



Education for sustainable development: a critical reflexive discourse on a transformative learning activity for business students

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Abstract

This paper presents in detail a critical reflexive discourse on a transformative learning activity that engaged 140 students of the “Risk Management and Green Business Strategy” module at the University of Turin. During the course, students were asked to find, analyze, and propose a solution for a self-identified challenge working in close partnership with local urban companies on sustainability issues. Following a project-based learning approach, this paper compares two different group of students. The treatment group, i.e., the students following the ESD module, was then compared with a control group represented by the students from the traditional course of the previous year, in terms of their willingness to orient their future career on sustainability topics. Findings point out clear impacts on the study of sustainability-related disciplines (i.e., + 372% of thesis on sustainability) and on long-term career orientation of students on sustainability-oriented master and jobs.

Keywords Transformative learning · Education for sustainable development · Higher Education Institutions · Critical reflexive discourse · Sustainability-oriented career

1 Introduction

With the adoption of the 2030 Agenda for Sustainable Development (United Nations, 2015, accessed 28 Apr 2021) and its related 17 Sustainable Development Goals (SDGs), worldwide institutions are called to play a leadership role in inspiring future generations to achieve and promote sustainable development (WCED, 1987). Within this policy platform, Higher Education Institutions (HEIs) are directly involved as leading actors for the global

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transition, with a greater emphasis on supporting the transformation of learners than what previously advocated by UNESCO (2004) through the Decade of Education for Sustainable Development (2005–2014).

Although it is not novel as a topic (see for instance the Talloires declaration, as an example of a widespread institutional commitment), today, a greater effort is required to radically transform mainstream pedagogies, to become vehicles capable of educating students of all disciplines to be future responsible citizens and involve all stakeholders in a global transition (Khan, 2013). To do so, educators are called to break down the traditional status quo of sage-on-the-stage, embracing more interdisciplinary and transdisciplinary education and learning schemes that go in the direction of transforming the role of the teacher in a guide-on-the-side (Klein, 2021). Unfortunately, this commitment is not linear and the risk of providing a shallow and dogmatic sustainability teaching is still high, especially considering the difficulties in matching competencies with pedagogies (Lozano et al., 2021).

For this purpose, UNESCO (2017a, 2017b) defines Education for Sustainable Development (ESD) as a holistic and transformational education that needs to be highly interdisciplinary and transdisciplinary to be effective. The same goes for the Education for Sustainable Development Goals (ESDGs), which are intrinsically and extremely interlinked and ecosystemic (Griggs et al., 2013; Nilsson et al., 2016, 2018), as it is almost impossible to address one single SDG without mentioning its relations with others. Consequently, educators should collaborate and cooperate in adopting different pedagogical approaches that move beyond a dogmatic teaching style. For instance, Brunstein et al., (2020, p. 181) stress the need “to understand the tensions that are present in knowledge co-creation and the interconnections between academic (theoretical) knowledge and practical knowledge of the business world.” Scholars globally advocate for adopting innovative pedagogical techniques, because dogmatic teaching of SDGs might result in a counterproductive effect in learners generating disaffection and utopias (Corazza, 2020). In this paper, we explore the results of a real ESD experience, using critical reflexive discourse. We do this by not only focusing on the short-term effects of a present (or absent) transformation in learners but also on long-term implications on their professional and personal careers.

Making a critical reflection on the results achieved through this lived experience requires to go beyond the calculative pragmatism of university corporatization that sees in indicators the ultimate ratio (Parker, 2011, 2013), to explore a more intimate dimension of learners’ personality and the overall meaning the ESD activity designed for the learners. We find in Mezirow’s (1991b, 2000) transformational learning theory and in Freire’s (1972) seminal work on critical pedagogy a general alignment, especially in questioning the ‘banking model’ of education, in which students are like containers to be dogmatically and passively filled by the educator with facts. These models presuppose a strong imbalance between educators and learners as if the former was acknowledging the latter’s ignorance as a mutual justification for the existence of that relationship. As the scholar pioneeringly argued already forty years ago, the education system must do away with this idea, by stressing that the teacher and the student play both roles simultaneously. This is the foundational and fundamental feature of the problem-posing model of education, which entails a liberating dialogical teacher-student relationship, in which they grow together.

Interactive, experiential, and learner-centered are only a few ways to break the traditional academic field silos by giving relevance to the learning environment (the loci where the training session is delivered). Specifically, this will happen by putting into discussion the effectiveness and efficiency of traditional frontal lectures, the timing, and the composition of the classes of HEIs to stimulate a real transformation in students’ behavior and attitude. For instance, the surrounding urban environment could represent a fruitful and

stimulating place also for students of business and management courses, working together with place-based commercial activities and local companies in developing sustainable development-related soft-skills and managerial ones (Abou-Warda, 2014; Cottafava et al., 2019, 2020). The university-city nexus becomes fundamental to support and stimulate external actors and stakeholders on the local territory, from industrial partners up to the citizens themselves in the guise of urban living laboratories (Verhoef et al., 2020). Similarly, a more recent model, i.e., the fourth-generation university, exactly underlined that HEIs must co-create and promote sustainable growth partnering with the local territory and local stakeholders (Oztel, 2020).

