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Sustainability education and community development in higher education using participatory and case based approaches in India

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Abstract

Purpose – This study aims at understanding how higher education institutions (HEIs) can contribute to sustainable development, by designing their programmes for bringing about a transformative impact on communities and students, and also to examine what alternative pedagogical approaches could be used for that. In the past decades, HEIs have increasingly created social innovation (SI) programmes, as a way to achieve United Nations Sustainable Development Goals. These community-oriented and field-based programmes are difficult to ally with conventional classroom education. This study explores how these programmes could integrate the participatory approach and what would be the benefits. It also investigates the effectiveness of the experiential learning approach for teaching sustainability.

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Design/methodology/approach – A case study method is used to document SI projects initiated by an HEI programme in rural India.

Findings – It was found that the participatory approach contributes to empowering communities and also benefits the students in terms of academic, professional and personal growth. Empirical findings show that experiential learning is an efficient method to teach sustainability. Ultimately, both pedagogical approaches are found to be mutually beneficial.

Originality/value – This study fills a gap in the literature, by providing empirical evidence on how HEI can implement innovative educational strategies such as participatory approach and experiential learning in their programmes towards teaching sustainability. A conceptual model for HEI interested in developing similar programmes is also proposed. To the best of the authors' knowledge, this study is one of the first studies focusing on the context of Indian HEI.

Keywords Sustainable development, Higher education, Social innovation, Participatory research, Experiential learning, Live-in-Labs®

Paper type Case study

1. Introduction

Sustainable development (SD) is the most important challenge humanity is facing now. Universities around the world have been trying to implement the principles for decades. Integrating SD in higher education institutions (HEIs) is important because they have to educate future generations in understanding the challenges ahead and equipping students with the knowledge and tools of how to address them. However, the implementation of SD in HEI is challenging due to misconceptions and conflicting agendas of the many stakeholders involved (Leal Filho, 2011).

One way through which SD has been introduced in HEI curriculums is social innovation (SI). SI has emerged in the past two decades as a well-accepted strategy for achieving SD (Hubert, 2010). As a result, there has been an increase in SI programmes aiming to develop and empower communities in HEI worldwide (Ayob *et al.*, 2016). These programmes are often a part of a larger strategy of HEI to achieve the United Nations Sustainable Development Goals (UNSDGs) and are embedded in their commitment to the common good, values of democracy and citizenship (Disterheft *et al.*, 2015).

However, implementing concrete community-based projects can be difficult to ally with conventional classroom education. This calls for exploring other pedagogical approaches for teaching SD in community-oriented and field-based programmes. In community-oriented programmes, participation of the community members should be a natural practice, as they are the end beneficiaries of these initiatives. Whether and how HEIs implement the participatory approach remains unfortunately under-documented. Therefore, the first research question explores how the participatory approach is integrated into these programmes and to what extent it is beneficial to students and communities.

Field-based educational strategies such as experiential learning are recognised to be efficient in some fields, but there is limited evidence of their use in teaching sustainability. A second research question investigates if experiential learning is an effective pedagogy in teaching sustainability.

The paper is structured as follows. Section 2 reviews the literature on HEI, communities, and education. Section 3 explains the methodology adopted. Case studies of a rural innovation programme in India are presented in Section 4. Practical and theoretical implications are discussed in Section 5.

2. Review of literature

This review of literature is presented in two sub-sections: studies related to HEI and SI and those concerning education to sustainability.

2.1 Higher education institutions and social innovation

In recent years, HEIs have integrated the SDG agenda into their missions worldwide. They have been increasingly committed to higher social responsibility and engagement with their community (Kennedy, 1999; Vasilescu *et al.*, 2010; Khovrak, 2020). Depending on contexts, their involvement in SD can span from "curriculum greening", which has minimal implications for SD, to a higher-level commitment, where HEI implements concrete actions (Leal Filho, 2011). Because of its immediate impact, field involvement focused on addressing the communities' real challenges which can be considered as an advanced level of HEI involvement with SD.

