Horyzonty Edukacji Akademickiej

Horyzonty Edukacji Akademickiej 3/2025 (161–179)

**DOI:** https://doi.org/10.26881/head.2025.3.16

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# Service learning as boundary crossing in higher education pedagogy: A qualitative analysis of participants' experiences in an interdisciplinary project

**Summary**

The article presents the results of a qualitative analysis of the experiences of students involved in the ARTIS project project – an interdisciplinary *service learning* initiative carried out jointly by the University of Gdańsk and the Academy of Fine Arts in Gdańsk, in cooperation with an industrial partner (a carpentry and furniture company) and Montessori educational institutions between October 2024 and June 2025. The empirical material was based on eight learning diaries kept by third– and fourth–year full–time students of pedagogy during the winter and summer semesters of the 2024/2025 academic year at the University of Gdańsk. The analysis, based on open coding (Charmaz), a seven–step interpretative procedure (Kvale) and the principles of thematic analysis (Braun, Clarke), identified five interrelated categories: the learning situation, combining theoretical knowledge with personal, market and social needs, perceived benefits of service learning, emerging challenges, and the logistical and organisational aspects of running the project. The results show *service learning* as a laboratory for cooperation and a mechanism for crossing boundaries: between theory and practice, academia and the social/market environment, as well as between the traditional roles of teacher and student. Participants report an increased sense of agency, the development of cooperation and critical reflection skills, as well as a more realistic understanding of the purpose of studying thanks to contact with real recipients and a cycle of iterative prototyping. In the discussion section, we confront the results with the literature on experiential education and

the debate on the third, and potentially also the fourth and fifth missions of the university, pointing to the lack of clear definitional boundaries for missions 4 and 5, but also their heuristic usefulness for describing innovative teaching. We conclude that *service learning* – as applied in the ARTIS project – operationalises the third mission and can co–implement selected aspects of the fourth (knowledge translation/market relations) and fifth (innovation/social responsibility and digital transformation) missions.

**Keywords:** service learning; higher education; interdisciplinary cooperation; experiential education

**Introduction**

This article is one of the results of the project "ARTIS – Academic craftsmanship and creativity in interdisciplinary *Service Learning* – from the idea of didactic materiality to implementation in the spirit of Montessori pedagogy", carried out jointly by students at the Academy of Fine Arts (Gdańsk, Poland) and the University of Gdańsk (Poland). The initiative was educational in nature and was based on inter–organisational cooperation, aimed at both developing and utilising the competences of pedagogy students and creating innovative prototypes of teaching aids for Montessori schools and other interested institutions.

The analysis presented in this article is based on the experiences of the project participants, documented in their learning diaries. The students' reflections became a source of qualitative data providing insight into the process of education, interdisciplinary cooperation and the development of competences related to the design and evaluation of educational materials, and above all, they enabled empirical exploration of education implemented in the form of grassroots, non–compulsory *service learning*.

A preliminary analysis of the research material allowed for the identification of four problem areas: (a) *service learning* in academic practice, (b) interpersonal relations and teamwork dynamics, (c) divergent tasks in a heterogeneous group of students, and (d) images of academic teachers in non–traditional forms of academic education.

This article focuses on the first of these areas and presents the results of a thematic analysis centred on *service* learning as an example of crossing various boundaries in teaching (Braun, Clarke 2024). The other issues will be developed and presented in separate scientific articles currently being prepared for publication.

A carpentry and furniture company also actively participated in the project, responsible for the production of the prototypes of teaching aids, which were then subjected to further usability tests and educational research. The company's management supported the students and academic staff of both universities by providing feedback at various stages and advising on technological and market issues. Thus, the project became an example of multilateral cooperation, bringing together different perspectives: academic, artistic, practical–technological and business.

*Service learning* is defined in the literature as a learning concept that allows for a deeper understanding of theory through practical action in a project, often for the benefit of the local community (Salam et al., 2019). This learning concept is based on the theory *of experiential education* (Dewey, 1938) and Kolb's' experiential learning cycle (Kolb, 2014), which are described in more detail later in this article. Unlike other forms of experiential education, such as volunteering, internships, etc.,

*service learning* should focus on both parts of its name: SERVICE (as a focus on practical skills, the needs of project recipients and market requirements) and LEARNING (as a focus on theoretical knowledge and participant development) (Furco, 1996). Therefore, it is intended to combine practical learning for participants in the form of, for example, internships with work for the local community, e.g. in the form of volunteering.

In this context, this version of *service learning* in higher education can be understood as a space or educational situation in which the boundaries between theory and practice, academic teaching and community needs, as well as between the traditional roles of teacher and student, are blurred. Institutional and disciplinary boundaries are also crossed – in this case, students of industrial design and pedagogy, in cooperation with a carpentry company, come together in a process of joint action, negotiating meanings and solutions, and creating products with practical applications. In this sense, *service learning* has become a laboratory of cooperation that challenges the one–sided, transmissive model of education, opening up space for deep experience, reflection and mutual responsibility.