Despite the dozens of papers and research published in the last few years about the enthusiasm for novel methodologies and practices to support ESD teaching techniques, studies on barriers, limitations, risks, and opportunities, from educators-centered perspectives are still rare. For this reason, this research aims to provide the lived experience of an educator in designing and implementing an ESD-based course, by adopting a rather uncommon biographical research approach, but suitable for narrating the outcome of teaching activities (Samkin & Schneider, 2014). The paper describes in detail a case study related to an ESD-based module run at the Department of Management of the University of Turin designed with the idea of controlling and checking. The career of the treatment group (i.e., the students involved in the ESD course), then, has been compared with a control group (i.e., the students of the same course of the previous year), in terms of their willingness to follow a sustainability-related career.

The rest of the paper is structured as follows. In Sect. 2, a brief introduction related to transformative learning and ESD approaches is provided, as well as about critical reflexive discourse as a research method. In Sect. 3, the ESD case study and the methodology are described in detail. Finally, in Sects. 4 and 5, findings in terms of both the output of the ESD module and the improvement in the willingness of students to follow a career related to sustainability topics are presented, by highlighting limitations and future research avenues on transformational learning activities and ESD.

2 Background

2.1 The loci of sustainability-oriented universities

In recent years, the social contract between universities and society has been subjected to a review of its constituents, going beyond the traditional duties of generating new knowledge and transferring it to the public, introducing a more holistic mechanism of collaboration and cooperation with external stakeholders (Leal Filho et al., 2019). In this sense, the need to transform universities as leading actors in society to envision and guide future societal values is crucial, and, nowadays, particularly urgent. Indeed, the educational role of universities within the ESGs framework is not only related to transferring knowledge to students but to transforming and empowering them to be the future leaders and actors of change (Calvano, 2017; Caughman et al., 2020; Clugston & Calder, 2014).

According to Fissi et al. (2021) and Findler et al. (2019), several aspects are fundamental to classify a sustainability-oriented university: community engagement, campus operations, teaching, research, as well as the institutional framework, accountability mechanisms, and the way of delivering and reporting information to the public. Moreover, the ongoing transformation toward sustainability-university should be analyzed by considering

specific institutional, organizational, and physical features such as size and age, geographical locations, profit, and vocational orientation (Ingallina & Charles, 2018). For instance, a campus setting or an urban setting are fundamental aspects to be considered, also when the educator is called to plan courses with sustainability-oriented pedagogies (Ávila et al., 2017; Teelken & Deem, 2013). In this view, the context could greatly impact the type of activities that an educator can design to connect the university-citizenry (Stough et al., 2018). For example, while it is very common to find courses that have a project-based approach (which is usually an organization or a specific problem), it is rarer to find courses that combine several projects and several simultaneous needs of the same specific area (Ortiz & Huber-Heim, 2017). Usually, the degree of complexity of these projects requires the educator to have a well-established social and relational network in the territory and with citizens (Dagiliūtė et al., 2018). In this sense, the most fundamental pillar of a sustainability-oriented university is its community engagement orientation (Corazza & Saluto, 2021).

2.2 ESD, project-based and transformative learning

Education for strong sustainability science (see for instance Roome's work, 2012) needs to empower students to grasp the interconnections with the external environment (taking care of it, for instance), the role of their behavior in decision-making processes, conflict resolution, shared consensus, as well as promoting students' actions, stewardships, and activism (Clugston & Calder, 2014). These challenging requirements need to focus on different aspects as multi-, inter or trans-disciplinary knowledge, with high interaction that should be supported by a high level of academic freedom that could be exercised toward students' empowerment (Cebrián, 2017; Cebrián et al., 2013; Cottafava et al., 2019). Only through interdisciplinary teaching, students could concretely approach grand challenges (Gibbons et al., 1994; Ledford, 2015). Regardless of one's background, those who relate to the SDGs for the first time manifest the need to collaboratively create and share a reference vocabulary, as they often have a partial vision that can be only compensated by collaborating with peers (Cottafava et al., 2019). Consequently, various types of interactions may occur, such as peer-to-peer, learner-teacher, or learner-external environment (Kysilka, 1998). All of them are essential elements of an ESD activity.

Peer-to-peer interactions need a proper class space to dialogue and to create a sense of togetherness (e.g., enough space to move or to work in a team, movable tables and chairs which is far from negligible, especially in very old universities), while for learner-external environment interactions, for instance, it is necessary to move outside the boundaries of the class and of the building itself, getting in touch with the urban environment and place-based communities (Borges et al., 2017; Holmén et al., 2021). Academic freedom could instead represent a very critical element, as it could create multiple barriers for educators, like posing limits in terms of intercourse coordination, and in terms of evaluation of the course outcome (specifically, in the view of mechanistic ranking-based parameters) (Ávila et al., 2019).

Empowering learners means that the educator must design an activity that is entirely aimed at letting and allowing the vast majority of participants in developing effective sustainable solutions in a real context, learning from the real experience and, after that, reflect and critique the knowledge acquired, matching the knowledge gained by all the group participants comparing and contrasting the proper one (Ortiz & Huber-Heim, 2017). For this purpose, academics highlighted the importance of active learning, participatory education,

and critical thinking (Lyons et al., 2001), while UNESCO (2017a) recognizes as a fundamental pillar of ESD and transformative education the centrality of reflexivity such as the skills of considering the impacts, locally or globally, of decision-making processes on future social, cultural, economic, and environmental scenarios. Soft skills such as system, critical, and anticipatory thinking, normative, strategic, and collaborative reasoning or problem-solving are then accompanied by pedagogies and techniques of think-pair-share, generating examples, developing scenarios, concept mapping, flowcharting, predicting, constructing tables/graphs, just to name a few (King, 1993).

