

Chapter 5

Participants' View on the Interdisciplinary Project



Abstract As Activity Theory is a theory focusing on the object, this chapter concentrates on the idea of hands-on multidisciplinary project that the teaching staff develop during the Change Laboratory workshops. It does so with the words of the people who are involved in the project: teachers, students and workshop assistants. Through interviews to the teaching staff and focus groups with students, the chapter will describe its historical antecedents, the features, the potentials and the challenges of the hands-on interdisciplinary project.

Keywords Interviews · Teaching staff · Interdisciplinary project · Object
Qualitative research methods

The first section introduces the methodology in the light of Cultural Historical Activity Theory. The need is to better understand the object, the interdisciplinary project, in the light of what it is and the changes that it entails in the activity system: new division of labour among teachers and between teachers and workshop assistants, new rules and learning tools, as well as new in-class didactics. This section also shows the questions being used and the validation process.

The second section analyses the interdisciplinary project by taking the teachers' perspective. The project features are that it is based on realistic tasks and problems, and it connects diverse technical subject matters and allows students to work in groups. The interdisciplinary project also has diverse transformative potentials: it can change the state exam based on a competence; it calls for an evaluation system beyond knowledge towards competence; it can change the curriculum to make it more up to date; through its advertisement on the school open day, it has the potential to attract enrolments; and through group work, it fights bullying and promotes group work as an important skill set for working life. The interdisciplinary project also faces challenges: it is more multidisciplinary than interdisciplinary; the role of workshop assistants is not fully utilised because of the high turnover and lack of experience; and it could result in an excessive workload for students.

The third section presents the workshop assistants' point of view. Similarly to teachers, the main characteristics of the interdisciplinary project that apply to them are concreteness with real problems, connectedness between subjects and group work.

The interdisciplinary project has diverse potentials: it will increase employability and be useful for both university and working life; it will facilitate the alignment of curriculum with the new needs of the market; and it will promote inclusion. The shortcomings are that it is interdisciplinary rather than interdisciplinarity, and the workshop assistants' role as connecting elements between subjects is undermined.

The fourth and fifth sections present the students' point of view. The Students of the section A only discussed the features of the interdisciplinary project: it promotes group work; it involves various disciplines and is more real, thus giving a holistic understanding of surveying; and it is competence based. The fifth section takes section B students' point of view. The features of the interdisciplinary project are that: it connects the diverse technical subjects, it is based on realistic tasks and problems, and it allows group work. Its main potentials are that it is useful for working life and university, and it has the potential to transform the relationship between teachers and students as a work relationship based on tutoring. It is facing challenges since not all the technical teachers are willing to participate, resulting in an overload for students; it competes with the regular curriculum instead of completing it; and the potential of the workshop assistant is not fully exploited.

5.1 The Methodology

In Cultural Historical Activity Theory, the object plays a key role, as it is the object that provides for the social meaning of the activity (Virkkunen & Newnham, 2013). During the Change Laboratory workshops, the participants developed a new object: a hands-on interdisciplinary project in surveying to be delivered in the two Grade 5 classes. Seen with the help of the triangle of activity (Engeström, 2015), this new object entails new division of labour, tools and roles. A new division of labour among teachers is necessary, because they coordinate their teachings around the common project. Since it is the workshop assistants who manage the project, a new division of labour between teachers and workshop assistants is also called for. The project also entails new rules and tools with in-class active didactics such as group work. This chapter analyses the participants' perspective with interviews and focus groups to better understand the new object and how it calls for a new division of labour, new tools and new rules.

I conducted six individual interviews with the teachers and two with the workshop assistants, while with students I made a focus group in each of the two Grade 5 classes (Section A and B). The following is a list of questions I used during the interviews and focus groups (Table 5.1).

Other themes which I had not thought about when devising the questions emerged spontaneously during the interviews, for example the relationship between the interdisciplinary project and the state exam at the end of Grade 5. The qualitative data analysis was done as follows (Merriam, 2009; Ravitch & Carl, 2015): I transcribed the whole interviews and focus groups and read them recursively to group common themes. The following sections will report a selection of excerpts I translated

Table 5.1 Trace questions for the interviews and focus groups

1. Could you describe the interdisciplinary project?
2. In what ways is the new interdisciplinary project different from the interdisciplinary projects carried out before the reform?
3. What are the differences between this interdisciplinary project compared to a regular project you have participated in?
4. How do you think students/teachers see the interdisciplinary project?
5. How do students/teachers work differently during the interdisciplinary project?
6. What do you think they find difficult in the interdisciplinary project?
7. Do you work differently with your colleagues involved in the interdisciplinary project?
8. How do the workshop assistants work differently during the interdisciplinary project?
9. How do you think the interdisciplinary project will impact on the visibility of surveying?
10. How do you think the interdisciplinary project will impact on new enrolments?

into English. The categories that I use to group the excerpts are the features, potentials and challenges of the interdisciplinary project. Moreover, in the case of the teachers' interview another category is represented by its historical antecedents. The next chapter will tell how these themes were vetted through a participant validation strategy.