This article has a classic IMRAD structure. In the rest of the introduction, we characterise *service learning* as a form of experiential education (Kolb 2014) and, at the same time, a teaching strategy closely integrated with the study programme, which combines "learning through engagement" with the implementation of the third, fourth and fifth missions of the university. At this point, we also mention the IPARD(E) cycle (Investigation–Planning–Action–Reflection–Demonstration–Evaluation) as an operational design framework (Kielsmeier 2011; Townsend 2016), emphasising the development of subject knowledge, critical thinking, teamwork, working with values and agency. We also point to the presence of *service–learning* practices in networks and institutions (e.g. SEA–EU Centre for Service Learning/University as a Society Hub, EOSLHE). In this section, we also define the concept of *service learning* as *an "approach*" focused on the identified needs of the community and deliberately linked to teaching objectives.

In the next section of the text, we describe the specifics of the research material and the methodological procedure. As mentioned above, eight learning diaries of students at the University of Gdańsk form the basis for qualitative thematic analysis. Here, we specify the method of data collection (analysis of diary texts) and the interpretative perspective adopted, emphasising the purposive nature of the sample selection and the idiographic dimension of drawing conclusions.

In the section devoted to the results of the study, we present the outcome space built around five categories of description, which together form a map of meanings assigned to experiences and mediated in the narratives of the project participants. We believe that the scope and content of the outcome space allow us to propose a mid–range thesis about *service learning* as a mechanism for transcending the boundaries of teaching and as a laboratory for cooperation.

In the discussion, we confront the results with the approach *to service learning* as experiential and civic education (the dimension of competence development, values and public responsibility) with the agenda of innovative teaching and the mission of the university. We point out that the described process and the formula of education present in it are in line with the implementation of the third, and perhaps also the fourth and fifth, missions of the university.

**Method**

As mentioned above, the empirical material consisted of eight learning diaries kept by students of pedagogy at the University of Gdańsk (Poland) participating in the ARTIS project (students of the Academy of Fine Arts did not keep such diaries). These were narrative records of experiences, covering both the events themselves, reflections on the course of activities, as well as (self–)assessments of their own learning and comments on cooperation with students of the Academy of Fine Arts and an external partner – a carpentry and furniture company. The students began their documentation at the beginning of the summer semester of the 2024/2025 academic year, which is why the first part of their notes is retrospective. The material used for the analysis includes notes kept throughout the entire duration of the first phase of the project – the design phase (two academic semesters). The students were deliberately not given any guidelines on how to keep their diaries; they were only asked to describe their own experiences and thoughts about participating in the project. The lack of guidelines is evident in the significant differences in form and narrative between the individual diaries. Some of them are written in the present tense, while others are verbalized in the past perspective. They also differ in terms of the length of the accounts and the varying focus on different elements, such as the description of specific events or a focus on describing only their own emotions accompanying their participation in the project. Overall, the empirical material provides the authors with an extremely rich source of information on this *service learning* project, and the diversity of the diaries allows for the identification of numerous thematic categories, described in detail below.

The analysis was qualitative, interpretative and rooted in the tradition of narrative research. Open coding was used in the spirit of grounded constructivist theory (Charmaz, 2006), and the analytical process was organised according to the seven steps of analysis described by Kvale (1996). In addition, we followed the principles of qualitative thematic analysis (Braun and Clarke, 2006; Baraun and Clarke 2024; Flick, 2018), which enabled us to ultimately identify five thematic categories: (a) the learning situation, (b) combining theoretical knowledge with market needs, (c) perceived benefits of *service learning*, (d) emerging challenges, (e) the logistical and organisational aspects of running the project.

For the sake of clarity and convenience of the readers, we present the methodology not only at the level of general justifications, but also illustrate it with an example, characterising the subsequent steps of reducing the material on the basis of an excerpt from the aforementioned diaries, which we treated as a single text.

At the outset, in the first step, the researcher immerses themselves in the text, reads it a few times and tries to capture the logic of the narrative. For example, the fragment describing the initial concerns of one of the authors and participants related to the selection of team members ("I would like to get the best students [name]..., but how can this be measured at the first meeting") is treated here merely as *a* possible *document of experience*, but at this stage it is not yet subject to any segmentation.

The next stage is *to extract natural units of meaning*, i.e. fragments relating to a single theme. Examples include: "concerns about the selection of team members", "differences in working style with J." or "positive experiences of previous cooperation". Next, each unit is given a preliminary code: the

first as "uncertainty in the learning situation", the second as "teamwork dynamics" and the third as "transfer of previous experiences".

The fourth step is to categorise and group the codes, which leads to their consolidation into broader analytical categories. In the above case, all three codes were integrated into the category "learning situation".

The fifth step involves reducing and condensing the meaning, i.e. summarising the essence of the experience. Our example can be summarised as follows: "uncertainty in the selection of colleagues mitigated by previous experience of fruitful cooperation".

At the interpretation stage, i.e. in the sixth step, the categories are reflected upon in the light of the literature and research questions. In this case, the "learning situation" is interpreted as an example of crossing the boundary between individual style and community learning, which is in line with the nature *of service learning* as a process of blurring roles and negotiating cooperation.

The final, seventh step is synthesis and reporting. As a result, five categories were identified, which form the outcome space discussed in the "Research results" section. Each of them will be illustrated with selected quotes from the diaries.

The analytical process was iterative in nature, involving constant movement between empirical material and code categories. By combining open coding (Charmaz), Kvale's seven–step interpretative procedure, and the principles of thematic analysis (Braun and Clarke, 2006; Braun and Clarke 2024), it was possible, in our opinion, to capture the experiences of the study participants in categories that both reflect their own narratives and allow them to be placed in the broader theoretical perspective *of service learning*.