According to Mezirow, father of the transformational learning theory, the pillars of an effective transformational process are, among others: debating and critically reflecting, taking action and applying critical reasoning on the same findings of the reflective process itself, also validating contested beliefs (Mezirow, 1991a, 1991b, 2000). King (1993) emphasized the need to change the transmittal model from passive to active, underlying that a constructivist model must work placing the learners at the center of an active and participatory process of knowledge creation, where the educator is the facilitator. Thus, the facilitator in a student-centered teaching approach is crucial to promote an active engagement of learners, but also to guide learners in a self-reflection on their emotional path, on their personal beliefs, sensations and difficulties (Barth, 2013, 2016; Kolb et al., 2001). With this intent, it is important that active learning pedagogies such as experiential learning, flipped classes, problem-based or project-based learning are designed as dynamic, interactive, and creative learning experiences, where the facilitator stimulates learners through dialog in becoming responsible active citizens (Johnson et al., 1994). Not only this but also a critical reflexive discourse with the perspective of the educator and facilitators could improve the learning circle, even though scientific studies using this approach are not common.

3 Methods

This study has been designed to apply a critical reflexive approach to an ESD activity to provide the educator's point of view about the process to design, implement, and run an ESD course within a business school. A critical reflexivity step is an essential part of the whole approach. The present work consisted of the comparison of the transformational learning outcome, in terms of the willingness of students to continue with a sustainability career of an ESD module (i.e., the treatment group) and a traditional class (i.e., the control group). In the following, the research context, the description of the two classes, the details of the traditional and the ESD learning activities, as well as the evaluation and comparison methodology, are provided.

3.1 Critical reflexive discourse for ESD

Without strictly positioning with one of these, our research takes inspiration from three connected research streams: autobiography, personal narratives, and autoethnography (Samkin & Schneider, 2014). Autobiographic approaches, largely tested in business and management, have been used, for instance, by Mitroff (2011) to analyze the failure of business schools to prepare students to ethically manage and face complex and wicked problems. Although commonly accepted in social sciences, autobiographies are generally considered limited in business research. On the other hand, personal narratives focus on the

experiences of the researchers through subjective and evocative narratives, but they rarely rely on personal reflection. On the contrary, autoethnography has been recently accepted as a suitable approach to study and analyze case studies in business, management and accounting (Samkin & Schneider, 2014), for its strong focus on the researcher's role in producing accounts of the social world, through his/her own reflexivity (Hammersley & Atkinson, 2007).

Previously used in social sciences, autoethnographies are largely adopted as a methodology because of their reliability, generalizability and validity (Ellis et al., 2011), but the feature of autoethnography that inspired us the most in this research is specifically its reflexive intent, which should be a guiding principle in this kind of studies, to avoid biased results and to allow research neutrality (Gariglio, 2017). We, therefore, make no claim that our research can be considered as a fully-fledged autoethnography, but we do engage in a 'rigorous self-reflection...in order to identify and interrogate the intersections between the self and social life' (Adams et al, 2017, p.1), toward our goal of describing and analyzing cases that address ethical responsibilities, with an educator perspective (Haynes, 2017), critically and qualitatively.

Reflexivity is used here with the intent of making a lively analysis and critique of the ESD experience, from a cultural point of view (Adams et al, 2017), as a critical dialogic intent between the object of the research presented (the ESD case) and the intersubjective stance of the educator (Zienkowski, 2017). In addition, the critical nature relies on the identification of the extremely intricate relations existing between large-scale forces (like the sustainability imperative that should revolutionize global economies) and the local context of the micro-level ESD experience performed (a post-industrialized urban area) (Bucholtz, 2001).

3.2 The research context

The University of Turin (UniTo), founded in 1440, is a large public university located in the city of Torino in Piedmont (Italy). It counts more than 120 buildings spread all over the city, as well as in other parts of the Piedmont region, and the academic community counts nearly 100.000 among students, professors, researchers, and staff members. With its 27 departments, UniTo is a generalist university, active in all academic fields (excluding architecture, engineering and applied fine arts), ensuring the relevance of the case study for similar universities. In the last decade, UniTo has been particularly committed to sustainability in all its activities, from research to educational programs, as well as on urban outreach and community engagement initiatives. The ESD course, the object of this study, was held at the Department of Management which counts more than 9,000 students (of which, about 10% of them are international).

Class description. The ESD activity has been conducted in the module of Green Business Strategy of the course "Risk Management and Green Business Strategy" (a third-year module) during the year 2018/2019. The module consisted of 21 h of lectures (equivalent to 3 ECTS). Every single lecture was 3-h long. The treatment group, i.e., the students who take part in the ESD activity, has been compared with a control group, i.e., the students of the same course of the previous year (2017/2018). The composition of the class has been an aspect to consider while designing an ESD course, because running an ESD activity in a class entirely made of native students, or a multicultural and international class, should lead to completely different designs, findings, and conclusions. We have to especially consider that it would be expected that students will actively interact between themselves, and

with local companies operating in the external environment to design and test solutions to sustainability issues. An SDG score has been used to track the level of multiculturalism of a class, especially in relation to the level of SDGs achieved by each student's country of origin. The SDG score refers to the following formula:

$$SDG \text{ score} = \frac{\sum_{i=1}^n S_i SDG_i}{\sum_{i=1}^n S_i} \quad (1)$$

where the SDG score is the total score for the entire class or department, S_i is the number of students from country i , SDG_i is the SDG score of a specific country i (Schmidt-Traub et al., 2017) and n is the total number of countries. The SDG index is a score between 0 and 100 that represents the level of achievement of SDGs by a country. Thus, in other words, it represents the progress toward the level of sustainable development of a specific country. Although the SDG index has not been designed for this purpose, its use here could act as a proxy for describing the overall composition of a class with international students, in terms of multicultural orientation and to determine the knowledge of the class regarding the external urban environment (such as, for instance, the knowledge of the territory, the history of the area, the gentrification, the quality of life of the residents).