5.2 The Interdisciplinary Project in the Eyes of the Teachers

The interviews gather the opinion of two teachers of design, one teacher of topography, two teachers of land valuation, as well as one teacher of agronomy who is also the school's vice director. The vice director is not directly involved in the implementation of the project, but had previous experience with interdisciplinary projects and in-depth pedagogical understanding. He participated in all Change Laboratory workshops, having drafted the idea of the interdisciplinary project. All the following interviewees teach technical subjects, because at that time no teacher of humanities had yet been involved.

The senior teachers already did a interdisciplinary project when it was a mandatory activity carried out during specifically allocated hours before the school reform. However, a new professional figure, the workshop assistant, now helps connect the diverse subjects into a whole, plus the project requires a competence-based approach and students' group work. With these elements, the interdisciplinary project becomes something new from the interdisciplinary project carried out in the end of the 1990s.

5.2.1 What Are the Historical Antecedents?

To better understand the history of the interdisciplinary project, it is necessary to connect it with other projects (interdisciplinary or not) carried out by the most experienced teachers in previous years in the school or in other schools. Firstly, there is a clear relationship between the new interdisciplinary project and the interdisciplinary projects carried out regularly before the school reform in both courses of surveying and agronomy (the agronomy course was held at the institute up until 2000). The vice director, who at the time taught in agronomy, explains the connection between old and new interdisciplinary project:

6	Vice director	<i>In the workshops we started from my proposal. The idea was to retake the old interdisciplinary project that we carried out years ago when I was here (with the surveyors) and at the course of agronomy. We have retaken a thing we already did</i>
7	Interviewer	<i>So what are the differences between the interdisciplinary projects you carried out before the reform and the present one?</i>
8	Vice director	<i>At that time, there were 3 weekly hours specifically dedicated to the interdisciplinary project. This year we dedicated the teachers' regular teaching hours to carry out the project in the classroom or in the workshops (continues below)</i>

For design teacher 2, the main difference is that now there is a new professional involved who connects the various subjects involved.

1	Interviewer	<i>What is the difference between the new interdisciplinary project and the interdisciplinary project you carried out before the school reform?</i>
2	Design teacher 2	<i>In the interdisciplinary project before the reform the workshop assistant, a fundamental professional that we should value well, was missing. Each teacher carried out a small piece of the project and there was a sort of hand-over. The first bit was done by a teacher, the second bit was done by another teacher, and each managed their own piece without understanding the common thread. This time there is a new professional figure that I believe in. If well trained and valued, the workshop assistant could make an overall project—I am not saying between the two classes, but at least in each class. S/he helps the students see the complexity of design, which is the result of diverse contributions. In our society, more and more, design is the result of diverse professionals' synergies, therefore the students should learn how to work in groups</i>

The new interdisciplinary project can also be traced to a small interdisciplinary project carried out by only two teachers the year before in the same school in the geotechnics course (an articulation of the surveying course).

1	Interviewer	<i>What is the difference between the new interdisciplinary project and the interdisciplinary project you carried out in Geotechnics?</i>
2	Vice director	<i>The project I did last year only concerned two subjects, while the new project concerns diverse subjects. This is the first difference, the second is that while my project concerned a simulated quarry, in the new interdisciplinary project the students go to a real site</i>

Third, the teacher of land valuation already carried out an interdisciplinary project when he was working in a private school which essentially entailed coteaching.

45	Land valuation teacher	<i>I don't remember how the interdisciplinary project started many years ago in surveying</i>
46	Interviewer	<i>But you said you already carried out an interdisciplinary project ...</i>
47	Land valuation teacher	<i>When I taught in a private school I did a small project with a teacher of law, I allocated some time to teach together</i>

Second, the difference between a simple project and the interdisciplinary project is that the students are confronted with diverse subject matters and group work.

40	Interviewer	<i>Working by project is the first working modality for surveyors</i>
41	Vice director	<i>Definitely. The new thing is to carry it out involving as many subjects as possible, and connecting the various disciplines. It is not a new thing, but the effort is to make it interdisciplinary. There are teachers that have the students working in groups, so they develop social competences. The interdisciplinary project is more complex than a regular project and, students develop their social competences even more</i>

Thinking about the number of subjects involved in the new interdisciplinary project, another difference is that interdisciplinary projects involve disciplines beyond technical subjects.