## Research results

### The situation of learning about oneself and from oneself

The "learning situation" includes the moment of entering the project, initial contacts with partners from the Academy of Fine Arts, team selection, self–presentation and role negotiation. This is a space of high emotional and cognitive intensity, in which UG students learn to function in a new, heterogeneous environment, reconciling different styles of work and communication. The analysis shows a transition from initial uncertainty to the gradual building of trust – while experiencing real tensions, which in turn become material for learning cooperation. Entering the project initiates uncertainty, which is connected with the need to make personal decisions and trust one's intuition towards unknown partners. The first meetings are also a moment of self–presentation – students consciously speak up to demonstrate their agency and competence.

> When the meeting at [name] finally took place, J. and I tried to "present" ourselves, i.e. we willingly spoke up on matters related to the university and our side of the project. During the visit, we were given a tour of the [name] buildings, and O. was appointed as the main guide due to his longest tenure at the university. During the tour, he immediately struck me and J. as the coolest guy in the world, and although he was open, very confident, and quite unconventional, we immediately agreed that we wanted O. on the team. Then, partly because of how we sat in the classroom, J.

ended up working with O., and I with A., who also joined our team because she had originally worked with O. on this project.

Right from the start, the differences in working styles and their impact on the comfort of cooperation become apparent and metacognitive reflection becomes part of the learning situation.

At the first stage of the project, which was simply an introduction to the project idea by our supervisor, when it was pointed out that we would all be working in small teams (originally about 5), two people from [name], two people from [name], my first concern arose. I knew that, of course, I would like to "get" the "best" students [name] for my team, but how to do it, how to measure it at the first meeting, how to recognise it? Secondly, I also had to have a pair from our university, and in our project I only knew J., because she was from my year. I immediately began to wonder whether it was a good idea to be paired with J., because we are opposites in our creative process. J. is calm, doesn't stress too much, doesn't necessarily care about guidelines, wants to do something good, but it's important for her to have fun doing it. I, on the other hand, stick very strictly to guidelines, find it difficult to go beyond the scope of the task, get stressed easily, and often have a pessimistic outlook. But what helped me come to terms with and even enjoy working with J. was that about a year earlier, we had worked together on a maths ebook, where J. was a very important person, without whom it might not have been successful at all, or might have ended up being of much poorer quality.

In the background of "learning about each other", there is also a learning process about organization. The realities of the project (deadlines, preparations, responsibilities) become a test, but also an opportunity to develop planning skills and mutual support.

Between the first and second meetings, we met only once. Communication was not the best, because O. did not reply much, but A. replied almost every time and started preparing the presentation earlier, but it was she who had to prepare the prototypes at night before the second meeting, because O. was working on orders for his business that same night and was bound by deadlines. However, I would like to point out that when we did manage to meet or communicate with O., he really rewarded us with his great ideas, artistic craftsmanship and charisma. A. also played a key role in keeping our cooperation with [name] "together" and formally meeting the requirements of [name] lecturers.

The new learning environment reveals a different ethos of criticism and evaluation – demanding, but understood as an opportunity to improve the project and develop.

As for the lecturers at [name], they are very direct and sometimes seem pretentious because they look for weaknesses to eliminate, but it seems to me that when a student has a solid concept, they can easily defend themselves against any criticism. I know that my feelings are quite neutral compared to my colleagues at the university, but this may be due to the fact that I have some experience in the field of artistic improvement, and the objections and indignation that sometimes arose among my colleagues, I had already experienced and digested a few years earlier. What's more, as I mentioned earlier, I absolutely see the point of this strategy. Lecturers look for the so–called "flaw in everything", which seems annoying, but when they actually find it, students, instead of being disappointed, should be happy that they now know what they need to fix to make the project ACTUALLY good, because if something incorrect, inconsistent, nonsensical or unfounded has been found in their project, it is simply not well–developed. However, if you disagree with your professors and put in enough effort to prove your point, they will have no choice but to admit that you are right. This is a very clear relationship and idea to me, but I know that it simply fits my

> personality, because I really like to prove that I am right, if I am, and if I am wrong, I am glad that someone is able to show me that. I like directness and blunt honesty because, in my opinion, it saves time and energy for both sides.

At the same time, there are warning signs regarding the cohesion and discipline of the groups – students are registering a "red flag" related to punctuality and preparation.

> The day finally came when we visited [name] and were able to meet the people with whom we had formed our teams at the first meeting. One of the things I remember about this meeting is that we had agreed on a specific time, but only we (from [name]), the lecturers and just two students from [name] showed up on time. This immediately raised a red flag for me, as I realised that I might be dealing with people who are not very organised, and working with such people can really get on my nerves. However, there are advantages to this situation: while we were forced to wait for the other students [name], we were able to visit their university building – and it was here that Z. and I met the people who became the rest of our team. With A. and O., because they were the ones who showed us around their university, I felt some connection from the very beginning and already during the tour I felt that I would want to work with them. And that's exactly what happened – after completing a few team–building ice–brakers, during which we paired up, we decided to work on the project together. If I had to compare us, A., like Z., played the role of the "mastermind" in collaboration with O., controlling the course of the project and ensuring that the guidelines set by the lecturers were followed. O., on the other hand, was the more chaotic and crazy side of their duo. They are both very creative people, definitely not thinking in a formulaic way, direct and open to people and new ideas, thanks to which I felt from the very first meeting that working on a project with them would be pure pleasure.