3.3 Traditional vs ESD teaching

Traditional teaching: the control group. The course for the control group was based on 15 h of theoretical lectures and 6 h spent on preparing a presentation about a case study related to green business strategy. The students were evaluated with respect to (1) a final presentation, (2) weekly assignments, and (3) a written examination, with each part weighted equally. Two competences were assessed: (1) the factual and (2) the conceptual knowledge. The former refers to the basic knowledge about sustainable development, while the latter was based on precise definitions about SD and their identification in practical cases (Anderson & Krathwohl, 2001).

ESD teaching: the treatment group. The ESD activity for the treatment group, instead, was structured to have three lectures with theoretical insights and three lectures of active learning activities. The theoretical lecture was taught with a flipped class model (Lozano et al., 2021). Basically, the whole module was designed as a project-based learning module, where the main activity was to study and analyze a real business case study and face the corresponding and identified challenges related to sustainable development. The whole ESD activity has been designed to study metacognitive knowledge, i.e., contextual, strategic and reflexive knowledge for problem-solving in a precise cognitive field (Anderson & Krathwohl, 2001). Furthermore, to avoid discrepancies with the control group and to overcome criticism based on a purported lack of taught knowledge during ESD activities, the whole module was designed in a way that would provide the same basic knowledge about SD as the traditional course. This aspect has been possible by adopting the flipped-class approach, in which theoretical notions are taught partially during the classes and partially at home with additional materials.

The adopted project-based approach, instead, consisted of student groups working to:

- a. support existing businesses in Turin or in the proximity of the Department of Management toward sustainability activities;
- b. develop a sustainability strategy in their local and personal/family business, or

- c. develop a sustainability strategy for the university/department, for a sustainability challenge.

To avoid biases in the choice of the project/business, in the preliminary phase, no advice was given to any group to find the case study/collaboration. The process has been completely free to ensure the highest level of personal commitment, creativity, and freedom. In some cases, a letter was given to the student groups to facilitate the first contact with the chosen businesses. Finally, each group was evaluated on a final written essay and a public presentation of the work.

For the final essay, a basic structure was provided to allow the evaluation of student soft skills and the use of common managerial tools through the SMARTER criteria (Specific, Measurable, Achievable, Realistic, Time-constrained, plus Ethical, Recorded). The basic structure was as follows: (1) introduction (the main problem), (2) a brief description of the chosen case study, (3) hypothesis, i.e., the group strategy and plan, (4) a detailed solution description, (5) a business model canvas, (6) a strategic analysis of the presented solution (e.g., SWOT analysis), and (7) conclusion. Students were called to make a plenary presentation of the results achieved and to join a collective discussion.

3.4 Evaluation process

Regarding the outcome of a transformational course, Redman (2013) suggests tracking that transformation using ex-ante and ex-post survey, but in that specific case, only six students joined the program, and the survey was carried out two weeks after the end of the program itself. In Wamsler (2020) instead, we can find a more coherent research design, as the comparison is between treatment group performance and control group performance calculated on the main purpose of that course, that in Wamsler was contemplative interventions for inner transformations. In this paper, the chosen qualitative proxy to compare the treatment group (i.e., the attenders of the ESD module) with the control group (i.e., students from a traditional course) was the willingness expressed by the students to continue their careers on sustainability-related topics.

Two main indicators have been considered as variables to measure the short-term transformative impact of the ESD activity: (1) the number of final dissertations related to sustainability, and (2) the number of recommendations letters asked from the students to the educator for future studies about sustainability (e.g., masters, professional courses). Similarly, two measures have been used to verify the performance of the two groups: (1) graduation time, expressed as the percentage of students who graduated on time, and (2) the average final score, namely the bachelor's final degree score.

To evaluate long-term transformation, a second data analysis process has been run in 2021, with personal recall with students that joined the ESD activity, also checking and coding the personal LinkedIn profile of participants. As such, it has been possible to retrieve and code data on the number of students with a career in a sustainability-related field such as (1) a master's degree in a sustainability-related field, and after (2) a professional career with an organizational position in sustainability-related management or a professional career in a sustainability-oriented organization (such as NGOs, or consulting companies in sustainability issues).

4 Results and discussion

The composition of the two groups is summarized in Table 1. While the course has been performed in an Italian university, the overall SDG score of 71,15 for the department level corresponded to the 65th position (out of 166) in the countries assessment, held by Kazakhstan in 2019, while a score of 69,59 referred to El Salvador (77th position). Thus, the composition of the treatment group, on average, can be interpreted as a class with the same development level of El Salvador (according to data published on <https://dashboards.sdgin dex.org/rankings> accessed in 2019 and subsequently). For 2019, Italy had a score of 78.28 occupying the 26th position. In terms of the composition of the class at a course level, this means that involving a higher percentage of international students is required to guarantee that each group engages with at least a native (Italian) participant, to facilitate the process of dialoguing with the external organizations or companies. The class of 2018/2019 represents the treatment group, while the class of 2017/2018 is considered as the control group. Both classes show a similar percentage of internationalization and gender distribution, also in terms of SDGs scores, despite the control group being smaller.