14	Interviewer	<i>Did the interdisciplinary project before the reform involve other subjects beyond technical subjects such as literature?</i>
15	Design teacher 2	<i>No, it didn't</i>
16	Interviewer	<i>Does the new interdisciplinary project involve English?</i>
17	Design teacher 2	<i>Yes, and this is the big novelty</i>

However, the interdisciplinary project carried out before the reform in Agronomy already included diverse subjects, and was presented as a project at the state exam, says the vice director.

27	Interviewer	<i>Did the old interdisciplinary project in agronomy have many subjects or did it only involve technical subjects?</i>
28	Vice director	<i>When I did it in agronomy we involved diverse subjects. We wrote the abstract in English, we had the literature teacher revise the reports, and sometimes statistical aspects for maths. We tried to involve as many subjects as possible. Sometimes we succeeded, some others we didn't. It was not the same old essay that irritates the commission at the state exam, it was a realistic project</i>

5.2.2 What Are the Features?

Firstly, many interviewees agree that the interdisciplinary project is based on realistic tasks that students could face one day in work activity. For the Design teacher 1, it is closer to the job of a professional surveyor:

15	Interviewer	<i>What is the difference between the interdisciplinary project and a regular project such as the design of a little townhouse?</i>
26	Design teacher 1	<i>I understood it as more complete, and that I started it as if it was a professional job</i>

The vice director emphasises the fact that in the interdisciplinary project, the students do not have to invent data, but rather deal with real data and problems.

23	Vice director	<i>At the state exam the candidate refers to a territory s/he knows. In Land Valuation the problem is: "by adopting invented data, the candidate ...", and this is not ideal. Instead, when you go outside and are confronted with concrete data, and not with the data you invented, this is much better</i>
51	Vice director	<i>I think for the school it is a big step ahead. It is not new, but instead of dealing with books from page x to page y, you deal with tasks concretely, and there is a good chance that the student will remember</i>

For the Design teacher 2, the interdisciplinary project is a task that forces students to cope with the problems typical of the working world.

31	Interviewer	<i>Do you think that this interdisciplinary project is more real than other projects you carried out? I know that the students went on the site to survey, and are designing a canteen that would be useful to the citizens. They also checked if the city planning could allow such a construction</i>
32	Design teacher 2	<i>Yes definitely, it is a work that forces the students to cope with the real world</i>
33	Interviewer	<i>More than other projects?</i>
44	Design teacher 2	<i>Yes, more than other projects because students work on concrete things. They see a map of the area which is not just hypothetical, and this is an absolutely positive aspect</i>

Although the topography teacher contends that other projects carried out in previous years were to some extent interdisciplinary, this project is different because it is far more similar to problems the students could deal with in their professional practice.

43	Interviewer	<i>What is the difference between the interdisciplinary project and another project you ran in the school? I know you carried out diverse projects, for example the project on the Shoah last year</i>
44	Topography teacher	<i>Do you remember that the last year we carried out the project on the gardens in another school? There is a difference though—the present interdisciplinary project deals with a building requiring more care compared to a garden. Let's say that the students' answer has been a little confused because they are not used to working on concrete things</i>
45	Interviewer	<i>So it's a more practical project, more realistic</i>
46	Topography teacher	<i>It's certainly practical and realistic. That's what we wanted. This is what we added to what we normally do. As I told you, we have always performed the survey out in the field. However, in previous projects the following step, that is the insertion of this survey into the program of the Real Estate Registry, had only been outlined</i>
47	Interviewer	<i>This time they do it for real</i>
48	Topography teacher	<i>Yes, this is a problem that we don't normally deal with. Let's say that this time we spent a lot of time on it so that the students could deal with reality. For example, the program does not work if you put a comma instead of a dot to separate the decimals. These obstacles however put the students into troubles and delay their work, so they very much feel the workload</i>

And this concept is repeated later in the interview:

153	Topography teacher	<i>It is important that the students understand what they can do and what they cannot do. For example, the site of the interdisciplinary project is close to the railway ...</i>
154	Interviewer	<i>It is a concrete case study. The students can think about what they know in practice</i>
155	Topography teacher	<i>This is what I was telling you before. There are a lot of constraints that you will never deal with if you make a little project of a simple townhouse of 100 m²</i>

Second, the interdisciplinary project makes a connection between subject matters. For the topography teacher, it will help the students to summarise what they are doing in the different technical subjects, thus allowing a holistic understanding of surveying and construction.

