Barbara Hegyi*, Boglárka Mucsi, Katalin Nádasi
Eötvös Loránd University, Faculty of Informatics, Budapest, Hungary

Leveraging the Responsibility Factor in the Business Courses for Hungarian and International Computer Science Students and Evaluating the Implications on their Entrepreneurial Ideas: the Case of ELTE Faculty of Informatics

DOI: 10.7595/management.fon.2025.0004

Abstract:

Research Question: The main research question of the study is whether computer science changes students' awareness in regard of how the role of social impact is demonstrable along the different courses due to embedded lectures and methodologies in basic entrepreneurship courses. **Motivation**: There are only limited research results available in relation to the awareness of students towards social responsibility (Rubic & Pavelic, 2023; Taboada et al., 2024; Hilt et al., 2024; Siqueira et al., 2023), mainly when it comes to students in tech, although their role in the development of the future responsible innovations will be crucial (Hwang, 2023; Howland, 2024). **Idea:** The idea of the study is to introduce those results that targeted the mapping of students' attitudes towards social responsibility in general, the efficiency of deepening their knowledge in this regard and the social responsibility factor component of their individual business ideas. **Data:** The change in the awareness and the different patterns originating from diverse student groups will be analyzed through three data sources that enable the induction of the depth of the acquired knowledge, based on data from a questionnaire-based survey, ration of correct answers in quizzes and the qualitative analysis of the individual ideas. The three data sources also refer to the expected progress that can be observed during the various phases of the courses and aim to contribute to the circumscription of differences in the interpretation of social impact. **Findings:** The study outlines conclusions on how effectively the knowledge regarding social impact can be transmitted in onsite and online basic entrepreneurship courses, identifying limitations in detecting deviation among the different groups of students. Our task was to examine, on the basis of preliminary knowledge what students think about the interrelations of profitability, positive social impact and competitiveness. The study also provides insights on how optimistic students are regarding profitability when it comes to the embracement of social aspects and in what phase of the venture development they can imagine concentrating on social issues. An introduction is presented on how the level of understanding in relation to the nature of social impact strategies changed along the courses. The analysis of the acquired knowledge and how it reflects in the individual business ideas is based on a scale for categorization that incorporates the typical patterns of the involvement of the social impact factor. **Contribution**: Educators and course designers striving to embrace a special element as a main focus in their innovation and entrepreneurship education might use the introduced approach as a potential tool to analyze the change in the depth of knowledge in regard of social responsibility.

Keywords: entrepreneurship education, social responsibility factor, computer science students, change of awareness, entrepreneurial mindset forming, distinctive character

JEL Classification: O3, A2, F6

1. Introduction

ELTE Faculty of Informatics (ELTE IK), as an education unit that has the main focus on Computer Science (CS), implemented the mandatory basic entrepreneurship courses with interactive seminars for all undergraduate students, believing that this mindset forming will affect the innovative thinking and entrepreneur-

* Corresponding author: Barbara Hegyi, bhegyi@inf.elte.hu

ial intentions during their whole career (Stoycheva et al., 2017; Hegyi, 2020). At master level, a minor in Innovation and Entrepreneurship complements the students' major in Computer Science in the framework of the EIT Digital Master School (Pisoni, 2019). Beyond the institutionalized courses in entrepreneurship, ELTE IK co-developed, implemented and sustained inter-university level interactive and blended entrepreneurship courses in EIT Higher Education Initiative (Hegyi, 2023) and PORTFOLIO Erasmus projects.

In our approach in every international collaboration, partners are competing (Ilonen & Heinonen, 2018) – competing and cooperating – with each other as they strive to attract similar groups of students, but have strong interest to jointly develop their education methodologies and contents.

Therefore a wide portfolio of the innovation and entrepreneurship courses at different levels of education at ELTE IK, with strong embeddedness into international education programmes demanding the continuous improvement of the methodologies (Woods, 2019), called for the determination of a distinctive feature that enables unique positioning.

The answer to this challenge became the integration of the questions of social responsibility into all entrepreneurship courses, besides launching an interdisciplinary advanced elective course, titled Innosocial aspects of entrepreneurship to enable the in-depth analysis of the social impact of the new tech innovations (Hegyi, 2021).

Although the number of applicants for each course is increasing and different formats are needed to address the flexibility needs of education, the efficiency of the implementation of the distinctive characteristics in the form of social responsibility remains a question. Our former study aimed to outline experimental conclusions in regard to the efficiency of message transmission in relation to social impact (Hegyi, 2023), however, the analysis focused upon only one online asynchronous course. Due to the pilot phase of the implementation, no datasets from other courses enabled a thorough analysis of the change of students' awareness, and the identified variables in the social impact description of the students' individual ideas called for further refinement.

The motivation of this paper is to introduce those results that targeted the mapping of students' attitudes towards social responsibility in general, the efficiency of the knowledge transfer in this regard and the social impact component of their individual ideas.

This systematic analysis allows conclusions on how embracing the responsibility factor can be better adjusted to the expectations of the dynamically changing entrepreneurship education, by comparing the different patterns of students' responses from regular and asynchronous courses. Although teamwork – specifically, multidisciplinary teamwork – was praised by the educators as an important aspect of the learning environment (Ilonen, 2021), the current paper focuses only on the analysis of individual inputs.
The research is oriented towards determining if the change in students' awareness and depth of knowledge in regard of the role of social impact is demonstrable along the different courses, and if there is a detectable difference between the results originating from different groups of participants (following online and onsite courses, Hungarian and international students). A further aim is to detect how the effect of the special element in the entrepreneurial mindset forming can be assessed in the short-term thinking of students.

2. Literature Review

The literature review aims to highlight the reasons why the focus on embedding the questions of social responsibility is crucial in the millennials' awareness raising along the entrepreneurship courses. In this chapter we outline an arch of related theories and relevant research results, from the shift towards more responsible solutions in the markets, through the expectations in change of universities' roles to tackle social and sustainability challenges, to the introduction of independent surveys that aimed to map the attitudes of students towards social responsibility.