4.1 ESD activity outcomes

Students of the treatment group self-organized into 16 sub-groups. Not all students of the course (14%) actively participated in the ESD activity (mainly part-time students), due to difficulties in schedule arrangement with personal working activities. Therefore, an alternative final evaluation and program have been provided to them. Two groups of students out of the 16 groups (one composed entirely of Chinese students and a Spanish one who had language problems) delivered a very unsuccessful work, and a second examination was arranged.

The basic group information—project name, the total number of students, percentage of female and international students—are summarized in Fig. 1 and in the Supplementary Materials. In Fig. 1, the *x*-axis represents the percentage of female students, the *y*-axis represents the international students one, while the size of the bubble corresponds to the number of students within the group. Out of the 14 self-arranged groups, only two groups were not very heterogeneous (one group was composed only of female students, while another one was only by international students).

Chosen projects. In general, the creation process of the group was completely free and without any bias from the educator, neither in the members' composition, nor in the choice of the challenge *a*, *b*, *c* (as described in the methods part). Table 2 shows the number of projects per challenge, and the corresponding projects' names. Detailed information about the aims and engaged stakeholders are provided in the Supplementary materials.

Table 1 Context description with respect to international students in 2017/18 and 2018/19

Context	Academic year	Total students	International students (%)	Female students (%)	SDGs score
Course level	2017/2018	124	47%	46%	69.57
	2018/2019	176	49%	49%	69.59
Department level	2017/2018	9.247	9.29%	–	71.15
	2018/2019	9.081	9.06%	–	71.16

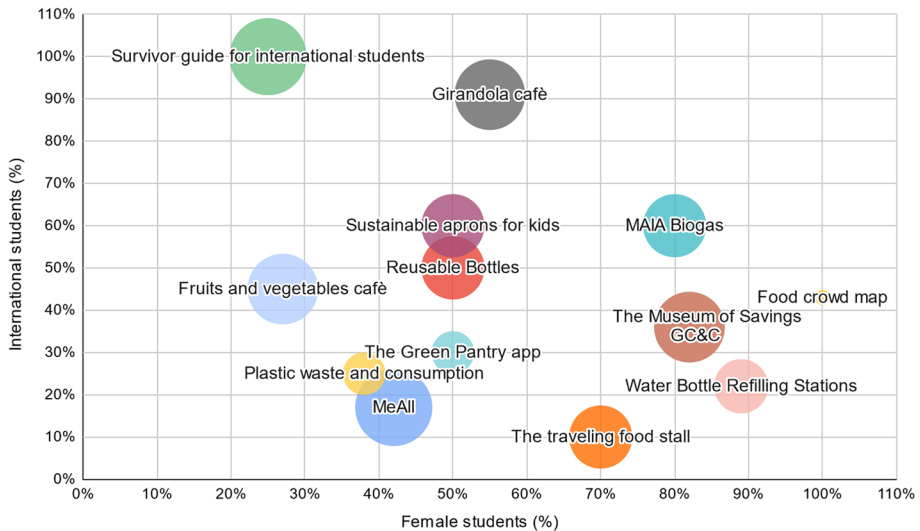


Fig. 1. Groups composition in terms of female and international students' participation (as% of total group members)

Type-a projects were aimed at supporting local businesses in Turin to implement green and sustainability-related strategies. Two out of four *type-a* projects—i.e., the traveling food stall, and fruits and vegetables café—supported two local food and beverage businesses promoting solutions for healthier consumption for students and citizens, one—i.e., the museum of savings—aimed at creating awareness about the overconsumption of paper, highlighting important aspects related to forest management and biodiversity losses, and the last one—i.e., sustainable aprons for kids—focused on the fast fashion consumption issue for baby clothes.

Type-b projects, instead, were related to the family businesses of one of the group members. In the case of Girandola Café, students introduced sustainable practices for a personally owned cafeteria, while for MAYA biogas, students developed a short video, later used by the company, to create citizens' engagement. The latter two projects, plastic waste and consumption and the green pantry, working on the ban of plastic products in a little shop in Spain (owned by a family member of one of the students), and on developing a Mobile App to monitor, and consequently reduce food waste at home. These last two group presentations, in particular, were not satisfactory and incomplete. Indeed, the plastic waste group was not able to provide any detail about the real business, while the green pantry group conducted an interesting benchmark analysis, but they stopped due to a lack of knowledge in software and mobile app development.

Finally, *type-c* projects focused on environmental issues directly related to the University of Turin itself. Two groups—i.e., reusable bottles, and water bottle refilling stations—worked on real and pragmatic solutions toward reducing single-use plastics within the University and, after the ESD course, provided useful insights to the Green Office in terms of affordability alternatives. Three other projects—food crowd map, GC&C, MeAll—proposed solutions related to food consumption, food container and packaging. The food crowd map group proposed a crowd service for students to map local activities, give feedback, and to provide basic information about diet and environmental impacts. GC&C

Table 2 Project types and names

Project type	Number of projects	Group names
<i>a</i>	4	The traveling food stall, the Museum of savings, sustainable aprons for kids, Fruits and vegetables cafe
<i>b</i>	4	Girandola cafe, MAIA biogas stakeholder engagement, plastic waste and consumption, the green pantry
<i>c</i>	6	Reusable Bottles, Food Crowd Map, GC&C, MeAll, survivor guide for international students, water bottle refilling stations

introduced a reusable coffee cup with the university logo, while MeAll developed the idea of a food delivery platform linked to local lockers and warehouses. Finally, the last group developed a sort of inclusive orientation guide for new international students to help them settle down in Turin and at the University of Turin, developed in seven different languages, on the basic steps to take once arrived in the city.