51	Interviewer	<i>Do you think students sum up what they study in the diverse subjects?</i>
52	Topography teacher	<i>As I was telling you before, at the moment they are struggling but at a later stage they will have an insight and everything will fit into place. It is like when you solve a detective story, everything looks confused at the beginning, but in the end everything makes sense. It will still take more time, but in the spring they will arrive to fully understand what they are doing ...</i>

And again:

74	Topography teacher	<i>However, what we have done so far is not yet connected, every teacher followed their own program, we haven't summarised at all</i>
75	Interviewer	<i>I see. Now comes the effort. So far, each teacher has done his or her part. You still have to wrap it up, and this will be the turn around</i>
76	Topography teacher	<i>I think so; in a later stage students will understand that they did a complete work instead of examining one little bit at a time. There will be a moment when they will become aware they did a job which is remarkable</i>

For the vice director, it will help students not to see technical subjects as separated.

8	Vice director	<i>We retook this thing which is very useful for the students as they connect the various disciplines</i>
9	Interviewer	<i>It is based on the idea of competence ...</i>
10	Vice director	<i>Yes, I see it at least didactically. In doing so students don't see disciplines as detached from each other (continues below)</i>

Third, the interdisciplinary project calls for group work, a set of social competences important in working life, as told by the vice director in speaking (no. 41) or by Design teacher 2 in speaking (no. 3) above or in the transcript below.

22	Interviewer	<i>Working by project is the regular working modality for surveyors, so what is the difference between working by projects as opposed to a interdisciplinary project?</i>
23	Design teacher 2	<i>I believe that working in groups is important for students to acquire relational competences beyond applying a formula or make a calculation</i>

For the topography teacher, the interdisciplinary project is an opportunity for group work, as she explains to parents during the school open day:

98	Interviewer	<i>If I understood it well, the interdisciplinary project will allow students to work in groups</i>
99	Topography teacher	<i>We also talked about that with parents, as they asked about bullying in our school. We explained that the class size in the latest triennium is small, since in Grade 3 we have 11 students in one class and 12 in Grade 5. We also talked about group work as an important competence during work, and that through the interdisciplinary project we have them working in groups</i>

5.2.3 What Are the Potentials?

This section deals with the pedagogical renewal brought by the interdisciplinary project. Firstly, it should align well with a competence-based state exam and has therefore the potential to transform the traditional disciplinary oral examination. This is the point of view of the vice director:

10	Vice director	<i>I do not know if it will affect the state exam, because the critique is that at the oral test there is one question on literature, one on history, the three minute-long question of English, mathematics, constructions ... instead, the interview should be interdisciplinary. I don't know if the commission will use the interdisciplinary project for the interview or will just employ the usual round of questions</i>
11	Interviewer	<i>We are talking about that in the follow-up workshops</i>
12	Vice director	<i>However, the law states clearly that the interview at the state exam must be interdisciplinary, and based on the activities performed during the year or during work experience</i>

For the Design teacher 2, it will be up to the commission whether or not the interdisciplinary project will be incorporated into the state exam.

43	Interviewer	<i>Do you think it could be brought as a project or essay at the state exam?</i>
44	Design teacher 2	<i>Yes, it could, but remember that the time dedicated to the project or essay during the oral examination is minor. I have a long experience of state exams. If the oral test lasts 30 min, only 10 are dedicated to the project or long essay. We can do everything we want, but if the state exam is not conceived differently, the valorisation of the students' project will rest in the good will of the commission</i>

Second, the interdisciplinary project can change the evaluation system now based on the assessment of knowledge connected to specific disciplines. For the vice director:

24	Interviewer	<i>I know this year the interdisciplinary project doesn't concern you as you work as vice director</i>
25	Vice director	<i>I will not work on it but I am equally interested because it is a new way to work and a new way to evaluate</i>
26	Interviewer	<i>It is a new way but it recalls the old. You already did it</i>
27	Vice director	<i>Yes, but it is new because in the last few years we have returned to teaching for knowledge</i>

Also for the Design teacher 2, the evaluation of the interdisciplinary project will have to include more criteria beyond the reproduction of knowledge.

47	Interviewer	<i>Also the evaluation should change, did you think about this?</i>
48	Design teacher 2	<i>Not specifically, but the experience we made last year on the flipped classroom made me understand that I should think about an array of criteria. I can't just assess a specific knowledge related to my subject, but consider the relationship with the other disciplines and the learning process. The evaluation should therefore concern a specific part of the interdisciplinary project where the student expresses his or her competences in a specific discipline, but also a part, perhaps the majority [of the mark], on the overall performance</i>

Moreover, the interdisciplinary project can trigger changes in the curriculum, says land valuation teacher 2.