Over the past two decades, more and more HEIs have started offering courses related to SD, particularly focusing on SI (Miller *et al.*, 2012; Nakao and Nishide, 2020). SI gives importance to social relations and empowering people (Hulgård and Shajahan, 2013). It is recognised as a more inclusive approach to innovation with a higher probability of benefiting the people (Chataway *et al.*, 2014). At the core of SI is the notion of generating socially innovative ideas to address challenges from the people experiencing them, and inclusively developing these ideas (Guidi and Moriceau, 2019). By contributing to social well-being and addressing some of the most pressing development needs, the capacity of SI to generate sustainable and inclusive community development has been largely acknowledged (Chataway *et al.*, 2014; Fressoli *et al.*, 2014; Baker and Mehmood, 2015; Pansera and Owen, 2018). SI programmes now exist in many HEIs such as Stanford University, Oxford University, Cambridge University and others (Ayob *et al.*, 2016). It is often included in the Sustainable Development Policy of HEI. Students are usually sent to the field to study how SI could help communities from South America, Africa, or Asia (Pérez-Foguet *et al.*, 2005; Brower, 2011; Bhattacharjya *et al.*, 2019).

SI has a long history in the Indian subcontinent. The Khadi movement led by Mahatma Gandhi in the 1930s is an example of engaging vulnerable communities in collective experimentation (Prasad, 2005). In India, SI has been largely approached from a technological perspective. The development of technical solutions using scientific advances has often been channelled to address social needs (Bhaduri and Kumar, 2011; Gupta, 2012; Lele and Goswami, 2017). Lately, Indian HEIs have developed their own programmes to address the challenges faced by the less fortunate segment of society (Ramesh *et al.*, 2016; Bhattacharjya *et al.*, 2019), and ultimately contribute to the UNSDGs. As for the rest of Asian HEI, there is a gap in how Indian HEI implement such SD initiatives (Leal Filho *et al.*, 2022).

2.2 Education to sustainability

The pedagogical approach of such programmes is critical for their success, as the primary mission of HEI is to educate future generations. Sustainability education scholars have long called for novel approaches to teach SD in HEI (Wals, 2010; Backman *et al.*, 2019). Conventional pedagogical practices are considered responsible for global problems (Leal Filho, 2011). There is an assumption that education for sustainability has to be different. Instead of reproducing past models, it should open the students to new ways of seeing and being (O'Sullivan, 2003). It must be transformative (Wals, 2010; Molderez, 2021).

This can be achieved through different teaching approaches, such as inter and transdisciplinary learning, participatory action research (Cebrián, 2017; Cornet and Barpanda, 2021), active and experiential learning (Dieleman and Huisingh, 2006; Kolb, 2014),

service learning (Brower, 2011), and problem-based learning (Ryan and Cotton, 2013; Sipos *et al.*, 2008; Thomas, 2009) among others. The common limitation to all these approaches is the way in which they have been applied so far and that they mostly remain campus-based. They were conducted with the students confined to the campus and the classroom. While this is largely understandable in terms of practicality, it does not capture the wider impact of the engagement that HEI could have both on the students and communities.

A participatory approach is one relevant alternative to make sustainability education more transformative (Wals, 2010). This is especially relevant in the context of HEI engaging in SI programmes with communities. SI is intrinsically participatory and collaborative (Cornet and Barpanda, 2021). The participatory approach is a democratic process that involves all participants throughout the project's life cycle, and which is by nature, oriented towards SD (Titterton and Smart, 2008). The essence of the participatory approach when engaging with communities is to learn from them: it acknowledges the relevance of local knowledge, apart from the scientific knowledge that is usually considered valid in conventional approaches (Keough, 1998). Embedding SI in the community's culture is key to creating economic and social value (Guidi and Moriceau, 2019) and ensuring long-term positive impact (De Beer and Marais, 2005).