In general, students working on *type-c* projects were more motivated and enthusiastic to develop a solution for their own environment (such as the University itself). Indeed, almost all the groups developed the first prototype before the final presentation. For instance, the water reusable bottles group presented the first design of a reusable bottle during the presentation, the food crowd map designed the website, the survivors' guide for international students was sent to the international university office, and to some international students' networks, while the water bottle refilling stations team conducted a survey with approximately 200 respondents, and the answers were later forwarded to the Green Office of the University. The refilling stations were installed one year later in several university buildings.

Ex-post critical considerations. First of all, enthusiasm is the first word that can be used to describe the works of the students. Indeed, almost all of them were very motivated by being called to provide solutions to very current problems. This aspect has been particularly true for *type-c* groups. Only one group complained about the general structure of the course and was scared by the idea of failing the exam, asking for a more traditional, guided syllabus. Another negative aspect was due to the relation between class size and space (the physical space), with the latter being not adequate for students to work in teams, for the limited space that could not host all the groups at the same time, and for the absence of movable tables/chairs.

Student satisfaction was generally high: The satisfaction rate was, on average, higher than 3 (on a scale where 4 is the maximum rate). In particular, eleven aspects have been evaluated (in parenthesis the score) through the ex-post survey of students (that is a relationship management tool of the university): 1) previous knowledge (3,38), 2) workload (3,32), 3) materials (3,36), 4) final examination (3,38), 5) schedule (3,46), 6) stimuli (3,44), 7) clarity (3,53), 8) side activities (3,80), 9) coherence (3,55), 10) professor's availability (3,62), and 11) interest in the subject (3,53). The highest score was for the side activities. Although for this ESD module, the side activity was the central one, students still intended it as a collateral activity of a traditional course. The worst scores, instead, were attributed to the workload and the materials. This can be seen as a rejection of the flipped-class approach perceived as time consuming.

4.2 Short-term evaluation

In the following months, just after the ESD course, something noteworthy occurred. Many students who attended the ESD module sought supervision for the final dissertation or asked for recommendation letters for their future careers. Thus, as described previously, we decided to compare the number of final dissertations and the willingness of students to follow the career on sustainability-related topics. Table 3 summarizes the main data and information used as a proxy to evaluate the transformative impact of the ESD course. In particular, 41 students of the treatment group (out of 176) graduated with a sustainability-focused dissertation (+372% of thesis on sustainability-related arguments) and 9 students asked for recommendation letters. On the contrary, only 11 students of the traditional course (i.e., the control group) had a final dissertation related to sustainability and only one asked for a recommendation letter. Hence,

Table 3 Final comparison

Proxy	Control group	Treatment group
Number of participants	124	176
Sustainability-based final dissertations	11	41
Recommendation letters for sustainability-oriented masters	1	9
Graduation time	70%	73%
Average mark reached for the course	27.28	28.50

taking the number of the final dissertations and of the recommendation letters as a proxy for the willingness of the students to continue pursuing a career on sustainability topics, the ESD module had a considerable impact. Table 3 also shows the percentage of students that graduated on time and their average grade. 73% of the treatment groups graduated on time against 70% of the control group, while the average grade was 27.28 versus 28.50 for the treatment and the control groups, respectively, showing how students' performance has not been affected or greatly changed. These findings are in line with previous studies on non-formal teaching techniques, such as flipped-class (González-Gómez et al., 2016), case studies teaching (Bonney, 2015), or experiential learning (Ngereja et al., 2020), that demonstrated the increase in performance and average score of students. In particular, experiential learning has been widely tested as an effective methodology to increase student engagement and to increase their interest in different fields, from business (Finch et al., 2015; Winsett et al., 2016) to health (Szeto et al., 2016) or engineering (Li et al., 2019). On the contrary, flipped-class in this case study has been negatively evaluated by students in contrast with previous studies (González-Gómez et al., 2016) and further evaluation and studies are needed to confirm students' perception.

4.3 Long-term evaluation

Acknowledgements of the long-term impact of ESD activity on students' careers were done by considering the treatment group only. This is because the control group had, however, made little impact on the short term (only one letter of recommendation versus 9 in the treatment group and 11 theses versus 41 in the treatment group). The transformation has impacted those who decided to have a career in a sustainability-related field in two ways: holding a master's degree in a sustainability-related field and continuing a professional career in a sustainability managerial role or working for an organization deeply involved in sustainability (such as NGOs or social/green companies). The results of the long-term transformation show that nine students continued to pursue a sustainability-oriented career, holding the Master's degree for which they asked a recommendation letter, and seven out of nine surprisingly started a professional career in sustainability-related jobs (such as, for instance, sustainable analysts, sustainability consultant, chief sustainability officer, sustainable entrepreneurs). The remaining two are still obtaining their Master's degree and they are expected to graduate in one year. Data analyzed in absolute and relative number, especially on the total of participants, are not showing an impressive number of students that opted for such a long-term professional career in the field, but it is also true that the ESD activity was conducted in a course module, and the whole degree was completely distant from being a sustainability-oriented course (Table 4).