In general, trends show an increasing number of social tech ventures and interest of impact investors in enterprises that can also leverage the social effects of their innovative idea (Kickul et al., 2016; Chang, 2019; Woods, 2019). The changing expectations of the customers and clients – mainly in relation to the outbreak of the pandemic – puts corporate social responsibility to the test, and not only in case of large companies.

Customers and users developed stronger awareness in regard to sustainable solutions, and higher ratio of the stakeholders of a company appreciates it more if a decision that sacrifices short-term profitability for the sake of real values is made. (Cone, 2019; Jung et al., 2016)

Advancements are observable in business models, as an innovation that considers sustainability as a characteristic of a business. Sustainability became the objective of business instead of being an attribute of business. (Bernow et al., 2017) The number of companies making investments in high-impact sustainable projects is increasing, and investors are progressively prioritizing the sustainability effect of projects when making decisions (Khan at al., 2016). Societal purpose is not isolated to volunteering and philanthropy, or careers in education and social work. Profit and social aspects are not opposite, but rather complementary terms in business concepts and processes. The positive social impact of a new product or service can mean a distinctive character in the international marketplace. (Popowska et al., 2022; Cone, 2019; Henriques, 2022)

Newly launched ventures used to think that they will deal with social responsibility after the market success, while they miss opportunities this way: there are unintended or unanticipated uses of technology that are often overlooked or not anticipated. As strategic discussions increasingly focus on how business can evolve and capitalize on new innovation, it is important to recognize the enhanced role companies should play in the responsible use of disruptive technologies. (Croce et al., 2021; Visser, 2010)

Research shows that some of the world's largest institutional investors are integrating sustainability into their investment decision-making and are assessing new projects based on environmental, social, and economic criteria. For instance, the world's largest asset manager, BlackRock, highlights that sustainability will be the company's new standard when investing, constructing portfolios, and managing risk (BlackRock, 2020).

The relevance of the social dimension of projects has then been increasingly acknowledged and new approaches to impact assessment have emerged calling for an integrated perspective where environmental and social matters are equally acknowledged and evaluated (Dendena, 2015; Klimkiewicz, 2023). Tools are being developed based on an integrated assessment of the multifaceted impact of projects, programmes and policy initiatives.

To address the challenges that can come with technological advancement, several approaches have recently been introduced to enable more exact predictions and assessments regarding projects. All embrace an analytical dimension, comprehensive assessment and documentation of the social context and likely project impacts, both positive and negative; a participatory dimension, involving engagement with project stakeholders in a meaningful way. Management dimension claims that the analysis and participation elements are embedded in project decision making and management systems, both during preparation and implementation. (Inter-American Development Bank, 2018)

More focus and emphasis is globally put on integrating the mindset of responsible thinking into all innovation processes due to different recent tragedies from flawed implementation of sophisticated technology, bad use or misuse of newest innovative solutions, through scandals based on wrongdoing by scientists or engineers to intentional mislead of patients and cheating with medical results. (Kreth et al., 2024) The spreading of advanced digital payment solutions, webshops and social media platforms brought the danger of leaking or selling sensitive information and personal data.

The pressure on tech-related industries, investors and decision-makers is increasing as millennials will be the largest portion of the workforce by 2025. They will act differently on traditional leadership, and also on transformational leadership that fosters more sustainable and responsible methods. Organizations make efforts on the development of responsible leadership and meaningful workplaces. There is no evidence yet about the impact of a transformational leader on a millennial's motivation toward leadership (Hopkins et al., 2022), while they approach leadership in ways different from those of previous generations. They have different values and different expectations from their leaders. As organizations embrace the millennial evolution, they are seeking new leadership styles that millennials find attractive.

To meet the challenges of the 21st century, the OECD policies recognized that students need to be empowered and feel that they can aspire to help shape a world where well-being and sustainability – for themselves, for others, and for the planet – is achievable. The OECD Learning Compass 2030 has identified three "transformative competencies" that students need in order to contribute to and thrive in our world, and shape a better future. Creating new value means 1) innovating to shape better lives, 2) reconciling tensions and dilemmas means taking into account the many interconnections and inter-relations between seemingly contradictory or incompatible ideas, and 3) considering the results of actions from both short – and long-term perspectives. Further taking responsibility is connected to the ability to reflect upon and evaluate one's own actions in the light of one's experience and education by considering personal, ethical and societal goals. So the OECD Learning Compass 2030 argues that it is through this process that students acquire a deeper understanding of opposing positions, develop arguments to support their own position, and find practical solutions to dilemmas and conflicts (OECD, 2019).

Beyond their core tasks of teaching, research and innovation, universities are key actors in addressing societal challenges to become true engines of development for cities and regions and promote civic engagement. There is an increasingly strong expectation at the EU, national, regional and local levels that universities will play an active role in contributing to regional innovation and development, and address societal grand challenges (Galan-Muros, 2024).

Based on a comprehensive research, Galvao (Galvao et al., 2019) suggests that higher education institutions, whose main mission is to educate and train people, have the duty to foster ethical, responsible, and sustainable behaviours in students. Degree programmes are advised to increasingly focus on education methods that enhance CSRO (corporate social responsibility orientation) and provide a more complete understanding of CSR dimensions, through CSR courses or volunteer activities. Similarly, Fonseca (Fonseca et al., 2020) states on their finding regarding students' social responsibility attitudes that it is essential that the social responsibility permeates the entire curriculum and not only through extracurricular activities. They recommend that academic programs must have subjects, courses and activities of a social, economic, scientific and cultural nature in which students participate.

Research suggests that more of a focus should be placed on whether and how professional social responsibility, especially at the macro-ethical level, develops within STEM students. Universities may need to take the step of actively encouraging a faculty and departments to include (in the STEM) curriculum discipline-specific education and activities directly tied to cultivating professional social responsibility. Experts urge that investigations should be made to detect what specific interventions foster social responsibility development, and initiatives should be encouraged both among curricular developments and extracurricular activities. (Kreth, 2024) Further experimentations are needed in relation to the effective involvements of the responsibility topic, including the potential formats of education, combining face-to-face and online settings to result in better learning engagement and flexible learning experiences (Ashraf et al., 2021).

As a result of the changing policies and global phenomena to prioritize more sustainable and responsible innovative solutions, research results with specific focus on students' attitudes and awareness towards related questions may show improvements compared to previous groups.