In the above excerpts from the diaries, which are just examples, there is a "pendulum swing" between tension and resourcefulness. The uncertainty of choosing partners is mitigated by the memory of previous successful cooperation; self–presentation balances the asymmetry of positions; didactic criticism – even when it is perceived as "harsh" – is reinterpreted as a tool for harmonising project assumptions. In this dynamic, the learning situation becomes a formative experience: students learn to negotiate roles, regulate emotions, and maintain task orientation despite organisational disruptions and inter–university cultural differences. This can result in the development of cooperation, self–awareness and task resilience competencies, which in further parts of the analysis will emerge as a condition for combining theory with practice and achieving developmental effects.

**Combining theoretical knowledge with personal, market and social needs**

The second category covers the consistency between pedagogical reflection (Montessori pedagogy, didactic sense), the requirements of production, materials science and the market, as well as individual interests and motivations. In the course of the ARTIS project, this is a triangulation: students–academia–industry. The key moment is contact with the company and the factory, where ideas must pass the test of feasibility, costs, materials, certifications and durability. Participants learn translational design thinking: they translate the language of theory and educational needs, as well as their own dreams and plans, into the language of technical parameters and market expectations, pedagogical validity and feasibility, as well as … business potential. In addition, awareness of the real production path acted as a strong motivator and decision–making filter.

> I think deadlines are what drive our team the most – ever since I can remember, they have been one of those things that motivated me, or rather forced me, to study or finish the tasks I had started. Apparently, I've found my kindred spirits, and the people in our group (except maybe Z.) feel very much the same way as I do in this regard. Of course, this isn't our only motivator, but it's probably the most effective one. In addition, we are definitely motivated by the opportunity to create something new that we can be proud of and by the experience itself of participating in such an interesting project. There is no denying that the opportunity to have our idea produced by [company name] also drives us forward. I automatically feel more motivated to work when I realise that something that requires such a significant investment of time and energy has the potential to become a real product that (if all goes well) will be able to enter the market. Therefore, one of the factors that has often influenced our choices has been the guidelines set by the company [own name], and it was thanks to them that we finally decided to choose our target product, although I must admit that I find our other ideas so interesting that if we have the opportunity to continue working in this team, I will be happy to devote my time to implementing them as well.

Awareness of the actual production path acted as a strong motivator and decision–making filter, providing an opportunity for multifaceted and multi–aspect learning for the various actors involved in the process. For example, a visit to the factory highlights the importance of material and safety decisions, educational justifications, etc.

> Only O. and I went to the factory on behalf of [name]. The owners of the brand [name], with whom we cooperate, turned out to be very nice and hospitable people. The brand [name] is a subsidiary of the furniture manufacturer [name]. Mr Y. and his wife are engineers and furniture designers. The brand's philosophy is based on sustainable development, and everything they produce can be repaired and renovated. They use only solid wood, cork and stainless steel. This meeting was also our first meeting with people from [name]. The students [name] seemed quite shy and slightly lost in this situation, but so were we. First, we attended a lecture by the owners of the company about their business. In the meantime, we asked questions. At one point, when the students from [name] heard about the need to use cork scraps left over from the production of other furniture, they really wanted to make all toys for small children out of cork. I pointed out that cork would not be suitable for small children as it crumbles easily and could be eaten. I was surprised at how surprised and enlightened the students [name] and the lecturers from [name] were. Prof. [name] asked me to give a "lecture" on child development. I call it a "lecture" because I don't know what else to call it. He simply asked me to explain to everyone how a child develops and when, what they put in their mouths, and what is safe for children and what is not. I tried to explain it as best I could. As the company owners' lecture continued, Mr W. said that they only use raw solid wood for their products. So I asked how such wood behaves when it comes into contact with water or grease, because children's toys will certainly be exposed to such contact. My question caused widespread consternation, so I explained that I am not a designer and do not know such things, but I am afraid that raw, unprotected wood is not a good solution for children and therefore asked if they also use any protective measures. The lecturer from [name] loudly exclaimed, "because these ladies are from [name]," as if that could change anything. I did not receive a meaningful answer to my questions. After the lecture, we toured the factory, which was very fascinating. Then we went to the conference room to say goodbye, and out of the blue, Mr F. from [name] asked me, as a representative of the students from [name], to publicly share my thoughts on the tour, the entire meeting and our future cooperation. It was extremely embarrassing for me, but of course I answered these questions. No one else was asked or encouraged to do so. In addition, Mr F. and

> Ms U. from [name] expressed their wish that we, the students from [name], should have specific ideas for toys at the next meeting, because "their students don't know".

An interesting aspect of the learning situation is, for example, the criteria for certification and normative compliance, which become a component of practical knowledge, which "guides subsequent iterations of prototyping and thus, despite initial reservations, invites divergent thinking (see, for example, Saretzki, Forthmann, & Benedek, 2024), but within a limited pool of possibilities.

