Online-Journals.org

iJOE International Journal of Online and Biomedical Engineering

iJOE | eISSN: 2626-8493 | Vol. 20 No. 13 (2024) | OPEN ACCESS

https://doi.org/10.3991/ijoe.v20i13.50895

SHORT PAPER

Challenges of Entrepreneurship Teaching in the Healthtech and Medtech Domains: Some Inputs for a New Approach

Adamantios Koumpis[1](✉), Arminda Maria Finisterra do Paço[2], Oya Beyan[1,3]

[1]Institute for Biomedical Informatics, Faculty of Medicine, University of Cologne and University Hospital of Cologne, Cologne, Germany

[2]Faculty of Human and Social Sciences, Universidade da Beira Interior, Covilhã, Portugal

[3]Fraunhofer Institute for Applied Informatics, Sankt Augustin, Germany

adamantios.koumpis@uk-koeln.de

ABSTRACT

The rapidly evolving landscapes of healthtech and medtech present unique challenges for entrepreneurship education, necessitating a specialized pedagogical approach. This paper explores pedagogical frameworks and the multifaceted barriers faced by educators in these domains. The cases presented emphasize the complexity and regulatory environment, the need for interdisciplinary knowledge, and the fast-paced technological advancements. Moreover, the convergence of medical knowledge with technological expertise demands a cross-disciplinary teaching strategy, complicating the traditional entrepreneurial education model. Additionally, the accelerated pace of technological change in healthtech and medtech outstrips conventional teaching methodologies, necessitating continuous curriculum updates and the incorporation of real-time industry developments. By addressing the current pedagogical challenges, entrepreneurship education in healthtech and medtech can more effectively equip students with the skills and knowledge needed to innovate and succeed in these highly specialized fields.

KEYWORDS

entrepreneurship, teaching, health, health technologies, medical technologies

1 INTRODUCTION

We cannot afford to teach entrepreneurship with tools and methods of the past century, caring only to revise and uplift our drawings and our slides' outlook. Osterwalder's business model canvas [7], which has been for many years considered the 'hot new thing' is now pretty irrelevant, and no young entrepreneur or entrepreneur-to-be would care to use it to convince anyone to invest in their business. In the emerging world of large language models (LLMs) and knowledge graphs (KGs), we need an entirely new language and approach to educate the future generations of young entrepreneurs.

Koumpis, A., Finisterra do Paço, A.M., Beyan, O. (2024). Challenges of Entrepreneurship Teaching in the Healthtech and Medtech Domains: Some Inputs for a New Approach. *International Journal of Online and Biomedical Engineering (iJOE)*, 20(13), pp. 167–174. https://doi.org/10.3991/ijoe.v20i13.50895

Article submitted 2024-06-04. Revision uploaded 2024-07-18. Final acceptance 2024-07-18.

Teaching them the *wrong* things will only help them fail fast and never care to try again. Teaching them the *right* stuff will allow them to fail and then try again so that they *fail better*. And eventually, be with the winners.

Health entrepreneurship and entrepreneurship in medtech and healthtech are by definition interdisciplinary and need skills and competence coming from several fields: one needs to have a good and sometimes even deep understanding of legal aspects that also relate to the need for increased data literacy. Ethics is also an area that is important as it practically affects many aspects of a future medtech or healthtech business, while in many cases may also threaten the very core of the business as such.

1.1 A brief note on pedagogical frameworks

On pedagogical frameworks, there is no doubt that we have a lot. The same is also true with other types of frameworks such as DigComp [8] and EntreComp [1] that have taken vast amounts of resources and no doubt, are worth considering. Still, apart from academics who may use them for their research and institutional functionaries who use them to devise new policies, there is no case at all that a future entrepreneur will succeed because their EQF level was at level 6, denoting 'Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles' rather than in level four ('Factual and theoretical knowledge in broad contexts within a field of work or study') or level four ('Knowledge of facts, principles, processes, and general concepts, in a field of work or study').

Those who had the opportunity to meet, work, and learn from entrepreneurs or businesspeople may agree that these were, on several occasions, rather illiterate or poorly skilled, to put it mildly, in quite many fields however, they all possessed the competence to be aware of their blind spots and be able to acquire special knowledge when they needed it. Sometimes failure was the result of choices in their inner circle of advisors and confidant(es). And some others failed because of character problems–but this lies outside the scope of the present article.

We have briefly described below some of the experiences that we have accumulated from the field of entrepreneurship teaching and training.

1.2 EIT HEI eco action

The European Institute of Innovation and Technology (EIT) aims to strengthen the ability to innovate by powering solutions to pressing global challenges and by nurturing entrepreneurial talent to create sustainable growth and skilled jobs in Europe. Thus, this institute supports dynamic pan-European partnerships, EIT Knowledge and Innovation Communities, among leading companies, research labs, and universities collaborating in entrepreneurial education courses, business creation and acceleration services, and innovation driven research projects.