As Hwang et al. (2023) found, to cultivate STEM professionals' social responsibility, it is important to provide opportunities to understand the nature of science and technology and to take part in a project that they themselves initiate based on an epistemological understanding of science and technology.

In their extensive research on social responsibility, Anand (Anand et al., 2021) concluded that their findings have empirically shown that business students with 'prior industry experience' and 'senior in age' demonstrate higher inclination towards corporate social responsibility. They did not detect any evidence to establish that academic background diversity alone in the classroom enhances social responsibility orientation. They also stated that no difference in social responsibility perception of future business leaders with and without business ethics education has been observed.

As Rubic (Rubic & Pavelic, 2023) highlighted, recent computer science students are better informed of sustainability practices as well as risks in the context of Green Information Technology (IT) area than the previous groups. By using a survey, they investigated whether current computer science students' attitudes towards a more active pro-environmental behaviour and thinking were significantly more positive than those of the students included in their previous study. Fonseca (Fonseca et al., 2020) also reported that the level of social responsibility of students is high, although they might be more encouraged to take up actions in relevant fields.

As Taboada stated (Taboada et al., 2024) future engineers in training do not have a clear definition of sustainable development. They emphasized that students must handle the different methods that allow environmental improvement in the production processes of goods and services. In addition, the possible economic and social benefits of the changes implemented to obtain sustainable production systems must also be quantified to enable the effective knowledge transmission in this domain.

Howland's (Howland et al., 2024) conclusions from their research can be very important to understand the results in our analysis to be introduced: they found that students entered with, and maintained, an awareness of ethical and social issues. They also highlighted that engineering ethics education efforts are helping to have a positive impact and are able to counterbalance a primary focus on technical aspects of engineering. Specific education may influence students' perceptions of some aspects of social considerations. They also opened an interesting question on whether and how such commitments change along students' transition from school to work.

Hildt advises that universities may need to take the step of actively encouraging the faculty and departments to include in the STEM curriculum the discipline-specific education and activities directly tied to cultivating professional social responsibility (Hildt et al., 2024). Their research explores the needs to investigate which

specific interventions foster social responsibility development or what (if any) curricular or extracurricular interventions can improve social responsibility attitudes. The improved elements in analyzed entrepreneurship courses of ELTE IK were improved to combine methods from WBL (work-based learning) to help students cultivate essential 4C soft skills (collaboration, creativity, critical thinking, and communication (Mohamed, 2024) and aim to leverage positive psychological effects of challenge-based and intercultural learning, opening doors towards positive psychology approach (Horikoshi, 2023).

The courses apply the principles of the Challenge-Based Reflective Learning (CBRL) framework that emphasizes context-driven, challenge-based experiential learning process. This novel approach enables the understanding of cross-boundary interactions and learning, overcoming the limitations of traditional, discipline-bounded models involving inter- and transdisciplinarity (Sung et al., 2024).

The respective courses embrace elements of Skills Infusion Program, as a career readiness program (Hua et al., 2022) that focuses on the development of competencies that include critical thinking/ problem solving; oral/written communications; teamwork/collaboration; digital technology (literacy); leadership; professionalism/work ethic; career management; and global/intercultural fluency and thus are relevant to all academic disciplines. The pedagogical approach relies on the conclusions of Pina-Stranger (Pina-Stranger et al., 2024) on how internationally interconnected courses with interdisciplinary context can contribute to the transmission of European and special values in entrepreneurship with putting back the teachers to the heart of education and leveraging their motives to develop the responsible thinking of students. The aim of the courses resonates with the entrepreneurial autonomy perspective as a process in which individuals identify economic, social, and/or environmental issues that they can improve via entrepreneurship and develop a new vision that articulates better economic, social, and/or environmental conditions (Siqueira et al., 2023).

As the highlighted documents and research results showed, the questions of social and environmental responsibility are urgently required to be introduced into the education of STEM professions, but only experimental conclusions are reported and more introductions of hands-on experiences are needed to extend the discussion and mainly, to reach groundbreaking transformation in these fields.

3. Methodology

Independently from the format and level of education, in all entrepreneurship courses the importance of the responsibility of new innovations is not only introduced as a theoretical chapter, but students have to build in the possible aspects into their team and individual ideas. The positive social impact is emphasized as an unmissable potential competitive edge (Cone, 2019). The different layers and related phenomena are explained by leveraging the critical contributions of students as well.

The analysis in this paper relies on three different data sources that were collected during the spring and autumn semesters of 2023, by taking the same three diverse assignments as a basis in three different basic entrepreneurship courses (2 different cohorts (autumn and spring) in each course):

- Business fundamentals, as a mandatory onsite course for all freshmen bachelor international CS students,
- The Hungarian version of it (*Innovativ vallalkozas menedzsment*), mandatory for all freshmen Hungarian CS students,
- and Creativity, responsibility and entrepreneurship, an asynchronous online course, can be elected by students from all faculties and CS students who have not completed any basic entrepreneurship courses yet.

Although the analyzed groups consisted of Hungarian and international students, the current study could not strive for outlining conclusions according to that distribution, as the asynchronous online course was chosen by both categories of participants.

The respective chapter on the social responsibility was introduced as one of the last chapters in each course, in the case of the onsite course as a separate lecture, in case of the asynchronous course (where students follow online modules) as part of the concluding live event.

The change in the awareness and the different patterns originating from diverse student groups will be analyzed through the following three data sources that enable the induction of acquired knowledge depth:

- The first data source is based on the answers to a questionnaire that aimed to detect the different preliminary attitudes and knowledge of students towards social responsibility before the topic was discussed in the related course. Inputs were collected and processed through a form that allowed anonymous answering in the Canvas learning management system.

- The second data source is based on the evaluation of students' answers of different basic entrepreneurship courses given to an online Canvas quiz that aimed to detect their acquired knowledge regarding the corporate social responsibility strategies in general. The quiz was released in each course immediately after the introduction of the social responsibility of new technologies topic, at the end of the lectures or the live event. The answers were collected anonymously and are not connected with the inputs of the students regarding preliminary attitudes on social responsibility. The related data will be analyzed at the level of understanding in relation to the phenomena and interdependencies of corporate social responsibility strategies.
- The third data source is built on the thorough qualitative analysis of the individual ideas: how students could embed the social responsibility factor, how well elaborated it was or if it was forced or mixed up with the environmental impact. The analysis of the social impact components of the final individual innovative ideas can show students' ability to apply the acquired knowledge.

