; Methodology; Formal Analysis; Writing - Original Draft; Writing - Review & Editing.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijme.2023.100879>.

References

- Amara, R. (1984). New directions for futures research - setting the stage. *Futures*, 16(4), 401–404.
- Baidoo-Anu, D., & Ansah, L. O. (2023). Education in the era of generative artificial intelligence (AI): Understanding the potential benefits of ChatGPT in promoting teaching and learning. *Journal of AIDS*, 7(1), 52–62.
- Bender, E. M., Gebru, T., McMillan-Major, A., & Shmitchell, S. (2021). On the dangers of stochastic parrots: Can language models be too big?. In *Proceedings of the 2021 ACM conference on fairness, accountability, and transparency* (pp. 610–623).
- Blank, S. (2023). *AI and chatgpt will revolutionize customer discovery*. Entrepreneur & Innovation Exchange. <https://eiexchange.com/content/ai-and-chatgpt-will-revolutionize-customer-discovery>.
- Boden, M. A. (1998). Creativity and artificial intelligence. *Artificial Intelligence*, 103, 347–356.
- Borji, A. (2023). *A categorical archive of ChatGPT failures*. *ArXiv Preprint* <https://arxiv.org/pdf/2302.03494.pdf>.
- Business Plan vs Business Models/Canvases: Data from entrepreneurship classes. *Teaching Entrepreneurship*. <https://www.teachingentrepreneurship.org/entrepreneurship-tools/>.
- Chalmers, D., MacKenzie, N. G., & Carter, S. (2021). Artificial intelligence and entrepreneurship: Implications for venture creation in the fourth industrial revolution. *Entrepreneurship Theory and Practice*, 45(5), 1028–1053.
- Chang, C., Hwang, G., & Gau, M. (2022). Promoting students' learning achievement and self-efficacy: A mobile chatbot approach for nursing training. *British Journal of Educational Technology*, 53(1), 171–188.
- Chen, L., Ifenthaler, D., & Yau, J. Y.-K. (2021). Online and blended entrepreneurship education: A systematic review of applied educational technologies. *Entrepreneurship Education*, 4(2), 191–232.
- Chen, L., Wang, P., Shi, F., Han, J., & Childs, P. (2018). A computational approach for combinational creativity in design. In *Proceedings of the 2018 15th international design conference* (pp. 1815–1824).
- Choi, J. H., Hickman, K. E., Monahan, A., & Schwarcz, D. (2023). *ChatGPT goes to law school*. SSRN. <https://ssrn.com/abstract=4335905>.
- Colson, E. (2019). *What AI-driven decision making looks like*. Harvard Business Review <https://hbr.org/2019/07/what-ai-driven-decision-making-looks-like>.
- Cribben, I., & Zeinali, Y. (2023). *The benefits and limitations of chatgpt in business education and research: A focus on management science, operations management and data analytics*. SSRN. <https://ssrn.com/abstract=4404276>.
- Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., Baabdullah, A. M., Koohang, A., Raghavan, V., & Ahuja, M. (2023). "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy. *International Journal of Information Management*, 71, Article 102642.
- Else, H. (2023). Abstracts written by ChatGPT fool scientists. *Nature*. <https://www.nature.com/articles/d41586-023-00056-7>.
- Essel, H. B., Vlachopoulos, D., Tachie-Menson, A., Johnson, E. E., & Baah, P. K. (2022). The impact of a virtual teaching assistant (chatbot) on students' learning in Ghanaian higher education. *International Journal of Educational Technology in Higher Education*, 19(1), 1–19.
- Esteva, A., Robicquet, A., Ramsundar, B., Kuleshov, V., DePristo, M., Chou, K., Cui, C., Corrado, G., Thrun, S., & Dean, J. (2019). A guide to deep learning in healthcare. *Nature Medicine*, 25(1), 24–29.