> Our entire group was present at the meeting. We presented our project. The main focus of our presentation was on the pedagogical part, because A. had not made a model in the meantime and was doing the visualisations on the day of the presentation. However, when I saw the visualisations, I was delighted with the concept. I would really like to have such furniture at home. I think we are doing a great project. During the discussion about our project, the leaders from [name] said little. I was very disappointed when, after J. pointed out that furniture for educational institutions must be certified, the lecturers from [name], who run the serial furniture workshop, seemed surprised and were unable to suggest what such certification might involve or where to check the guidelines. The main comments (apart from the above from J.) that I remember from this meeting were that our idea would be expensive to sell, who would want to buy it, it would be difficult to persuade anyone to buy it, and that we should include more geometric shapes in our vision. Apart from the comment about certificates, unfortunately, none of the other comments seemed to me to be constructive.

Further examples of translation between teaching assumptions (here based on Montessori pedagogy) and manufacturing parameters and learning situations in a heterogeneous team working on a multidisciplinary project.

> We met only once between the first and second meetings. Communication was not the best, because O. did not reply much, but A. replied almost every time and started preparing the presentation earlier, but it was she who had to prepare the prototypes at night before the second meeting, because O. was working on orders for his business that same night and was bound by deadlines. However, I would like to point out that when we did manage to meet or communicate with O., he really rewarded us with his great ideas, artistic craftsmanship and charisma. A. also played a key role in keeping our cooperation [...] together and formally meeting the requirements of [name] lecturers.

> What surprised me was the fact that the students from [name] already had a preliminary plan of what they wanted to focus on most in the project. To be honest, this suited me fine, because when I went to the meeting, I was very confused about the choice of topics I wanted to look into more closely. U. and F. decided on a project that would develop teamwork skills. They pointed out that there are many aids available on the market that require group work, but usually these aids are based on competition, and few of them require children to cooperate. Our first meeting ended with a brainstorming session on what we could produce that would both interest children and develop their teamwork skills. There were many ideas, and since we could only choose one, which was not an easy task, our work came to a standstill for several weeks.

We see an interesting “translation arc” here: from identifying a teaching need (e.g. cooperation instead of competition), through market scanning and the selection of reference concepts (e.g. Froebel's gifts, Montessori developmental materials), to iterations in line with technological and business conditions (materials, certificates, cost, durability, implementation logistics). The industrial

partner and the resources of the university educating in the field of design are not a backdrop, but active co–creators of quality criteria – their guidelines organise design decisions and give them a realistic implementation horizon, inviting to think outside the box.

At the same time, the pedagogical voice articulated by UG students through questions about developmental meaning, safety and compliance with Montessori principles "stabilises" the direction of the work and prevents the depreciation of educational values under the pressure of "mere" manufacturability. Combining psycho–pedagogical theories with the market in this way is an interdisciplinary competence that arises in action: through confrontation in the factory, reviews, critical questions and prototype corrections.

**Perceived benefits of service learning**

The third category reveals how participants in the process define and experience the benefits of participating in the project. These benefits are multidimensional: they include personal development, a sense of agency, satisfaction from teamwork, and the unique experience of being part of a project that is truly embedded in the social and market world. Students point out that *service learning* is a form of education that allows them to directly combine theory with practice and to see the deeper meaning of their own actions.

Let us quote four examples from the diaries of four different participants:

- Such experiences simply fill you with a very positive attitude towards life and your own abilities.
- I believe that thanks to this project, I saw the real meaning of studying pedagogy;
- The greatest satisfaction came from the awareness that something we co–created has a chance to find its way into real educational institutions.
- Thanks to the project, I felt that my skills are important and useful, that I can contribute something valuable.

The above excerpts show that the perceived benefits of *service learning* include emotional, cognitive and social dimensions. The project increases the sense of self–efficacy, allows students to experience a real impact on the world, and strengthens their motivation to continue studying and acting. It is worth emphasising that students see the value of learning in connection with practice and the authentic recipients of their work – educational institutions. Extending the interpretation of the above benefits, it is worth referring to them in terms of classic approaches to experiential pedagogy. Let us recall a few well–known theads.

In David A. Kolb's logic of the experiential learning cycle, the students' "concrete experience" in the project (working on a real product, meeting with partners, testing in institutions) generated material for "reflective observation" (diaries, team discussions), which in turn fostered "abstract conceptualisation" (organising concepts, redefining quality criteria) and "active experimentation" (successive iterations of prototypes and organisational solutions). The satisfaction described by the participants, the growing sense of agency and the meaning of studying are therefore "symptoms" of the completion of the full cycle of experience and knowledge in the CE–RO–AC–AE cycle (Kolb, 2014).

In turn, Dewey's framework of experience adds an important distinction in the quality of experiences: not every "doing" is educational, which is worth remembering, especially today when promoting so–called activating didactics.

What students identify as most valuable (contact with the recipient, feedback from an industrial partner, tests in institutions) reinforces the "continuity" and "interaction" of experiences, i.e. the conditions which, according to John Dewey, determine that experiences are not "miseducational" but form a meaningful progression of development (Dewey, 1938).

Janet Eyler and Dwight E. Giles' research directly refers to *service learning*, showing that well–designed activities combining engagement with learning produce convergent sets of outcomes – personal and interpersonal (e.g. increased empathy, cooperation skills), cognitive (deeper understanding of knowledge and its applications) and civic (sense of responsibility and public agency).

In the diaries cited, these three sets of "benefits" are clearly present: the students write about changes in themselves (emotions, confidence), about "seeing the point" of studying (understanding applications), and about the motivation that comes from having a real audience for their work (Eyler & Giles, 1999).