The three data sources also refer to the expected progress that can be observable during the various phases of the courses and aim to contribute to the circumscription of differences in the interpretation of social impact.

Based on the main intents of the analysis, the research investigates into the following three research questions (RQ):

- RQ1.: Is the change of students' awareness and depth of knowledge in regard of the role of social impact demonstrable along the courses?
- RQ2.: Is there a detectable difference between the results originating from different groups of participants who followed online and onsite courses?
- RQ3.: Is the effect of the special element in the entrepreneurial education of CS students reflected in their individual ideas?

4. Results and Discussion

The study outlines conclusions on how the knowledge and applicable methods regarding social impact could be effectively transmitted in onsite and online basic entrepreneurship courses and if there is detectable deviation in the embeddedness level among the different groups of students.

In the subchapters below, the analyses of the three different data sources will be provided, aiming to map the progress in the depth of knowledge and competencies in relation to social impact.

4.1 Preliminary knowledge and attitudes

In the spring and fall semesters of 2023, a total of 350 students from 3 courses (Business fundamentals onsite course (85) – international students, Creativity, responsibility and entrepreneurship asynchronous online course (140) – both national and international and Innovativ vallalkozas menedzsment onsite course (125) – national students) answered the questions of the survey.

The main questions of the survey and the collected answers in a percentage distribution are introduced in Table 1.

In some questions there is no significant difference in the students' perception of the social responsibility of tech ventures (including new start-ups and big tech companies as well). In others, however, there is a palpable distinction between the two student groups who attended the courses in-person (Business fund., Innov. vall. men.)

In all student groups the majority agreed that profitability and social impact are not mutually exclusive factors in case of new tech ventures (Q2.). However, while both Creativity and Innovativ vallalkozas menedzsment students opted for this answer above 80%, in case of Business fundamentals students it is only 53%. Respectively they chose the more pessimistic answer (profitability and social impact are indeed excluding each other) in a higher percentage (47%) compared to the other student groups' ca. 15%.

In the next question (Q3.) the answers are more balanced, as around 80% in each student group agreed that positive social impact can serve as a competitive advantage. 10% of the students argued that focusing on social aspects can set back competitiveness, and an average of 7% thinks that only social start-ups should address social issues.

On average 70% of the students agree that considering all the responsibility aspects would help new ventures strengthen their position on the market (Q8.). However, again, if we break down the average to each student group, we can see that Business fundamentals and Creativity students preferred this answer close to 80% (78% and 79%), and among Innovativ vallalkozas menedzsment students only 56% voted for this. This also means that compared to the other two groups, they were two times (44%) more likely to think that strengthening their position on the market deters new ventures from focusing on responsibility aspects.

Somewhat above 50% of the students disagree that the consideration of social aspects would hinder the development of innovative solutions (Q5.). An interestingly high percentage, 29% of them, could not decide on the question and chose the Neutral option. (In cases where students could choose from a 5 degree scale, positive (Agree, Strongly Agree) and negative (Disagree, Strongly disagree) answers were merged.)

Almost half of the students, 48% agree that it is not necessary to reach a good market position before tackling social responsibility issues (Q6.). Similarly to the previous question, 25% of the respondents chose the Neutral option.

Regarding the social responsibility of big tech companies, the overall tone is more pessimistic as on average 49% of them think CSR is more likely to be greenwashing, than a strategical, responsible part of the companies' business models (29%). But there is a significant difference between the responses of the two in-person courses' students: 46% of the Business fundamental students agree that big tech companies are really responsible, while only 15% of the Innovativ vallalkozas menedzsment students chose this answer. 13% of the Business fundamentals thinks that CSR manifests itself in the form of ad hoc charity campaigns, while more than double, 28% of the Innovativ vallalkozas menedzsment students chose the same option.

Table 1: Preliminary attitudes of students in relation to social impact

Course / **Questions of the survey**	**Business fundamentals**	**Creativity, responsibility and entrepreneurship**	**Innovatív vállalkozás menedzsment**
Q2. Do you think that profitability and positive social impact are mutually exclusive in the case of new ventures?			
No	53%	84%	86%
Yes	47%	16%	14%
Q3. Can startups be competitive while addressing social issues?			
No, focusing on social aspects can set back competitiveness	12%	5%	14%
No, only social startups are expected to address social issues	9%	7%	5%
Yes, positive social impact can be a competitive advantage in the market	79%	88%	82%
Q5. It is possible to develop new competitive innovative solutions while considering all potential social aspects?			
Agree	55%	43%	50%
Disagree	11%	14%	18%
Neutral	28%	33%	24%
Strongly agree	5%	9%	5%
Strongly disagree	1%	2%	2%
Q6. Firms can concentrate on social responsibility issues only after reaching a good position in the market.			
Agree	25%	24%	25%
Disagree	32%	44%	37%
Neutral	31%	20%	26%
Strongly agree	4%	3%	2%
Strongly disagree	9%	9%	10%

The answers of the Creativity students, who attended these courses online, range between the two other groups.

Although in relation to some questions we could observe different patterns of preliminary social responsibility attitudes in the different course-related groups, we could not detect any clear evidence regarding the background diversity (national or international). In this phase the differences that might be the effects of the diverse formats (onsite, online) were not yet analyzable as we mapped the preliminary attitudes through the questionnaire.

As the sample allows limited conclusions regarding the distribution of results, the study enables only the reporting about aggregated results in relation to the analyzed CS student cohorts, regardless of their nationality or the chosen course format:

- The majority of the students think that profitability and positive social impact are not mutually exclusive. (Q2)
- Above 80% of the CS students in the analyzed cohorts think that startups can be competitive while addressing social issues. (Q3)
- They are less optimistic when it comes to the embracement of the double challenge of social aspects and competitive innovative solutions (Q5.), as only around the half of them believes that it is possible.
- Their majority thinks that firms can concentrate on social responsibility issues before reaching a good position in the market.