Table 4 Long-term transformation

Students with a career in a sustainability-related field	Female	Male	Total
Master's degree in a sustainability-related field	6	3	9
Professional career	6	1	7

From data analysis, it does not emerge any specific causality between the type of projects run by students and the impact of the project typology on the long-term career choice of students. Or, better, the prevalence of students from *type-b* and *type-c* projects in requesting dissertation supervision and letters of recommendation could potentially be because those groups of projects included the highest number of participants. In terms of future strategies, it can be assumed that valid observations are needed to establish a link between the lively experience of students in project-led courses and their transformation. For instance, taking track of impacts such as creativity, freedom to innovate, technological challenges, budgetary constraints, respect of regulations, and family values, would help researchers understand the presence of drivers and barriers in supporting long-term transformations through sustainability projects. In this vein, a specific critique would be done here in the need of offering concrete financial and institutional support to students involved in such projects, as the lack of credibility and institutional commitment could divert the interest of skeptical students in taking a step toward a sustainability-oriented career.

Moreover, it should be considered that no coordination activities have been run among lecturers of the different disciplines of the Bachelor course, and no sustainability literacy was provided to these students before joining the ESD, considering that, the long-term results here presented and discussed, could be evaluated positively.

4.4 SWOT analysis: students' and teacher's perspective

The implications of a project-based ESD course are rather non-trivial and linear both in terms of students' and teachers' perspectives. In this paragraph, different strengths, weaknesses, opportunities, and threats (SWOT) that emerged during the discussed case study and in previous studies are discussed to provide useful insights for future studies and practitioners engaged in ESD. Previous similar studies on ESD (Cottafava et al., 2019, 2020) already discussed SWOT features of project-based ESD teaching initiatives from a students' perspective. Although with a slightly different educational environment—i.e., a two-day full-time workshops—the authors highlighted, among others, the experiential learning, learning of the SDGs, and the adoption of business tools as strengths, while as weaknesses a *superficial knowledge* and the *difficulty to create a common language*. While the identified strengths, from a students' perspective, are still valid for a longer teaching module (as the case study here presented), the highlighted weaknesses could be overcome. Indeed, if the knowledge provided to students in a short module (2–3 days) could be superficial due to a lack of time to deepen complex concepts, this is not necessarily true for a whole teaching course (2–3 months), even if teaching the complexity regarding sustainability and sustainable development still remains one of the main challenges for ESD. On the other hand, creating a *common language* among participants (a weakness for transdisciplinary teaching) is not a major issue for a module addressed to business students since they have a common background. Other weaknesses may instead emerge due to cultural differences

within international classes, as underlined in this case study. Regarding external features (opportunities and threats), the improvement of local territory with *'real' projects*, the creation and setup of an *innovation community* about sustainability through *networking* have been recognized as opportunities for project-based ESD courses, while guaranteeing a *follow up* of the projects developed by the students and the risk to target a too *wide challenge* (due to the broadness topics treated by the SDGs) are the main threats. Similarly, with a longer teaching module (2–3 months), the opportunities are still valid and even strengthened, while the threats may be partially solved. The risk of encompassing a too wide challenge, for instance, with the described case study was overcome by focusing on local or family businesses or on the university itself. On the contrary, the likelihood to experience failure and difficulties in following up the presented projects still remains a challenge if no resources (both in terms of person and capital) have been allocated.

From a teachers' perspective, Fig. 2 shows the SWOT analysis. Some aspects are in common with the students' SWOT, while others depend on the role of the teacher/professor within the academic community. In particular, regarding strengths and opportunities, a project-based module may be considered as part of a third-mission and urban outreach activity since students' projects are addressed on the local territory and can have a direct positive impact on the neighborhoods or the cities where universities belong to. Similarly, projects focused on the academic community itself may help teachers and professors to positively contribute to the management of the university they belong to. Finally, collaborating with