Finally, Jack Mezirow's perspective completes the picture with a transformative dimension: moments of "difficult" encounters (differences in work styles, criticism, logistical tensions) can be read as mini "confusing dilemmas" that trigger critical reflection and, for some students, lead to a transformation of their frame of reference (e.g., they think differently about their professional role, the meaning of studying pedagogy, quality standards, and the relationship between theory and practice). In this view, the joy and agency they write about are not solely the result of "successful projects," but – above all – of working through experiences and incorporating them into a new, more mature framework of understanding – which is, after all, the essence of transformative learning (Mezirow, 1991).

Putting these threads together, it can be said that the benefits of *service learning* observed in the diaries are consistent with Kolb's theory (closed cycle of experience), correspond to Dewey's conditions for valuable experience (continuity and interaction), and are confirmed by *the evidence–based* approach to the effects of SL by Eyler and Giles (personal, cognitive, civic) and – at least for some of the participants – bear the hallmarks of transformative change in Mezirow's sense (critical reflection leading to a modification of perspectives).

**Emerging challenges**

The fourth category refers to the difficulties and tensions that arose during the project. The challenges mainly concerned inter–organizational communication, differences in the level of commitment, as well as tensions resulting from different working styles and expectations. However, these elements were not only barriers – students often interpreted them as developmental experiences that taught them flexibility, patience and negotiation skills. Let us quote a few illustrative excerpts from their statements.

- Communication was not the best because U. did not reply much, but F. replied almost every time and started preparing the presentation earlier;
- This is where a red light went off in my head, warning me that I might be dealing with people who are not very organised;
- Organisational misunderstandings were frustrating at times, but at the same time they taught me to be more patient and adaptable.
- I noticed a difference in the approach to deadlines and responsibilities between us and the students [name]. This generated tension but also forced us to have an open conversation.

These excerpts reveal that the challenges were relational, organisational and cultural in nature. The students differentiated their ways of working and approaches to responsibilities, which led to tensions but also became a source of learning. As a result, these challenges can be treated as an integral part of the *service–learning* process, which prepares students to deal with the ambiguity and diversity of real professional life.

In developing the interpretation of the category of "challenges," it is worth referring to the sociocultural tradition, in which learning is treated as a social and dialogical process. Lev Vygotsky pointed out that cognitive development takes place in interaction with others and in situations that exceed the individual's current capabilities but fall within the so–called zone of proximal development.

It is precisely "tasks beyond current capabilities, but achievable with the support of others" that bring about qualitative changes in thinking (Vygotsky, 1971/2006). In the interpretation of Ewa Filipiak, who translated this perspective into the field of education, it is crucial to create demanding, open and complex situations, the ones that provoke cognitive effort and at the same time enable the use of the social resources of the group. Filipiak (2012) emphasises that people develop particularly when they encounter a task that is difficult and requires the reorganisation of existing cognitive structures, but at the same time is possible to perform thanks to the support of a teacher, peers or other available people. The analysed diaries show that the tensions resulting from organisational and interpersonal differences were precisely of this nature – they were difficult, but they became a space for joint negotiation and mutual learning.

The concept of *productive failure*, which has recently been developed in literature, is based on similar logic. Researchers in mathematics and problem–based learning pedagogy emphasise that encountering difficulties and temporarily struggling with a problem promotes a deeper understanding of the material and develops perseverance (Kapur, 2024). *Productive failure*, therefore, does not mean frustration without a way out, but situations in which learners or students must exceed their own limitations and test different strategies before reaching a solution.

The diary excerpts cited above reflect the logic of constructively struggling with problems, which ultimately results in new knowledge, aptitudes and skills.

The most relevant theoretical context seems to be "PUNC" (*Professional Uncertainty Competence*), i.e. the competence to function and operate professionally in conditions of complexity and uncertainty (Orłowska, 2020; Lazarus, 2021). Authors dealing with this issue point out that contemporary educational and social challenges require preparing students not so much to cope with

clearly defined and predictable tasks, but rather with ambiguous situations full of tensions and conflicting expectations.

*Service learning* – especially in interdisciplinary projects such as ARTIS – creates a favourable environment for developing PUNC. Dealing with different working styles, different organisational cultures at universities, and even divergent requirements of social partners prepares students to function in a professional world where uncertainty is the rule rather than the exception. The analysed diaries confirm that although tensions were a source of frustration, the project participants also interpreted them as formative situations that "taught" them flexibility, negotiation and resilience to ambiguity. In this sense, the difficulties and tensions revealed in the studied material are not a "side effect" *of service– –learning*, but the core of this approach: learning/studying through real social experiences means confronting uncertainty and diversity, which, when properly supported, become a source of transformation.

**The logistical and organisational aspects of running a project following the *service learning* methodology**

The last category concerns organisational and logistical issues, which appeared in the diaries as both obstacles and difficulties, as well as opportunities for learning. The participants in the process emphasised the different approaches and roles of coordinators, problems with setting deadlines, and the diversity of organisational practices among the institutions involved. Against the backdrop of these experiences, the theme of learning project management in real–life conditions emerges. Let us quote a few excerpts from the diaries:

- All organisational issues concerning our meetings – although, being in my fourth year at our university, organisational problems could be considered normal;
- There were situations where we couldn't coordinate because everyone had different commitments – this required a lot of flexibility;
- The supervisors were supportive, but sometimes there was a lack of quick feedback, which created uncertainty;
- I learned that a project is not only about ideas and creativity, but also about calendars, deadlines and logistics.