These preliminary attitudes show similarities with the conclusions of Fonseca (Fonseca, I. et al., 2020) and Rubic (Rubic & Pavelic, 2023) who observed a high level of social and environmental responsibility of students and with the observations of Anand (Anand et al., 2021) who did not find an obvious correlation between the role of business ethics education and the level of social responsibility awareness.

4.2 Level of understanding in relation to the nature of social impact strategies

Both in the autumn and the spring semester of 2023, right after the introduction of the topic on social responsibility and the related theoretical and practical interdependencies, a quiz (short test, through Canvas system) was released in all cohorts and different courses as an assignment. Mostly those students who attended the respective lecture answered the questions due to the short time slot for submission.

In case of the basic entrepreneurship course (Innovativ vallalkozas menedzsment) altogether 149, in the Business fundamentals course 135, and in the asynchronous online Creativity course 85 students' answers are evaluated. In the two different semesters the proportion of respondents shows a different picture.

The aim of the quiz was to enable the analysis of the impact on students' knowledge and level of understanding regarding the role of social impact strategies.

As Table 2. shows, as regards the first statement that was intentionally phrased in a way to check whether the answers of the respondents can be misled (Social responsibility and profitability are mutually exclusive in case of business ventures), in both semesters in all courses the rate of correct answers is very high, approaching or exceeding 90% (except the case of Business fundamentals course in the spring semester, most probably due to the low number of responses).

Regarding the second statement (New tech ventures have to strengthen their position in the market, so they cannot focus on responsibility aspects), all groups in each analyzed semester gave correct answers (all groups above 72%, in the autumn semester all groups above 92%), so we can assume that the audience understood the emphasized message that new tech ventures need to embrace the responsibility questions from their birth.

As for the third statement (Big tech companies integrate social responsibility in their business strategies…), most of the respondents of all subjects in both semesters submitted the correct answers, except one case; the ratio is above 86%.

When comparing the answers of the quizzes, no explicit pattern can be identified regarding the differences in the level of understanding. In those cases where ratio of correct answers was lower, the data always correlated with the lower number of respondents (non-representative sample).

The data collection was anonymous and due to the formerly outlined reasons in subchapter 4.1, answers cannot be analyzed at a group level and cannot be interconnected with the respondents' previous attitudes in the questionnaire.

Table 2: The ratio of correct answers to quiz statements (true/false) in the different entrepreneurship courses

	2023 spring			**2023 autmn**		
Ratio (%) of correct answers in the quiz/Course title	**Innovatív vállalkozás menedzsment (in Hungarian), 36 respondents**	**Business fundamentals, 22 respondents**	**Creativity, responsibility and entrepreneurship, 30 respondents**	**Innovatív vállalkozás menedzsment (fin Hungarian), 112 respondents**	**Business fundamentals, 113 respondents**	**Creativity, responsibility and entrepreneurship, 55 respondents**
Social responsibility and profitability are mutually exclusive in case of business ventures	89%	55%	97%	92%	96%	95%
New tech ventures have to strengthen their position in the market, so they cannot focus on responsibility aspects	72%	86%	80%	94%	92%	96%
Big tech companies integrate social responsibility in their business strategies	97%	86%	73%	88%	99%	91%

As one of the main aims of the analysis lies around the questions on whether we can make an impact on the knowledge level of the students in this special regard, it can clearly be concluded that the majority of students – independently from the format and the language of the course – could understand deeper interdependencies in relation to social impact strategies.

4.3 The ability to apply the acquired knowledge in the individual innovative ideas

The next level in the analysis of the progress is the assessment of students' ability to apply the acquired knowledge in their innovative ideas that were presented according to determined pitch requirements.

The acquired knowledge was analyzed based on the typical patterns of the involvement of the social impact factor in the individual ideas from previous semesters (Hegyi, 2023), which enabled the creation of a scale for categorization.

The data collection regarding the clarity of the social impact factor was based on the educator's classification during the evaluation of the oral idea presentations in case of the onsite courses (both for that for national and that for international students), while in the case of the asynchronous course, it was based on the analysis of the recorded video pitches or on pagers of students.

As the final innovative idea presentation, part of the course completion requirements in all courses was to embrace the social impact factor besides other business idea introduction criteria; the clarity of it was classified based on the following scale:

- no elaborated social impact,
- weak or not systematic social impact,
- dubious or forced social impact,
- positive social impact is mixed up with environmental impact and sustainability,
- clear concept of positive social impact,
- both positive social and environmental impacts are well elaborated.

The course instructor categorized each innovative idea presentation according to the above scale, only taking into account the content that was introduced by the students.

In Table 3. the respective number of individual idea presentations is only distributed between the two analyzed semesters and the format of courses, since the format of the course determined different final assignments for assessment (in case of onsite courses, oral individual idea presentation, in the case of the asynchronous online course: one pager or video pitch). An interesting fact can be seen in the analysis that among 378 innovative ideas only 2 were categorized as non-profit ones and for the negligible ratio in the entire sample, these are not separately indicated.

We can observe that the lowest number falls into the 'Dubious or forced' social impact and the 'Both social and environmental impact is well elaborated' categories, both numbers are higher in case of the onsite courses. The lower number in these categories might show the impact of presented case studies that prove the counter-effect of double-faced responsibility strategies and the emphasized requirement in regard of social impact elaboration (not the environmental impact unless necessarily due to the nature of the innovative idea).

The ideas with 'No elaborated social impact' and 'Weak or not systematic social impact' represent an almost similar ratio among the total of 378 ideas, showing slightly higher numbers in the case of the online asynchronous course. Together the ideas in these two categories represent one third of the total number of analyzed ones, showing that the message transmission in regard to the role of social impact was not heterogeneously efficient.

But we can also conclude that almost one fourth of the ideas was introduced with 'positive impact mixed up with environmental impact', with similar ratios in the onsite and online courses.

The number of ideas with 'clear concept of positive social impact' is the highest in the analyzed sample, showing explicitly higher ratio in case of the onsite courses.