UBIExecutive, Business School at the University of Beira Interior (UBI) is part of one of the 26 approved projects, within the scope of the EIT HEI Initiative. Specifically, it is part of the EcoAction consortium, made up of the following partners: FHV – Fachhochschule Voralberg – University of Applied Sciences – Austria; SeAMK – Seinäjoki University of Applied Sciences – Finland; UNI PFZ University Pforzheim – Gestaltung, Technik, Wirtschaft und Recht – Germany; UNI OB –

University Óbuda – Hungary; IUEM Comillas Universidad Pontificia – Spain; and PBN – Pannon Business Network Association – Hungary. EcoAction, made up of a geographically and economically varied alliance of five universities and two leading companies in technology transfer, aims to strengthen the entrepreneurial skills of participating universities and boost hundreds of SMEs through facilitation actions in the start-up phase, extending the impact to the regions where they are located in order to enhance their influence beyond the local ecosystem.

By putting into practice, the different skills and experiences of partners from higher education institutions (HEIs), EcoAction multiplies the set of tools available for effective business cooperation in each HEI (EcoFit platform). The project aims to reinforce the involvement of companies and industry, dialogue with SMEs, and mobilize the potential of the knowledge triangle inherent in the consortium's design. The EcoAction training program extends learning to students through entrepreneurial learning workshops, ideation and pitching events, and improving student-industry cooperation through sharing best practices. Academic partners will have an increased opportunity here to transfer their R&D potential for the benefit of SMEs and through cooperation actions in industrial innovation.

The involvement of research transfer offices and associated partners provides strong hands-on experience of industry involvement, ensuring the ability of EcoAction to plan and execute small and medium-sized enterprise (SME) outreach and dialogue with best results. By setting the cooperation in the explicit context of innovation and engagement of entrepreneurial spirit (Idea Exchange Forum), the Innovation Vision Action Plan (IVAP) brings into action the potential of the knowledge triangle inherent in the consortium design.

The EcoAction training program extends learning to students through entrepreneurial learning nuggets, ideation and pitching events, and improvement of student-industry cooperation through best practice sharing. The research and development capabilities of the partners delivered to benefit SMEs and industry innovation cooperation are brought to bear on education and research. All partners are engaged in all work packages of the IVAP to provide the best possible basis for transformational learning.

Finally, the project greatly benefits the EIT community, which involves policymakers, incubators, and representatives from the broader business environment.

2 MEDTECH TEACHING AT COLOGNE

At the relatively recently founded Institute for Biomedical Informatics at the University Hospital of Cologne, which is also associated with the Medical Faculty of the University of Cologne, we have identified the importance of educating medical students on the subject of entrepreneurship and in particular about medtech entrepreneurship. Though most of the students might decide to follow a typical medical practitioner's career, there is always the chance that throughout their professional lives they will encounter themselves with the opportunity to either build their own start-up or, more usually, be part of an entrepreneurial team. Acquiring some basic skills and understanding on how to cope with such challenges is, in this respect, a positive asset that can be of high value and relevance for many of them, even if they will go for a career in the public sector or a big organization; entrepreneurial skills and an entrepreneurial spirit are highly sought in every context, as we very well know.

In this context, we have developed course material and offered medtech courses several times in several contexts and with specialization to the target audience. For example, for the winter semester of 2022–2023, we offered a course titled 'MedTechs: A hands-on approach to medical technology-based entrepreneurship and innovation' that spanned over 30 hours of contact time and 150 hours of self-study.

The course was planned to have an interactive and experiential nature, aiming to help students acquire basic competence and cope with the challenges and opportunities faced by entrepreneurs in starting or growing a MedTech startup. The students were supported to explore case studies and develop content and strategies that are necessary for MedTech entrepreneurs to be familiar with. The students were offered the necessary support to work in groups or independently for acquiring hands-on experiences related to the various aspects of launching a MedTech as well as for expanding their initial ideas into viable business opportunities.

Instead of asking the students to prepare literature review reports or other material, we asked them to work on a mini-project (individually or in teams of two to three persons) with final outcomes the very same deliverables that a start-up needs when submitting an application for funding to the EIC Accelerator Programme, namely:

- preparation of a pitchdeck of 10 slides only,
- preparation of a max three minutes video of the idea and team, and finally
- preparation of a very short proposal with the very rough elements of their project and startup idea.

Below we present the structure for each of the eight classes that the course encompassed, with the final (eighth) class dedicated to having students present their projects.