Research on participatory methods highlights their efficiency on SD at the community level (Titterton and Smart, 2008; Gutberlet *et al.*, 2013). In contrast, their use in HEI, especially in sustainability programmes and their impact on the students' learning is not well documented (Disterheft *et al.*, 2015). Existing studies focus on the implementation within campuses (Coronado *et al.*, 2020) for faculty development (Cebrián, 2017) or are limited to specific courses (Savage *et al.*, 2015).

Another alternative way to teach sustainability is to take the students out of the classroom (Pérez-Foguet *et al.*, 2005; Brower, 2011; Ramesh *et al.*, 2016). This is contradictory to the traditional pedagogical approach that reproduces the real world in the classroom (Thomsen *et al.*, 2019). While it seems easier, as everything can be under control in a class environment, one could argue that it does not prepare students for the real world, where nothing can be totally controlled. This approach of learning-by-doing relates to the experiential learning theory (ELT) of Kolb (2014), which has four stages: concrete experience, reflective observation, abstract conceptualisation and active experimentation. This theory has become largely accepted in educational institutions, especially at the project level. Having students involved outside of the classroom is beneficial for the students and the communities (Brower, 2011; Thomsen *et al.*, 2019). However, evidence on how HEIs have used experiential learning to teach sustainability is limited, requiring more empirical research.

HEI engaging in SI programmes with communities as part of their commitment to SD could be expected to use participatory methods, which are recognised as more inclusive. However, there is a gap in research as to how participation is integrated into this type of programme. Besides, there is a lack of empirical evidence on how HEI conducts community development programmes involving students. Similarly, experiential learning is a well-accepted pedagogical approach, but there is limited evidence of its use for teaching sustainability in that context. Hence, in the context of HEI-led SI programmes focusing on community development outside of the classroom, we propose to explore two important research questions in this paper. Firstly, we explore how the participatory approach is integrated into these programmes, and to what extent it is beneficial to students and communities. Secondly, we investigate if experiential learning is an effective pedagogical approach to teaching sustainability.

3. Methodology

The phenomena of community development programmes led by HEIs are recent and understudied. Case study is a well-accepted method of inquiry for new or lesser-known phenomena, as it helps to generate new empirical evidence (Creswell and Poth, 2016). Hence, an exploratory case study approach is adopted to answer the research questions.

A community development initiative led by an Indian HEI was chosen for this. Live-in-Labs® is a programme initiated by Amrita Vishwa Vidyapeetham, a private Indian HEI. It operates in more than 100 rural communities all over India. Following the Indian conception of SI, Live-in-Labs® aims to address rural challenges through participatory technological solutions. The programme integrates the principles of Kolb's ELT (Kolb, 2014), with its own Live-in-Labs® platform (Ramesh *et al.*, 2016). Multidisciplinary project teams composed of faculty and students have the opportunity to experience, embrace, engage and empower rural communities by applying classroom knowledge for the development of sustainable solutions to real-life problems (Ramesh *et al.*, 2016; Varma *et al.*, 2021; Cornet and Barpanda, 2021; Ramesh *et al.*, 2022).

The Live-in-Labs® program follows a human-centric design (HCD) approach to community engagement and sustainable solution development. It comprises multiple phases: village identification, challenge identification, ideation, co-design, co-evaluation, design finalisation, lab prototype, community experience evaluation, sustainable social change model, participatory deployment, sustenance management and sustainable social change interventions as well as sustainable solutions (Ramesh *et al.*, 2016). Throughout this process, multiple tools are used to implement the HCD approach, such as ethnographic action research, participatory rural appraisal (PRA), collaborative design and sustainable business models, to cite a few (Varma *et al.*, 2021; Ramesh *et al.*, 2022).