Table 3: Categorization of individual idea presentations based on the clarity of social impact

Clarity of social impact/Course	**Online Creativity, responsibility and entrepreneurship course**		**Onsite basic entrepreneurship course (Business fundamentals and innovatív vállalkozás menedzsment)**		**Total number of presentations**
	2023 spring	**2023 autmn**	**2023 spring**	**2023 autmn**	
Total (number of individual presentations)	73	89	91	125	378
Positive social impact is mixed up with environmental impact and sustainability	24	20	18	23	85
Dubious or forced social impact	6	6	1	19	32
Clear concept of positive social impact	5	16	47	35	103
No elaborated social impact	20	22	2	14	58
Weak or not systematic social impact	16	22	19	12	69
Both (positive) social and environmental impact is well elaborated (not mixed)	2	3	4	22	31

With its one fourth, this latter mentioned category of 'clear social impact' concept refers to the effect of successful awareness-raising in regard of social impact strategies and can mean that a determinant ratio of students can apply the acquired knowledge when it comes to idea creation.

Conclusion

The analyzed datasets were established in three different phases of the courses implementation, aiming to detect if the change in the awareness and the depth of knowledge is observable.

The preliminary attitudes of students drew an interesting picture to us, showing that the majority of the students agreed before introducing any chapter on social responsibility that profitability and social impact are not mutually exclusive. The important fact was that on average 70% of the students agreed that considering all the responsibility aspects would help new ventures strengthen their position in the market. From the aggregated answers we could see that the preliminary knowledge and attitudes of students in Business fundamentals course were different from the other two groups, adumbrating further distinct patterns along the analysis. The results show similar patterns to Rubic's (Rubic & Pavelic, 2023) and Howland's (Howland, 2024) findings in relation to the awareness of social impact. As for the attitudes towards more responsible solutions, they are in alignment with the statements of Hopkins and the OECD.

The analysis of the level of understanding based on the quizzes did not bring the expected diverse ratios. Apart from one lower percentage in case of one semester among the Business fundamentals course students (most probably due to a low number of responses), all the students performed very well with their answers, the average of correct answers approaches 90% and there is no demonstrable difference due to the format (online or onsite, language Hungarian or English). The results resonate Taboada's (Taboada et al., 2024) and Hwang's (Hwang, 2023) suggestions to offer opportunities to deepen students' knowledge in regard to social responsibility and as Galan-Muros (2024) proposed, address social change in the education activities.

The third database that was established on the assessment of the social impact factor of individual ideas, allowed us to analyze if students could apply the acquired knowledge. Although only around one fourth of the students could form a clear concept on social impact, in general we can state that the majority of the students (83%) strived to elaborate on the question of social responsibility. In this dataset there were no identifiable differences between the two onsite courses (Innovativ vallalkozas menedzsment and Business fundamentals); in case of clear social impact concept the students of onsite courses performed much better. The students who could form a clear social impact may represent that group of future innovators who are ready to integrate social responsibility in their business as Croce (2021) and Visser (2010) suggested. Most probably these students are ready to leverage the positive social impact a distinctive character, as defined by Cone (2019) and Popowska et al. (2022).

In general, we can state that the elaboration on social impact was an integral part of the idea presentations. It confirms that a change in the awareness in regard of social impact is observable along the courses.

As for the research questions, in case of RQ1. (RQ1.: Is the change of students' awareness and depth of knowledge in regard of the role of social impact demonstrable along the courses?), based on the high ratios introduced in 4.2. subchapter, we can assume that a change of student awareness and the depth of knowledge regarding the role of social impact is demonstrable. The level of students' understanding in relation of the respective interdependencies might have improved; although the low ratio of clear social impact concepts in the individual idea presentations may shake this conclusion, we can see that more than 80% of students strived for elaborating on social impact. The advanced preliminary attitudes might also make the statement in relation to Q1. uncertain.

RQ2. (RQ2.: Is there a detectable difference between the results originating from different groups of participants who followed online and onsite courses?) aimed to investigate into explicit differences among the results originating from different groups participants. Except for the lower ratio of the clear social impact concept, no other determining difference in the performance of students attending the online or the onsite courses was identifiable. We could highlight diverse answers among the Business fundamentals course students (mostly foreign students), but when it came to the analysis of the level of understanding and the clarity of social impact factor of the individual ideas, the difference seemed to disappear. The format of the course (onsite or online) did not affect the results in relation to social responsibility.

Regarding RQ3. (Q3.: Is the effect of the special element in the entrepreneurial education of CS students reflected in their individual ideas?), if any effect of the special element can be observable, we can rely on the ratios introduced in details in the subchapter 4.3. where we saw that more than 80% of students strived to elaborate on the positive social impact factor.

Further investigations can be implemented regarding the attitudes and awareness of social impact, mainly in relation to the advancement of new technologies. An advanced characterization of the variables that support the assessment of so-

cial responsibility elements can be imagined similarly to the description of Vainola and Zechen (2021) who involved cognitive, emotional, openness and behavioural elements, too.

The main limitation of the study is that although the analyzed groups consisted of Hungarian and international students, the current analysis could not strive for outlining conclusions according to that distribution, as the asynchronous online course was chosen by both categories of participants. The conclusions can show the different patterns in relation to the differences between the online and onsite courses.

Further limitation is that the results origin only from students of one Faculty, so the findings can be interpreted as elements of a case of that education unit, calling for further extension of the analysis in regard to students of other institutions or another scientific domain.

As the answers were collected anonymously and are not connected with the inputs of the students regarding preliminary attitudes on social responsibility, further improvement opportunity can be the enabling of an analysis that shows how the introduced topics affected those students who were more aware of social factors compared to those with less expressed preliminary knowledge.

As Fonseca also suggested, high social responsibility awareness is not enough, students should be encouraged to reflect and take action in relation to the search for the common benefit. The change of awareness would bring new interesting patterns to the analysis.

Research cannot always bring the expected results: although progress can be demonstrated at the level of understanding in relation to the nature of social impact strategies, the ability to apply the acquired knowledge properly did not show the brightest achievements. But the numbers of the analyzed two semesters assignments also highlight that the impact of the special element in the entrepreneurship education is identifiable and students are open to the embracement of the related questions.