Logistical and organisational challenges, although sometimes a source of frustration, also became an important part of the learning process. Students gained experience in time management, team coordination and responding to unforeseen circumstances (which links logistics to the previous category). In this way, logistics – usually treated as a "background" – sometimes took on an educational dimension, preparing students for professional reality.

On the other hand, this view of logistics and organisation would not be complete without mentioning the numerous problems, disruptions and difficulties in finding time, which can hardly be considered educational. Therefore, although we recognise the value of challenges, it is also important to note situations that were simply disruptive and had no positive dimensions. Postponements of

meetings, changes of dates and a lack of communication on the part of some of the organisers meant that other people involved had to skip the meeting.

Let us quote a few excerpts from the diaries that refer to this negative aspect of logistics and organisation as well as inter–organisational communication:

- One of the biggest challenges we had to face was the attitude of the leaders from [name]. Despite our efforts and many hours of work on the details of the project, we were often criticised that our solutions were not feasible for children. This was difficult for us because we knew that children in Montessori schools have a wide range of abilities, and many of the tasks we proposed were in line with their educational programme. However, the leaders did not always take this into account.
- I was a little stressed because I knew that this was the first time we had the chance to meet the students [name], but also the moment when we would have to divide into groups. My first thought was: How can I choose who I want to work with if I don't know these people? I didn't know who I would be comfortable working with. The choice of groups was important because the project was planned for a longer period of time. How can we work for so long with someone we don't get on with? Then work turns from pleasure into a fight against windmills (it was a bit like that in our group, but more on that later). Ms. H. prepared integration games for us to get to know each other better. Some project groups were already formed during these games. I understand this because each of us took up the "fight" for people to work with.
- I had to leave the meeting early, but M., T. and Z. discussed the initial concepts.
- Thanks to this, we found out that Thursday's meeting had been postponed until the following week. It's just a shame that no one informed us about it. If this information hadn't come out by accident, we would probably all have gone to [name] on Thursday. I don't like the fact that this was decided without consulting us. I knew right away that I wouldn't be there, so I informed my group. I didn't like this arbitrary decision, but I was sure that I would be the only one not there, so I let it go.
- […] we asked B. if he managed to create a model during his Thursday class. We didn't get an answer.
- Why am I not in U. and F.'s group? Because U. and F. quickly made contact with the UG students and were the first to form a group. I don't know, somehow it seemed to me that this group was already "closed" and the rest of the girls had no chance of joining it. These are my feelings, that's how I remember it.
- But as time went on and their criticism became more and more damning, I began to feel like I was fighting a losing battle. I felt that no matter how much time and energy we put into our work, there were always more objections. I realised that there was no chance of us being recognised – that our efforts were simply ineffective. And waiting for the results after Thursday's meeting of students [name] and information about what the lecturers said, I can compare to waiting for a verdict.
- The problem arose because a specific date had been set long in advance and most of us had adjusted our plans accordingly, but if it hadn't been for the fact that our friends from another group accidentally found out that the meeting was not going to take place, which none of us were aware of due to the lack of any information from students or professors. After asking a question in the main group, it turned out that, without any agreement with [name], a different date had been set, which did not suit a large number of people. In my opinion, this situation was very unpleasant and also meant that I could not attend the next meeting about the project.

Sometimes, people participating in the project report rudeness, disrespect and an unacceptable lack of courtesy on the part of the leader, which, of course, especially in the context of the issue discussed here, cannot be considered an example of constructive "clashing" with new people and learning. Naturally, in such situations, people "learn" to cope with difficult social situations, but such incidents simply should not occur.

Nevertheless, from the perspective of the sociology of education, the hidden curriculum can be seen at work here (Meighan, 1993). Students not only acquire the substantive knowledge and competences declared in the syllabuses, but also learn "informally" – how to deal with organisational chaos, how to negotiate deadlines, how to distribute responsibility between institutions. These elements, although rarely included in official teaching objectives, have an equally strong influence on aptitudes, attitudes and skills that are important both from the perspective of professional career and life in general.

In this sense, logistics and organisation in a *service learning* project can be understood as an important part of the "*curriculum in action*", which reveals that learning also takes place through the experience of institutional constraints and rules of the game (Jackson, 1968/1990), although when these logistical problems and challenges are too numerous or take on an unacceptable form, it can interrupt the process. In this sense, this chaos and lack of clarity in areas of responsibility can destroy the learning.

However, it is worth emphasising once again that in the diaries analysed, students did not treat these challenges solely as obstacles, but also as opportunities for development. Such interpretations show that *the hidden* curriculum does not have to be exclusively reproductive or oppressive (as suggested by some classical critical educational sociology interpretations), but can also have a formative function – teaching agency, management and responsibility for a joint undertaking.

In conclusion, one could venture the thesis that what appears to be a barrier sometimes (though not always) transforms into an educational space: the link between formal educational content and institutional practice generates learning precisely when logistics require the mobilisation of resources, reflection and cooperation, but sometimes it also frustrates, blocks and discourages, and then it is difficult to talk about the positive and educational potential of challenges related to logistics, communication and project management.