This study focuses on two projects that are passing through the first three phases of the Live-in-Labs® program. At this stage, the teams engage with the communities by staying with them and sharing their daily routine for at least a week. As the programme is truly participatory, it uses Ethnography and participatory tools such as PRA to identify the needs, capabilities and knowledge from a people-centric perspective (Chambers, 1994; Narayanasamy, 2009). This will indicate the key challenges and objectives for developing an appropriate solution afterwards.

Based on the participatory data generated by each project, qualitative case studies were developed. These cases help understand better how a participatory approach was implemented throughout the development of rural grassroots innovations and how experiential learning was applied in the project execution. These cases were selected jointly between the authors and the Live-in-Labs® program team. The main criteria considered were the socio-economic characteristics of the rural communities, to increase the comparability and robustness of the cases. Two tribal communities of the state of Kerala (Case 1) and Odisha (Case 2) with similar features (summarised in Table 1) were chosen.

Project teams of a maximum of six students were formed. Each team had native speakers of the language required for the fieldwork. All student teams attended a four-day intensive workshop on campus, in which they were trained on ethnography, HCD, PRA and co-design. The workshop combined theoretical and hands-on sessions to prepare them for the field. After that, all teams travelled immediately to their assigned rural communities to apply what they had learned. A total of two field engagements were conducted during two consecutive semesters. As a principle, the teams communicated with the communities using the native language, which was Malayalam for Case 1 (Kerala), and Odiya for Case 2 (Odisha). However, as tribal communities often have their own dialects, the services of local translators were also needed.

The teams documented community interactions in their field journals and project reports. These were complemented by participant observation and informal interviews which were submitted as field assignments. Finally, this information was triangulated with document analysis and thematic analysis of field journals and project reports. Analysis was performed manually by the authors and reviewed by fellow researchers who were not part of the project.

4. Experiences from the field: case studies

Fieldwork was conducted in the communities between the summer of 2018 and the summer of 2019. The participatory session outcomes and project reports were analysed to create a rich story for each case. Field journals reflecting the field experience were coded and thematically analysed. The main outcomes are presented here (see Table 2 for details).

4.1 Case 1: Valaramkunnu, Kerala

This community is nestled in the mountains of Kerala, southwest India. The community members belong to three tribes and share a small territory in a dense forest area. They have been living a reclusive life for generations. Their contact with the outside world is mainly for purchasing daily necessities. Men leave the village to work as daily labourers, whereas women stay back to take care of their children. Their low socio-economic condition enables them to avail government social services.

The Live-in-Labs® program has been involved with the community since 2014 (Robert *et al*, 2016; Ragula *et al.*, 2016). The most pressing need of the community was to diversify their income source. There is no economic activity in the community. Repeated interactions with them helped identify the preferred activities that can be conducted near their homes. Senior community members mentioned that until the late 1970s, they used to earn a living out of distilling lemongrass essential oil. However, they had to stop this because forest regulations prevented them from accessing firewood. Lemongrass still grows abundantly around the community but is not used anymore.

With the community's approval, a Live-in-Labs® project team composed of faculty and students from the School of Engineering started developing a sustainable lemongrass distillation unit that would use only renewable energy (Ragula *et al.*, 2016). As per the Live-in-Labs® phased approach (Ramesh *et al.*, 2016), a prototype was deployed in the community. Four community women volunteered to be trained in operating it. For two years, the prototype was tested in real conditions. Its technical performance and impact on the community were also monitored. The feedback collected pointed out some design improvements. These were cross-checked by a student team, using human-centric participatory tools.