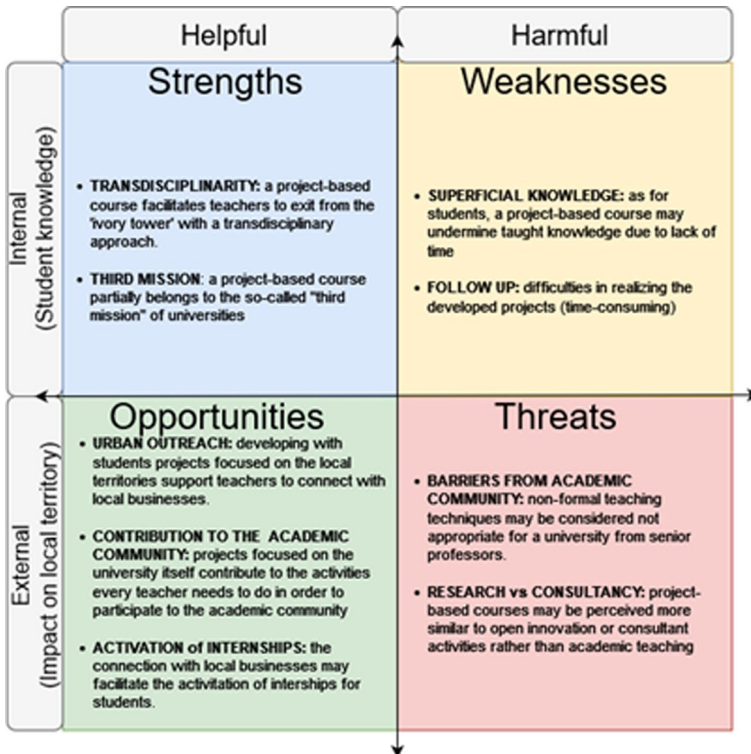


Fig. 2. SWOT analysis from teachers' perspective

local businesses may facilitate job placement and the activation of internships for students. On the contrary, the main weaknesses are in common with some of the weaknesses and threats of students. Indeed, the main challenge still remains balancing the short time for teaching hard skills and vertical and deep knowledge with the development of students' soft skills, as well as balancing the time among research and education and the follow-up of real projects (activity not yet officially recognized for the academic career). Finally, some external threats may emerge from colleagues and senior professors, locked into traditional education systems that may perceive non-formal teaching as the role of consultancy firms rather than of a higher education institution.

Concluding, recalling the percentage of students interested in following their career in a sustainability-related field, the performance (in terms of students' engagement in sustainability) of non-formal teaching has been widely improved further by running and implementing such modules as earlier as possible. Indeed, as demonstrated by other studies about ESD (Olsson et al., 2016), the concern about environmental and social issues tends to decrease in adolescence as the children grow up, and consequently, a non-formal project-based teaching module may be perceived by the students as a side-activity, less important than other academic courses. Moreover, running such modules in the first years of the students' academic careers may facilitate solving some of the weaknesses presented in Fig. 2. In particular, the issue of the follow-up of the projects may be overcome by teaching the ESD module in the first year. In this way, students may be engaged and incentivized to follow their projects for the entire bachelors' degree. The positive performance of running project-based education is widely demonstrated worldwide by several 'experiments' such as the one of the *Universitatea Alternativă* (en: The Alternative University), an education project developed by the NGO CROS (Centrul de Resurse pentru Organizații Studențești) in Bucharest, Romania.

5 Concluding remarks

Certainly partial, and not radical (Klein, 2021), the ESD activity presented in this research is apt to demonstrate how active learning pedagogies aimed at learner transformation can be implemented. During this activity, many students have encountered issues dictated by regulation, lack of financial resources, and the need to provide concrete solutions based on scarcity of resources or time logic. Overall, enthusiasm for the study of sustainability has involved a very high number of students who have chosen to write a dissertation on these issues. Fewer have chosen to pursue further study on these topics, but many have continued or are continuing a sustainability-oriented professional career. This ESD activity was still conducted at a time when sustainability topics were taught on a very limited basis across the entire curriculum. Consequently, the choice to undertake a future path of both study and career-oriented toward sustainability could suggest how attending the ESD module has contributed, at least in part, to triggering positive reinforcement toward an internal transformation in the direction of sustainability for their personal life (Mezirow, 1991b, 2000).

However, it clearly emerges how this training activity provided during the last year of the Bachelor can bring students closer to a concrete choice about their professional future in the field of sustainability. Secondly, it emerges how, from the creativity and freedom of choice and self-regulation, and while being guided by the teacher, students have been able to show greater enthusiasm, feel appreciated, be taken seriously, and be able to make a difference. Third, the concreteness of the activity, and also the possibility

of comparing themselves with others, even on negative aspects or management problems encountered, meant that many of them developed a critical sense, in affirming the strengths or weaknesses of their own project, or even of the company itself with which they had come into contact.

From the educators' point of view, then, it is certainly worth noting that the design of these activities in an urban context depends strictly on the relationships of the educator with the environment of reference, and on his/her knowledge of the territory. The percentage of foreign students involved in this ESD activity was very high, and consequently, it is normal to think that often for international students, it is important to return home following a professional profile more appealing in the job market (especially for those students coming from countries with a very low SDG index). As regards the methodology adopted, in order to build a critical reflective discourse, some proxies or indicators have been used here. This is not to diminish the importance of the intersubjective dialogue with the participants, but rather to construct initial reasoning on the effectiveness of transformation in the long run, and therefore on the duration of deep transformation practices.

A perennial criticism toward any form of ethnographic research, often highlighted by ethnographers themselves, is that its data can hardly be generalized (Brewer, 1994; Hammersley, 1991) and that there is a general tendency for researchers to be un-reflexive. However, we also believe that transformative learning cannot be abstracted from the lived experience of the educators and learners, and, in this case, a critical reflexive discourse has included looking and commenting on data. We acknowledge that the results are based on a single case study and encourage scholars to engage in transformational ESD education, to give further strength and validity to it, and to reflect on our journey as educators. Hence, further studies on ESD and project-based teaching techniques need to deepen the impact on students' academic careers, as well as their engagement and concern in sustainability and environmental topics, perhaps moving from single case studies to a larger scale by including entire Bachelors' or Masters' education programmes. Furthermore, future studies may also focus on other types of experiential activities, such as civil service, the use of art as an educational activity, and other novel approaches. Indeed, the convergence between the STEM (Science, Technology, Engineering, and Mathematics) and Arts is gaining momentum and a new learning framework, the so-called STEAM (Science, Technology, Engineering, Arts, and Mathematics) is emerging. Art practices, alongside hard sciences, facilitate the learning and the knowledge of complex social issues and it would enrich the comprehension of such phenomena, with interactive, participatory, and dialogic features (Radziwill, 2015).

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Declarations

Conflict of interest The authors declare that they have no conflict of interest.

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