Educators and course designers striving to embrace a special element as a main focus in their innovation and entrepreneurship education can use the introduced approach as a potential tool to analyze the change in awareness and applicable knowledge regarding social responsibility.

As in the case of real-life social responsibility strategies, the impact of the special factor in the courses can be assessed on a long run. The study can provide suggestions on how business courses in all disciplines can be upgraded to contain responsibility topics that will be reflected in students' business ideas.

REFERENCES

[1] Ashraf, M. A., Yang, M., Zhang, Y., Denden, M., Tlili, A., Liu, J., Huang, R., & Burgos, D. (2021). A systematic review of systematic reviews on blended learning: Trends, gaps and future directions. *Psychology Research and Behavior Management, 14*, 1525–1541., DOI: 10.2147/PRBM.S331741

[2] BlackRock. (2020). *Sustainability as BlackRock's new standard for investing*. Retrieved December 11, 2023, from https://www.blackrock.com/corporate/investor-relations/2020-blackrock-client-letter

[3] Bernow, S., Klempner, B., & Magnin, C. (2017). *From 'why' to 'why not': Sustainable investing as the new normal*. McKinsey & Company, London, UK.

[4] Croce, A., Ughetto, E., Scellato, G., Fontana, F. (2021). Social impact venture capital investing: an explorative study. *Venture Capital, Taylor & Francis Journals, 23(4),* 345-369. DOI: 10.1080/13691066.2021.1982069

[5] Chang, A. M. (2019). *Lean Impact: How to innovate for radically greater social good*. Wiley.

[6] Cone, P. (2019): *Creating social impact: How your firm gains by adopting a socially responsible business strategy*. Middletown: Amity Advisory

[7] Dendena, B., Corsi, D. (2015). The Environmental and Social Impact Assessment: a further step towards an integrated assessment process, *Journal of Cleaner Production, 108*(Part A), 965-977, ISSN 0959-6526, DOI: 10.1016/j.jclepro.2015.07.110

[8] Fonseca, I., Bernate, J., Betancourt, M., Baron, B., Cobo, J. (2020). Developing Social Responsibility in University Students. In Proceedings of the 11th International Conference on Education Technology and Computers (ICETC '19) (pp. 215–218). Association for Computing Machinery, New York, NY, USA. DOI: 10.1145/3369255.3369275

[9] Galan-Muros, V., Bouckaert, M. (2024): *New platform fills gap in comparable data about HE systems*, University World News.

[10] Galvao, A., Mendes, L., Marques, A., Mascarenhas, C. (2019). Factors influencing students' corporate social responsibility orientation in higher education, *Journal of Cleaner Production, 215,* 290-304. DOI: 10.1016/j.jclepro.2019.01.059

[11] Hegyi, B. (2020). Elmaradt kreativ harmonia az innovativ vallalkozasi szemleletformalast celzo kurzusokban, In: L. Kovacs (Ed.), *Globalis kihivas – lokalis valaszok: A koronavirus (Covid19) gazdasagi es tarsadalmi osszefuggesei es hatasai* (pp. 361-372), Szombathely, Magyarorszag, Savaria University Press.

[12] Hegyi, B. (2021). Innosocial aspects in the entrepreneurial education of computer science students, In: L. Gomez Chova, A. Lopez Martinez, & I. Candel Torres (Eds.) *INTED2021 Proceedings (*pp. 3054-3058), Valencia, Spain: International Academy of Technology, Education and Development (IATED).

[13] Hegyi, B. (2023). Experimental Conclusions of the Online Inter-University Creativity, Responsibility, and Entrepreneurship Course Implementation, *Education Sciences, 13*(3). DOI: 10.3390/educsci13030240

[14] Henriques, P. L., Matos, P. V., Jeronimo, H. M. (2022). Eager to Develop Sustainable Business Ideas? Assessment through a New Business Plan (BP4S Model). *Sustainability, 14*, 1030. DOI: 10.3390/su14021030, https://www.mdpi.com/2071-1050/14/2/1030

[15] Hildt, E., Laas, K., Miller, C.Z., Brey, E.M. (2024). Building Inclusive Ethical Cultures in STEM. In E. Hildt, K. Laas, E. M. Brey, & C. Z. Miller (Eds.), Building Inclusive Ethical Cultures in STEM*, The International Library of Ethics, Law and Technology (vol. 42).* Cham: Springer. DOI: 10.1007/978-3-031-51560-6_1

[16] Hwang, Y., Ko, Y., Shim, S. S. (2023). Promoting engineering students' social responsibility and willingness to act on socioscientific issues. *International Journal of STEM Education, 10*, 11. DOI: 10.1186/s40594-023-00402-1

[17] Horikoshi, K. (2023). The positive education of challenge: innovative integration of challenge based learning and positive education. *Frontiers in Psychology. 14*. DOI: 10.3389/fpsyg.2023.1225122

[18] Hopkins Porter T., Heat M., Messina N., Bible S. C. (2022): Millennials and the motivation to lead: is a transformational leader a catalyst or barrier? *Management Research Review, 46*(8), 1149-1162. DOI: 10.1108/MRR-05-2022-0322

[19] Howland, S. J., Jesiek, B. K., Claussen, S. (2024). Measures of Ethics and Social Responsibility Among Undergraduate Engineering Students: Findings from a Longitudinal Study. *Science and Engineering Ethics*, 30, 5. DOI: 10.1007/s11948-024-00462-8

[20] Hua, D. M., Davison B. C., Vamsi K. G. (2022). Enhancing Student Career Readiness through Skills Infusion. *Information Systems Education Journal (ISEDJ) 20*(5). Center for Information and Communication Sciences, Ball State University.

[21] Ilonen, S., Heinonen, J. (2018). Understanding affective learning outcomes in entrepreneurship education*. Industry and Higher Education, 32*(6), 391-404.