Attribute names	Case 1	Case 2
Community name	Valaramkunnu	Barapita
District	Wayanad	Khordha
State	Kerala	Odisha
Population (nos)	200	300
No of houses	45	65
Tribe name	Paniyan, Kurichian, Kattunayakan	Ho
Social status	Below poverty line	Below poverty line
Main occupation	Labour work	Agriculture, labour work

Source: Authors' own work

Table 1. Key features of the communities studied

Themes	Subthemes	Quotations	Source
Theory into practice	Practicing informal interviews	We interviewed many people, and we were doing observation. They told us their thoughts, aspirations, and pain points	Case 1, student 5
	Practicing informal interviews	We split up into 2 groups for the interviews. Each person we interviewed had differences but their main and common problem was the lack of water during summer	Case 1, Student 1
	Practicing PRA	While we were working on the PRA we understood more about the village and the inter-relation of issues they faced	Case 2, Student 3
	Practicing PRA	We were focused on identifying an issue that needs to be addressed and implemented. I had also prepared questions on my own pertaining to the issue they faced	Case 2, Student 3
	Synthesizing the work done	We were happy that we had discovered the knots of our issue and now we have to discuss and implement an effective solution	Case 2, Student 3
Learning beyond academics	Team work	Planned to split into three. One team will go for observation. Another for interview and another for mapping	Case 1, Student 6
	Team work	The previous night we sat together discussing what the final report would need and if we have enough pictures and videos	Case 2, Student 3
	Going beyond what you are asked for	We worked on the lemongrass plant . . . We did the whole process again. We finished and then we understood the process. Tomorrow we have to teach three ladies. So we discussed about how to teach them better	Case 1, student 5
	Learn other things	We didn't know many types of trees. We had to use google lens for that	Case 1, Student 5
	Learn other things	As we didn't have any knowledge about Odiya and Ho, and even Hindi we know only to some extent, it was really a tough time for us. We thought of doing pictorial representation to people by showing the pictures in our mobile	Case 2, Student 2
Students learning from villagers	Experiencing village hardships	[We experienced] The pain and struggle of living in a remote village without basic needs like water. We should practice to use water economically so that it won't get over my the mid day	Case 1, Student 6
	Experiencing village hardships	I spoke with the people. Many had lot of problems, but in spite of all the problems, they told they were happy. It amazed me	Case 1, student 3
	Experiencing village hardships	We were out of electricity and water and the experience was stifling to say the least	Case 2, Student 4
	Emotions	It was hard to believe that 62 year old women danced like a 12 year old child	Case 2, Student 1
	Emotions	Today we had a real life memorable experience. [We] Faced real life situations. Both likable and unlikable	Case 1, Student 6
	Emotions	[on interviewing an old farmer] I was very happy to see their hard work even in that age	Case 2, Student 1

Table 2. Quotations from students' field journals

Source: Authors' own work

The team travelled and stayed among the villagers for a week in August 2019, to conduct a participatory assessment of the project and the community, using ethnography, participant observation and PRA. Participatory workshops helped them understand the context and culture of the community. All community members openly shared their concerns, suggestions, perceived advantages and suggested improvements for the distillation unit. The distillation unit was redesigned to simplify its operating process based on the findings of the team.

4.2 Case 2: Barapita, Odisha

This rural community is nestled in the dense forest of Odisha, East India. A canal originating from a nearby dam crosses the village and irrigates the fields. Rice cultivation is their primary source of income, though seasonal. All working people have to leave the community searching for daily wage work during the off-season. The community's low socio-economic level makes them eligible to access government social services and subsidies, such as rationed food. As part of the Government of India's nationwide programme, Swachh Bharat Abhiyan or Clean India Mission launched in 2014, toilets were constructed in the community around the year 2016 to reduce open defaecation and improve waste management practices.

In July 2018 a group of Live-in-Labs® students visited the community for a week. In line with the human-centric approach, they conducted PRA workshops complemented with ethnography, participant observation and informal interviews. It was identified that the village had an ample number of public toilets. However, these were not in working condition. Villagers still largely practised open defaecation (Vineeth *et al.*, 2020). Access to water was another challenge that emerged from the participatory interactions (Akshaya *et al.*, 2020). The village canal is used for all purposes, including bathing, washing dishes and laundry. Several villagers were seen with skin rashes, probably caused by poor water quality. The water from the community's hand pumps was tested in the university laboratory and was found to be contaminated with pesticides.