1st class:

- Presentation of the teaching team and the students
- Introductory remarks from the teaching team, concept, and approach to be taken
- Discussion with the students on their expectations from the course
- Organization of the course, outcomes, and results

2nd class:

- Flaws and fallacies in entrepreneurship: learning from (other people's) mistakes
- Preparation of a question set to use when interviewing the start-ups
- Presentation of invited start-up #1
- Interviewing of the start-up #1 by the students ('Ask Me Anything' session)
- Discussion of some ideas for the assignments (BYOEI, 'Bring Your Own Entrepreneurial Idea')
- Conclusions: aftermaths and follow-ups

3rd class:

- First presentation of the students' entrepreneurial ideas
- Intuitive validity checks
- Discussion
- Presentation of start-up #2
- Interviewing of the start-up #2 by the students ('Ask Me Anything' session)
- Conclusions: aftermaths and follow-ups

4th class:

- Start-up garage: students prepare material individually or in groups to enrich or support their entrepreneurial ideas, and they discuss and get feedback from the teaching team and the other students
- A short introduction to pitching and try-out sessions
- Hints and suggestions for corrections and improvements

5th class:

- Start-up garage: students continue to prepare material individually or in groups to enrich or support their entrepreneurial ideas, and they discuss and get feedback from the teaching team and the other students.
- Checkpoint for the progress of the individually or group projects and of the final deliverables, namely: the pitch deck of 10 slides only, the max 3 minute video of the idea and team, and a very short proposal with the very rough elements of their start-up.
- Hints and suggestions for corrections and improvements

6th class:

- Start-up garage: students continue to prepare material individually or in groups to enrich or support their entrepreneurial ideas, and they discuss and get feedback from the teaching team and the other students.
- Hints and suggestions for corrections and improvements
- Rehearsal for the last class: check of all pending items: organize communication processes for the final event.

7th class:

- Start-up garage: students will continue to prepare material individually or in groups to enrich or support their entrepreneurial ideas, and they discuss and get feedback from the teaching team and the other students.
- Hints and suggestions for corrections and improvements

8th class (final):

- 'Going live!' Presentation of the course and the achievements
- Presentation of the individual and group projects of the students
- Connecting to opportunities–paths to take after the course ends
- Jury's presentation of the scores for the presented projects

As the course described above was demanding in duration and efforts by the students, we came up with a short (or quick) 'track' version that would complement the long 'track' version. The short version we came up with concerned 12 hours of collaboration with the students, and the students were asked only to build their pitch deck and the short video, so there was no request for them to prepare a short proposal at all.

It is evident from the above that emphasis was posed on *doing* and *learning by doing*, so instead of creating content for the students to 'learn' and 'read', or relying on some textbook that we would then use to shape the class as, for example [6],

or implement the course as an elaborate case of applying principles of design thinking methodology [5], we cared to provide an enabling setting for the students to develop and mature their own ideas, with us taking a supportive though not passive at all role.

We also consider that focusing on the main outcomes we mentioned above that are the same that are needed for applicants to the Accelerator Programme of the European Innovation Council (EIC), we strengthen their self-esteem as they realize that what they prepare is not distant at all from what might be needed in case they are in fact applying for funding. As an example of a good, though 'unorthodox' practice, one may consider the case of POSH, which was promoted as some kind of shopify for events. To this, its founders came up with a rather unconventional way to prepare a pitch deck that had a duration of exactly sixty seconds, so only one minute, and which supports our argument that teaching in entrepreneurship does not need to be regarded with strict criteria as in the case of teaching some other courses.

3 DISCUSSION

The need for bridging together a broad range of skills, abilities, and knowledge required to fulfill the aims of entrepreneurship education programs is not new at all and has been identified by [3] that build their entrepreneurial intention model in relation to psychological characteristics such as locus of control, propensity to take risk, self-confidence, need for achievement, tolerance of ambiguity, and innovativeness. The original model developed had been tested in [2], though for an audience of younger high school students, but the results may be easily transferrable to a more mature audience as well.

We encounter the challenge of building new training material as part of the Erasmus+ RESTLESS project as an opportunity to meet and satisfy what may have been as of now rather underserved needs. Indicatively, we mention, amongst others:

Building narratives: This is considered a key part of every pitch deck, and entrepreneurs and entrepreneurs-to-be face the pressure of needing to come up with their own stories and include some personal and if possible, motivational and emotional elements there, while they also fail to understand the process of narrative building in a hands-on way and approach. In computer science jargon, one may use the terms **epics** and **user stories**.

Looking into the big(ger) picture of maturing readiness levels for all three aspects of technology, business, and market. To this end, Technology Readiness Levels (TRLs) are used for describing or assessing the maturity of technologies during, e.g., the planning or implementation of a research or an innovation action; the latter terms are used in the jargon of the European Commission's Framework Programme-funded measures [4], while Business Readiness Level [9] describes the maturity of business considerations developed alongside the technical development of the research and innovation activities, answering questions like whether a technology is financially viable or commercially feasible. Market readiness level can be defined in a similar fashion in relation to how ready a product or a service are to appear as a commercial offer for a group of customers.