**Summary of analyses**

The analysis of the five categories identified from the diaries of the project participants reveals a rich picture of the students' experiences in the area of *service learning*. It is clear that the project was a learning situation that gave rise to fears, negotiations and a process of adaptation. Combining theoretical knowledge with market needs became an opportunity for translation between the world of academia and industry. The benefits that students reported included personal development, satisfaction and a sense of purpose in their studies.

At the same time, there were challenges – communicative, organisational and cultural – which both blocked progress and became "material" for learning resilience and flexibility. The impact of the project on the students included (at least in the light of the participants' narratives) both the

development of competences and reflection on their own professional future. Finally, logistics and organisation showed that the practical aspects of educational project management are an integral part of learning in real–life conditions.

We therefore conclude that the project presented here is a model example of transcending the boundaries of teaching in the spirit of *service learning*. From the students' perspective, it is a comprehensive experience that combines theory with practice, individual development with teamwork, and our thematic analysis shows that such initiatives can serve as a laboratory for the development of modern academic and civic competences (e.g. PUNC).

## Discussion

### *Service learning* and the missions of the university

The issue of the so–called "university mission" is the subject of intense debate in the literature on the subject. While the first two missions – teaching and research – are considered the foundation of an academic institution's identity, the next three – the third, fourth and fifth – are not only more diverse but also less clearly defined. Our study, based on a qualitative analysis of the learning diaries of the "ARTIS" project participants, provides interesting data for this discussion, allowing us to compare students' experiences with the theory *of service learning* and the concept of the university's other missions.

The participants' diaries repeatedly reflect on the fact that participation in the project not only broadened their knowledge, but also shaped their attitudes, values and sense of social responsibility. This was clearly linked to the practice *of service learning* – learning through engagement, which combines the teaching process with activities for the benefit of the community (Eyler & Giles, 1999). The ARTIS project, created in collaboration between students, partners from another university and an industrial partner, became a space where academic education went beyond the traditional model. Thus, its nature is situated in the field of discussion about the university's future missions.

The third mission of the university, defined as active engagement with the social, economic and cultural environment, is relatively well established in educational policies and literature (Banaś, Czech, & Kołaczek, 2019; Kola & Leja, 2015). It encompasses both the transfer of knowledge and technology, as well as civic, culture–creating and ethical activities.

In this sense, the ARTIS project might be treated as example of the implementation of the third mission. Students from both universities not only expanded their competences, but also created products – prototypes of educational aids – which were intended for real use in Montessori schools and other interested institutions. The industrial partner contributed technological knowledge and a potential market, and students will have the opportunity to test the prototypes in real educational contexts. In this way, the educational process was combined with practical, social and economic impact, which is the essence of the third mission (Boffo & Cocorullo, 2019).

The narratives from the diaries confirm this rootedness. Participants wrote about their satisfaction with the fact that "something we co–created has a chance to find its way into real

educational institutions." This type of reflection indicates that those involved in the process saw their contribution not only in academic, but also in social and practical terms.

While the third mission is still relatively stable in its definition, the fourth mission is controversial and conceptualised in different ways. Kretz and Sá (2013) proposed understanding it as a perspective of entrepreneurship and economic relevance, i.e. the systemic orientation of universities towards the economy, spin–offs and the commercialisation of research. Similarly, Boffo and Cocorullo (2019) point out that the fourth mission is related to the management of academic entrepreneurship and policies supporting innovation. Sometimes the fourth mission appears as an autonomous pillar, alongside teaching, research and "extension" (Insaurralde–Alviso, 2022). Here, the emphasis is on the systemic embedding of commercialisation and intellectual property protection processes.

However, there is no uniform definition. In the literature, the "fourth mission" is also sometimes related with public communication (Knobel, 2022), which further complicates the picture. In this sense, talking about the fourth mission means operating in a field of blurred definitional boundaries.

Even more controversial is the concept of the fifth mission, which some authors propose to interpret in terms of social responsibility or civic activism (cf. Knobel, 2022).

It is clear, then, that, as in the case of the fourth mission, the fifth does not have a uniform framework – its definitions are proposals rather than an established canon. However, this does not mean that these categories are useless. They can serve a heuristic function, allowing us to describe processes that go beyond the classical understanding of the university.

*Service learning*, as implemented in the ARTIS project, combined elements of teaching, research and social engagement. Working in interdisciplinary teams, students experienced education through action, developed cooperation skills, learned to negotiate differences and create valuable educational products. Their reflections, recorded in diaries, indicate the development not only of academic skills, but also of civic attitudes and values.

In this sense, *service learning* fits into the third mission, as it combines education with a real impact on society. However, given the involvement of an industrial partner, the project can also be considered in the logic of the fourth mission – as a form of academic entrepreneurship, knowledge transition and production for the market.

Moreover, the digital and technological themes, as well as the dimension of innovation in the teaching formula itself, can be interpreted as part of the discourse of the fifth mission, which emphasises the role of digital transformation and social responsibility as new dimensions of the university.

An analysis of the diaries shows that students perceived the project as a formative experience – shaping their competences, values and professional identity. Many passages reflected on the sense of agency, the meaning of studying, and responsibility towards others. This points to a strong civic and evaluative component, which is the essence *of service learning* (Eyler & Giles, 1999).

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