The research team could only partially understand the problem during this first visit. Therefore, six months later, they returned to the community with the objective of going deeper and identify solutions using co-design (Cornet and Barpanda, 2021). This revealed that villagers were well informed of the advantages of using toilets and the inconveniences of open defaecation. However, they did not use the toilets, as they lacked electricity or a water connection. In India, as a predominant sanitation practice, water is used instead of toilet paper and hence not having water connectivity will deter anybody from using the toilet. Once this problem was understood, collaborative discussions reached a consensus on a proper community water distribution system. The appropriate technical parameters were discussed (Rengaraj *et al.*, 2021). A water filtration system was considered essential. With these key requirements, the team returned to the university campus to develop a complete solution, integrating the community's requirements.

4.3 The students' perspective

The students' field journals documented their experience using ethnography and participant observation. Thematic analysis, summarised in Table 2, identified three main themes summarising the multiple pedagogical benefits of the field experience. First, students can apply what they have learned in the education system. Learning takes a new dimension when it becomes practical and aims at solving a real-life problem.

Secondly, students learn *beyond* classroom knowledge. Field experience puts students in real and potentially unpredictable situations. It nudges them to think outside the box, be responsible and adapt to situations out of their comfort zone. Field journals show that students

learned to work as a team, address unforeseen difficulties such as language barriers and lack of knowledge in specific areas and go beyond what they were instructed to do. Students therefore have to explore multiple alternatives and think in a multidisciplinary manner.

Finally, field exposure is an eye-opener to the reality of rural communities. A majority of students come from urban middle-class backgrounds. Sharing the same facilities and living conditions as villagers was a first-time experience for many of them which changed their perspective of life.

5. Discussion

5.1 An essentially participatory process

The cases illustrate a process of SI development that is largely field-based, bottom-up and based on human-centric participatory principles. The cases highlight the participatory tools used at each phase of the interactions with the communities and their outcomes.

This study shows how community development programmes led by HEI (Cebrián, 2017; Coronado *et al.*, 2020) can integrate participatory approaches. It is consistent with the literature that community members must be fully involved from the start, in developing inclusive and socially relevant solutions. It makes it easier to identify solutions that truly answer their needs, capabilities and knowledge (Keough, 1998; Guidi and Moriceau, 2019). The rural communities studied in these cases were actively involved at all stages of the process. Through this process, communities can reflect on their difficulties and collectively discuss how to solve them. In line with Chambers (1994), we observe that the communities' voice is at the heart of this collective approach and can ultimately consolidate the community bonding and empower them.

The other contribution of this study is to provide evidence that the participatory approach can be part of alternative pedagogies for teaching sustainability. In these cases, tools such as PRA, co-design and ethnography are taught and applied for the students to understand rural communities and develop solutions along with them. Through field-based community engagement programmes, using a participatory approach ensures meaningful engagement of students with the community. It maximises interactions with the community members and ensures that the students make the most out of the experience (Chambers, 1994).

The students' field journals further show that students learn at multiple levels in return for their commitment. They get multiple benefits that can be useful for their future careers. The first benefit is to gain more experience by putting classroom knowledge into practice to solve real challenges. Field exposure further pushes them to learn beyond classroom teaching and explore knowledge immediately relevant to their projects. They develop problem-solving skills, social responsibility and self-confidence through field-based learning, as Brower (2011) also identified in earlier research.

Students learn about themselves as much as they learn about life in rural areas. The Live-in-Labs® learning experience stands out from other programmes studied in the literature (Brower, 2011; Thomsen *et al*, 2019), for it is directly embedded in the communities (Ramesh *et al.*, 2016). As illustrated in the cases, projects involve important time on the field, which leverages the advantages of both participatory and field-based learning.