[22] Ilonen, S. (2021). Creating an entrepreneurial learning environment for entrepreneurship education in HE: The educator's perspective. *Industry and Higher Education*, *35*(4), 518-530. DOI: 10.1177/09504222211020637

[23] Inter-American Development Bank. (2018). *Social impact assessment: integrating social issues in development projects* (IDB Series on Environmental and Social Risk and Opportunity). https://publications.iadb.org/en/publications/english/viewer/Social_Impact_Assessment_Integrating_Social_Issues_in_Development_Projects.pdf

[24] Jung, H. J., Kim, D. O. (2016). Good Neighbors but Bad Employers: Two Faces of Corporate Social Responsibility Programs. *Journal of Business Ethics.* DOI: https://doi.org/10.1007/s10551-015-2587-3

[25] Khan, M., Serafeim, G., Yoon, A. (2016). Corporate sustainability: First evidence on materiality. *The Accounting Review, 91,* 1697–1724.

[26] Kickul, J., Lyons, T. S. (2016*). Understanding Social entrepreneurship: The relentness pursuit of mission in an ever changing world*. London: Routledge

[27] Klimkiewicz, K. (2023). Social Impact Assessment. In S. O. Idowu, R. Schmidpeter, N. Capaldi, L. Zu, M. Del Baldo, & R. Abreu (Eds.), *Encyclopedia of sustainable management*. Cham: Springer. DOI: 10.1007/978-3-031-25984-5_205

[28] Kreth, Q., Schiff D., Jeonghyun L., Zegura, E. S. (2024). Social Responsibility and Ethics in STEM Education: The State of the Field, In *Building Inclusive Ethical Cultures in STEM.* DOI: 10.1007/978-3-031-51560-6_2

[29] Mohamed, A. (2024). Enhancing Workplace Skills through Work-Based Learning in Engineering Education*. International Journal of Innovative Science and Research Technology (IJISRT), 9*(7), 1983-1990. DOI: 10.38124/ijisrt/IJISRT24JUL1276

[30] OECD. (2019). OECD Future of Education and Skills 2030: Concept Note.

[31] Pina-Stranger, A., Varas, G., Le Saux Slimane Sales, A. (2024). Key role of teachers in sustainable inter-university education. In *Proceedings of the 10th International Conference on Higher Education Advances (HEAd'24).* DOI: 10.4995/HEAd24.2024.17301

[32] Pisoni, G. (2019). Strategies for Pan-European Implementation of Blended Learning for Innovation and Entrepreneurship (I&E) Education. *Education Sciences, 9(2),* 124. DOI: 10.3390/educsci9020124

[33] Popowska, M., & Wasilczuk, J.E. (Eds.). (2022). *Organizational Change, Innovation and Business Development: The Impact of Non-Technological Innovations* (1st ed.). Routledge. DOI: 10.4324/9781003161615
[34] Siqueira, A.C.O., Honig, B., Mariano, S., Moraes, J., Cunha, R.M. (2023). Creating economic, social, and environmental change through entrepreneurship: An entrepreneurial autonomy perspective informed by Paulo Freire, *Journal of Business Venturing Insights, 19*, e00386, DOI: 10.1016/j.jbvi.2023.e00386.
[35] Sung, S., Thomas, D., Rikakis, T. (2024). Enacting Transdisciplinary Values for a Postdigital World: The Challenge-Based Reflective Learning (CBRL) Framework. *Postdigital Science and Education*, 1-26. DOI: 10.1007/s42438-024-00485-1
[36] Stoycheva, M., Bonifacio, M., Marchese, M., Klabbers, M., Ilieva, G., Pisoni, L., Angeli, A. Guarise (2017). Developing engagement strategies in the blended learning triangle: The case of I&E education in the EIT Digital. *In EDULEARN17 Proceedings (pp. 6254–6261). Valencia: IATED.*
[37] Taboada, P., Quetzalli, G., Virgen, A. (2024). The Perception of Undergraduate Students From Different Educational Systems on Sustainability. *SAGE Open, 14*(2). DOI: 10.1177/21582440241243153
[38] Vainola, R., Zechen, X. (2021). Characteristics of the pedagogical model of formation of students' social responsibility by means of project technologies. *Scientific Journal of Khortytsia National Academy*. DOI: 10.51706/2707-3076-2021-5-20
[39] Rubic, I., Pavelic, L. (2023). University students' awareness and attitudes regarding environmental responsibility., *Annals of Disaster Risk Sciences*, *5*(1-2). DOI: 10.51381/adrs.v5i1-2.433
[40] Visser W. (2010). CSR 2.0: The Evolution and Revolution of Corporate Social Responsibility. In M. Pohl & N. Tolhurst (Eds.) *Responsible Business: How to Manage a CSR Strategy Successfully*. Wiley.
[41] Woods, M. (2019). *Audacious social impact: A Practical Guide to Building High Performing Organizations That Deliver Great Social Value*. Pittsburgh: Koehler.

Received: 2024-05-14
Revision requested: 2024-08-06
Revised: 2025-01-12 (2 revisions)
Accepted:2025-02-20

About the Authors

Barbara Hegyi
Eötvös Loránd University, Faculty of Informatics, Budapest, Hungary
bhegyi@inf.elte.hu

Barbara Hegyi is an economist with a PhD in Regional Sciences. She coordinated several RDI projects from 2005 in the Budapest ecosystem. Since 2016, she has coordinated the Innovation and Entrepreneurship (I&E) minor at the EIT Digital Master School in Budapest, and also designed elective courses that focus on the social responsibility of innovations. As a lecturer in entrepreneurship, she is an inciter of several interdisciplinary and inter-university initiatives. She has been coordinating several activities in EU-funded projects while leading the REDINEST project that aims to build impact labs at an international level.

Boglárka Mucsi
Eötvös Loránd University, Faculty of Informatics, Budapest, Hungary
mucsib@inf.ele.hu

Boglárka Mucsi was appointed part-time teaching assistant in 2023 at the Faculty of Informatics, ELTE. With her decade-long expertise in social innovation projects and marketing, she supports the implementation of entrepreneurship courses and interconnected international projects.

Katalin Nádasi
Eötvös Loránd University, Faculty of Informatics, Budapest, Hungary
knadasi@inf.elte.hu

Katalin Nádasi was appointed lecturer of entrepreneurship in 2023 at the Faculty of Informatics, ELTE. She has over 20 years of professional and teaching experience and holds a PhD in Economics. She has published and conducted research in Marketing and New Technologies.