Building – increasing – improving data literacy: There is no doubt that nowadays every type of entrepreneurial activity shall depend on acquiring data at least in one part or stage of their lifecycle. Helping future entrepreneurs develop some deeper understanding of data literacy aspects is, in this respect, a must-have. Same, it is also for them to develop a good understanding of **ethical and legal aspects**,

while it is easy to see that those two intersect in many different ways. For e.g., which data are ethical to acquire, process, and store? How can value built as a result of acquired data create no ethical considerations or concerns? How can a data-intensive business idea be both legal and ethical? How do the time aspect and the Zeitgeist affect the ethical considerations? To name only a few open-ended questions.

4 ACKNOWLEDGEMENT

The authors' organizations receive funding as part of the Erasmus+ Action KA220-HED – Cooperation partnerships in higher education (KA220-HED) in the context of the RESTLESS project for 'empoweRing university students through health Entrepreneurship trainings'.

5 REFERENCES

[1] M. Bacigalupo, P. Kampylis, Y. Punie, and L. Van Den Brande, "EntreComp: The entrepreneurship competence framework," EUR 27939 EN. Luxembourg (Luxembourg): Publications Office of the European Union; JRC101581, 2016.

[2] A. Dinis, A. do Paco, J. Ferreira, M. Raposo, and R. Gouveia Rodrigues, "Psychological characteristics and entrepreneurial intentions among secondary students," *Education + Training*, vol. 55, nos. 8–9, pp. 763–780, 2013. https://doi.org/10.1108/ET-06-2013-0085

[3] J. J. Ferreira, M. L. Raposo, R. Gouveia Rodrigues, A. Dinis, and A. Do Paco, "A model of entrepreneurial intention: An application of the psychological and behavioral approaches," *Journal of Small Business and Enterprise Development*, vol. 19, no. 3, pp. 424–440, 2012. https://doi.org/10.1108/14626001211250144

[4] M. Héder, "From NASA to EU: The evolution of the TRL scale in public sector innovation," *The Innovation Journal: The Public Sector Innovation Journal*, vol. 22, no. 2, 2017.

[5] M. Lewrick, P. Link, and L. Leifer, *The Design Thinking Toolbox: A Guide to Mastering the Most Popular and Valuable Innovation Methods.* ISBN: 978-1119629191, Hoboken, NJ: Wiley, 2020.

[6] F. G. Massa, *Entrepreneurship in the Wild: A Startup Field Guide*. Cambridge, MA: MIT Press, 2021.

[7] A. Osterwalder, Y. Pigneur, and T. Clark, "Business model generation: A handbook for visionaries," in *Game Changers, and Challengers*, in Strategyzer Series. Hoboken, NJ: John Wiley & Sons, 2010.

[8] R. Vuorikari, S. Kluzer, and Y. Punie, "DigComp 2.2: The digital competence framework for citizens," EUR 31006 EN, Publications Office of the European Union, Luxembourg, 2022. https://doi.org/10.2760/490274

[9] N. Yasynska, I. Fomichenko, O. Voloshyna, L. Byvsheva, and E. Krikunenko, "Assessment of the level of business readiness for digitalization using marketing and neural network technologies," *Innovative Marketing*, vol. 15, no. 3, pp. 42–59, 2019. https://doi.org/10.21511/im.15(3).2019.04

6 AUTHORS

Dr. Adamantios Koumpis is Research and Teaching officer at the Institute for Biomedical Informatics of the University Hospital of Cologne and the Medical Faculty of the University of Cologne. His current research interests are in the area

of MedTech and Healthtech entrepreneurship and the role of innovation ecosystems as a factor in supporting entrepreneurship (E-mail: adamantios.koumpis@uk-koeln.de).

Arminda Maria Finisterra do Paço (Ph.D. in Management) is Associate Professor with Habilitation at the University of Beira Interior, and she is researcher at the NECE (Research Center in Business Sciences), a R&D Unit from UBI. She is currently the Head of the Faculty of Social and Human Sciences at UBI. Her areas of interest are particularly focused on entrepreneurship education and sustainability issues (e.g., sustainability in higher education, circular economy, sustainable consumption, etc.). She has been publishing scientific articles in international journals and has participated in numerous national and international funded R&D projects. She is currently the general coordinator of a project related with entrepreneurship in the health sector named Health2Innovation (ERASMUS Lump Sum Grant).

Prof. Dr. Oya Beyan is Medical Informatics Professor at the Medical Faculty of the University of Cologne and the Founding Director of the Institute for Biomedical Informatics of the University Hospital of Cologne. Her research lies at the area of data reusability and FAIR data management, distributed analytics on sensitive data, and data-driven transformation in medicine. Her areas of expertise are medical informatics, semantic web technologies, clinical decision support, patient empowerment, research data management, and ethical and social challenges of data.