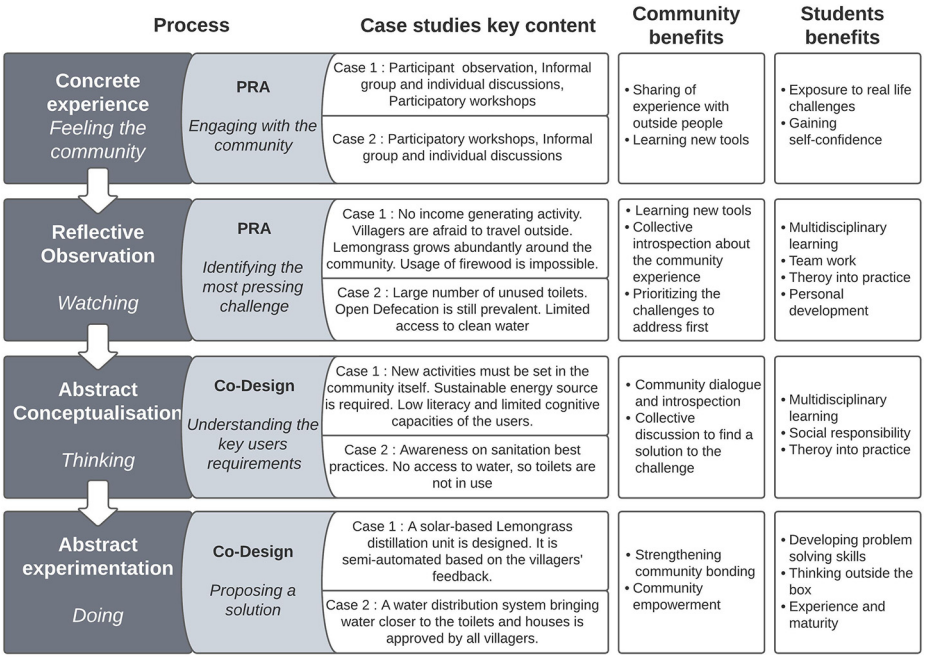
This immersive experience engages heads, hands and hearts, ultimately making learning truly transformative (Sipos *et al.*, 2008). Beyond academic and practical learning, it contributes to the students' personal growth. Exposure to life in rural communities can be life-changing, illustrating what Sipos *et al.* (2008) called transformative sustainability learning. It provides not only education for a living but also education for life.

5.2 Participatory approach with experiential learning: conceptual considerations

The case studies illustrate a participatory process, which is embedded in an experiential learning approach to teaching sustainability, loosely based on Kolb (2014). The first two stages of Kolb's theory revolve around feeling and watching actions, which relates to the earlier stages of community engagement when PRA is used. The next two stages identify the requirements and design a solution, which in these cases was achieved through co-design (Figure 1) following Varma *et al.* (2021) methodology.

According to Kolb (2014), the learning process happens through the acquisition and transformation of experience. The two case studies went through the four stages of Kolb's ELT. In the second case, the initial field experience based on PRA found that villagers still practised open defaecation despite having many toilets available. Several hypotheses were explored with co-design until an agreement was found with the community on a preferred solution for this challenge. These case studies show the way Kolb's ELT (Kolb, 2014) can offer a relevant framework to explain how knowledge is built up through interactions and across time in a given community. ELT can explain how in this type of programme, one can learn both within the cases and at the programme level from the experience of a case, to improve on the other.

The cases illustrate that the participatory approach enhances the benefits of experiential learning. The participatory process based on experiential learning illustrated in Figure 1 can serve both as a framework for structuring community engagement and to teach sustainability for the students engaged in the programme. The case studies illustrate that it can benefit communities, students and researchers.