- Firat, M. (2023). *How Chat GPT can transform autodidactic experiences and open education?*. <https://doi.org/10.31219/osf.io/9ge8m>
- Fox, J., Pittaway, L., & Uzuegbunam, I. (2018). Simulations in entrepreneurship education: Serious games and learning through play. *Entrepreneurship Education and Pedagogy*, 1(1), 61–89.
- García-Peñalvo, F. J. (2023). The perception of artificial intelligence in educational contexts after the launch of ChatGPT: Disruption or panic? *Education in Knowledge Society*, 24, 1–9.
- Gimmon, E., & Levie, J. (2021). Early indicators of very long-term venture performance: A 20-year panel study. *Academy of Management Discoveries*, 7(2), 203–224.
- Giuggioli, G., & Pellegrini, M. (2022). Artificial intelligence as an enabler for entrepreneurs: A systematic literature review and an agenda for future research. *International Journal of Entrepreneurial Behaviour & Research*, 29(4), 816–837.
- Govindarajan, V., & Sikka, N. (2020). *The analytics and AI opportunity for business schools*. Harvard Business Publishing. <https://hbsp.harvard.edu/inspiring-minds/the-analytics-and-ai-opportunity-for-business-schools>.
- Haenlein, M., & Kaplan, A. (2019). A brief history of artificial intelligence: On the past, present, and future of artificial intelligence. *California Management Review*, 61(4), 5–14.
- Han, J., Shi, F., Chen, L., & Childs, P. R. N. (2018). The Combinator—a computer-based tool for creative idea generation based on a simulation approach. *Design Science*, 4(11), 1–34.
- Hiremath, G., Hajare, A., Bhosale, P., Nanaware, R., & Wagh, K. S. (2018). Chatbot for education system. *International Journal of Advance Research, Ideas and Innovations in Technology*, 4(3), 37–43.
- Kawamori, H., Salamzadeh, A., Demiryurek, K., & Ghajarzadeh, M. (2020). Entrepreneurial universities in times of crisis: Case of COVID-19 pandemic. *Journal of Entrepreneurship, Business and Economics*, 8(1), 77–88.
- Khalid, N. (2020). Artificial intelligence learning and entrepreneurial performance among university students: Evidence from Malaysian higher educational institutions. *Journal of Intelligent and Fuzzy Systems*, 39(4), 5417–5435.
- Khan, R. A., Jawaid, M., Khan, A. R., & Sajjad, M. (2023). ChatGPT - reshaping medical education and clinical management. *Pakistan Journal of Medical Sciences*, 39(2), 605–607.
- Luan, L., Lin, X., & Li, W. (2023). *Exploring the cognitive dynamics of artificial intelligence in the post-COVID-19 and learning 3.0 era: A case study of ChatGPT*. ArXiv Preprint: [arXiv:2302.04818](https://arxiv.org/abs/2302.04818).
- Mavlutova, I., Lesinskas, K., Liogys, M., & Hermanis, J. (2020). Innovative teaching techniques for entrepreneurship education in the era of digitalisation. *WSEAS Transactions on Environment and Development*, 16(1), 725–733.
- Mendoza, S., Hernández-León, M., Sánchez-Adame, L. M., Rodríguez, J., Decouchant, D., & Meneses-Viveros, A. (2020). Supporting student-teacher interaction through a chatbot. *Proceedings of the Human and Technology Ecosystems: 7th International Conference, LCT, 2020*, 93–107.
- Mikic-Ponte, F. A., Llamas-Nistal, M., & Caeiro-Rodríguez, M. (2018). Using a chatterbot as a faq assistant in a course about computers architecture. *Proceedings of the 2018 IEEE Frontiers in Education Conference (FIE)*, 1–4.
- Mollick, E., & Mollick, L. (2023). *Let ChatGPT be your teaching assistant*. Harvard Business Publishing. <https://hbsp.harvard.edu/inspiring-minds/let-chatgpt-be-your-teaching-assistant>.
- Okonkwo, C. W., & Ade-Ibijola, A. (2020). Python-Bot: A chatbot for teaching python programming. *Engineering Letters*, 29(1), 25–35.
- Osterwalder, A., & Pigneur, Y. (2010). *Business model generation: A handbook for visionaries, game changers, and challengers*. John Wiley & Sons.
- Qadir, J. (2022). Engineering education in the era of ChatGPT: Promise and pitfalls of generative AI for education. *Proceedings of the 2022 IEEE Global Engineering Education Conference*, (1–9).
- Ratten, V., & Jones, P. (2021a). Covid-19 and entrepreneurship education: Implications for advancing research and practice. *International Journal of Management in Education*, 19(1), Article 100432.
- Ratten, V., & Jones, P. (2021b). Entrepreneurship and management education: Exploring trends and gaps. *International Journal of Management in Education*, 19(1), Article 100431.
- Ribeiro, A. T. V. B., Ferragá, C. A., Trivinho-Strixino, F., & Cardoso, A. C. F. (2020). Entrepreneurship education going remote: A response to covid-19 restrictions. *Journal of Entrepreneurship Education*, 24(1), 1–8.
- Rosenzweig-Ziff, D. (2023). *New York City blocks use of the ChatGPT bot in its schools*. *The Washington Post*.
- Rudolph, J., Tan, S., & Tan, S. (2023). ChatGPT: Bullshit spewer or the end of traditional assessments in higher education? *Journal of Applied Learning and Teaching*, 6(1), 342–363.
- Shen, Y., Heacock, L., Elias, J., Hentel, K. D., Reig, B., Shih, G., & Moy, L. (2023). ChatGPT and other large language models are double-edged swords. *Radiology*. <https://doi.org/10.1148/radiol.230163>
- Smith, D., Muldoon, J., & Lakshmikanth, G. S. (2022). The need for modification: The impact of COVID-19 on pitch competitions. *Entrepreneurship Education and Pedagogy*, 5(4), 686–702.
- Stokel-Walker, C. (2022). AI bot ChatGPT writes smart essays-should academics worry? *Nature*. <https://www.nature.com/articles/d41586-022-04397-7>.
- Tarabasz, A., Selaković, M., & Abraham, C. (2018). The classroom of the future: Disrupting the concept of contemporary business education. *Entrepreneurial Business and Economics Review*, 6(4), 231–244.
- Thorp, H. H. (2023). ChatGPT is fun, but not an author. In *Science - American Association for the Advancement of science*. <https://www.science.org/doi/10.1126/science.adg7879>.
- Tkachenko, V., Kuzior, A., & Kwilinski, A. (2019). Introduction of artificial intelligence tools into the training methods of entrepreneurship activities. *Journal of Entrepreneurship Education*, 22(6), 1–10.
- Vecchiarini, M., Muldoon, J., Smith, D., & Boling, R. (2023). Experiential learning in an online setting: How entrepreneurship education changed during the covid-19 pandemic. In *Entrepreneurship education and pedagogy*. <https://doi.org/10.1177/251512742311791>