Source: Authors' own creation, adapted from Kolb (2014)

Figure 1. Schematisation of the process followed in the case studies, illustrating a participatory model of sustainable community development based on experiential learning

The process schematised in Figure 1, though based on experiential and collaborative learning, remains primarily based on a human-centric approach. As such, it remains adaptable to the context of every rural community. Keeping enough flexibility is essential to create a space for creativity and exchange of information, in which relevant solutions centred on the needs of communities, can emerge. This means that priority is given to the community's needs and requirements over theoretical models. As a result, not all cases may follow Kolb's model. The process discussed in the present study may be one among many others.

6. Conclusion

This study aimed to understand how HEI can contribute to SD, by designing their programmes for transformative impact on communities and students, and what pedagogical strategies could be used to accomplish this. This was articulated around two main research questions. Two cases of SI projects in rural India which are part of the Live-in-Labs® program were studied to answer those questions.

The first research question explored how HEI-led SI programmes could integrate the participatory approach and to what extent it was beneficial to students and communities. The case studies provided empirical evidence of a HEI-led sustainability programme which is entirely founded on participatory principles, both in its approach to community engagement and student teaching. This is in contrast with many existing studies that focus on limited campus projects (Savage *et al.*, 2015; Coronado *et al.*, 2020).

Through the cases, it was found that communities were actively engaged in a bottom-up process, in which they could express their needs and get empowered. This is consistent with community development literature (Chambers, 1994; Keough, 1998; Guidi and Moriceau, 2019). However, the link with sustainability education through HEI programmes has not been discussed yet. This is one contribution of this paper, which could lead to further studies.

Findings further show that the students who engage in these programmes are benefitted in terms of academic, professional and personal growth, which goes beyond what previous studies had identified (Pérez-Foguet *et al.*, 2005; Brower, 2011; Thomsen *et al*, 2019). When using a participatory approach, SD learning becomes more interdisciplinary, innovative, grounded in real-life challenges and therefore becomes an empirical illustration of what Sipos *et al.* (2008) had conceptualised as transformative education.

The second research question investigated was whether experiential learning can offer an effective pedagogical approach to teaching sustainability. The cases clearly show the positive impact of implementing an experiential learning approach to sustainability education. It documents empirically how HEI can use this pedagogy. It extends previous studies (Brower, 2011; Thomsen *et al.*, 2019) by applying it to sustainability, an area which had so far not been assessed with this pedagogy. Findings also show that experiential learning and participatory methods can be pedagogically mutually beneficial. The participatory approach enhances students' experiential learning from participatory to hands-on engagement.

This study makes contributions at different levels. It makes an empirical contribution by providing evidence that the participatory approach and experiential learning can be used as alternative pedagogies for teaching sustainability. Therefore, it extends previous research (Sterling, 2004; Disterheft *et al.*, 2015) by confirming that integrating the principles of

participation in education to sustainability could improve the integration of sustainability in academic curricula in general.

Based on this, a conceptual contribution is made with a model of the participatory process, embedded in an experiential learning approach to teaching sustainability. This model confirms the relevance of Kolb (2014) while integrating it with participatory and experiential dimensions of Varma *et al.* (2021).

Overall, this study extends our knowledge on SD programmes developed by HEI, by identifying new pedagogical methods to conduct them. Exploring new methods involves multidisciplinarity. In the process, this study identifies possible bridges with other academic areas such as community development and SI studies, which could be further researched.

The model identified in this study can have practical implications for HEI interested in developing SD programmes outside the classroom with new pedagogical approaches. This model is flexible and can serve both as a framework for structuring community engagement and to teach sustainability in a more hands-on way.

The limitation of this study is that it is based on community projects developed as part of a specific programme. The HEI had a long-term involvement with rural communities, which facilitated the research. Though the cases were carefully chosen to ensure reliability, validity and higher comparability, findings remain context-specific. The same limitation applies to the model, which needs to be further tested in different contexts.

Given the novelty of the topic, this research was exploratory and qualitative. Using quantitative research methods would help to assess the long-term impact such programmes can have on the development of communities and the careers of students.

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Further reading

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