47	Interviewer	<i>Did you have to change your didactics in the interdisciplinary project?</i>
48	Land valuation teacher 2	<i>The only novelty, which pleased me as I had done it during my private practice, is that we surveyed the green area. The students liked this part a lot, I think I opened a new world to them. They normally only focus on constructions, but as surveyors they could also design green areas</i>

This change in the curriculum is remarkable since during the Change Laboratory, some had criticised the programme as it focuses on constructions and very little on environment, while the green skills are key for the future surveyor.

Fourth, the interdisciplinary project can be shown during open days to promote enrolments in surveying. The topography teacher was the one in charge of the open day and emphasises its features: interdisciplinarity, concreteness.

85	Interviewer	<i>How did it go in the open day? Did you present the interdisciplinary project?</i>
86	Topography teacher	<i>I talked to the parents about our projects. I talked about a project of the gardens we did few years ago. I said that every year we seek to look for something that connects the various disciplines, something practical, etcetera, and I believe they understood the importance of doing so</i>

In the open day, group work within the interdisciplinary project is emphasised as a possible way to combat bullying and learn a set of skills important in working life.

114	Interviewer	<i>Hence, in the open day you presented the interdisciplinary project as a useful tool in combatting bullying, since teachers work together and students work in groups</i>
115	Topography teacher	<i>The truth is that we do not see any bullying here - at least in the triennium. But the fact the students cooperate is a good way to fight bullying. Furthermore, a course that has a cooperative approach is good because if you work in a private practice one professional has an idea and a colleague has another idea, one person specialises in a thing and another in another thing. However, the need for cooperating is not an invention. Do you remember that during the Change Laboratory we said that an individual work cannot simply be turned into a group work? Instead, in design, many minds have to come together</i>

5.2.4 What Are the Challenges?

The teachers also identify issues with the interdisciplinary project. The main observation is that as it unfolds, the project is multidisciplinary rather than interdisciplinary. It is true that within this paradigm, the same issue is dealt with in different subjects,

but as the teachers do not integrate their work with that of their colleagues, eventually the project is made of small pieces without connection between the topics. For the land valuation teacher 2, the need for interdisciplinarity in surveying had been a main concern during the Change. He explains this clearly in two different speaking turns:

2	land valuation teacher 2	<i>To me the interdisciplinary project is something interesting but not what I meant. When I asked about the interdisciplinarity during the workshops it was because the students' competences should be transversal and not only sectorial. In the interdisciplinary project I teach subject x, you teach subject y, etcetera. So the student understands that s/he has to study x, y, and z, but finds no relationships between them</i>
8	land valuation teacher 2	<i>Land valuation is an interdisciplinary subject. If you don't connect all disciplines, when I ask questions to students I see that my subject is not transferred to the other subjects. A surveyor must have a holistic vision. [...] If we explain our subjects separately we don't give them the possibility of deepening their understanding</i>

Although the teacher suggests common lessons to overcome multidisciplinary, the role of workshop assistants should be key, as they could liaise the different technical subjects, thus giving the students an holistic view of the project and of surveying. The second problem is that the workshop assistants are not connecting the diverse technical subjects, the main reasons being their turnover and lack of experience. Concerning turnover, says the land valuation teacher 1:

18	Interviewer	<i>Talking about coordination, how are you managing with the other teachers?</i>
19	Land valuation teacher 1	<i>If I have to be sincere, so far I haven't cooperated with the other teachers or exchanged information. There hasn't been any connecting work from the workshop assistants because they have already changed twice since the beginning of the year. At the end of the year the appointed workshop assistant should return, and I count on her support</i>

The same concept is repeated by the topography teacher.

31	Interviewer	<i>So it is a problem the fact that the workshop assistants always change</i>
32	Topography teacher	<i>Yes, we said that from the beginning</i>

Moreover, for other teachers the workshop assistants are not of help in connecting the subjects because they do not have the necessary experience to do so.

29	Interviewer	<i>You said that a drawback you are observing this year is that the workshop assistant is not the professional that coordinates the interdisciplinary project as we had planned</i>
30	Design teacher 2	<i>Don't get me wrong, this is for structural reasons because they have lacked in continuity. Perhaps this is because it's their first experience with this, and they have to build a role which is not yet well defined</i>

For the land valuation teacher 2, to be useful, the workshop assistant should have a long-standing professional experience.

19	Interviewer	<i>We thought that the workshop assistant was the figure to connect the subjects. How do you see it?</i>
20	Land valuation teacher 2	<i>It is hard for me to understand the function of the workshop assistants. I don't know what they can do, and the only time I worked with a bright workshop assistant, even though I felt uncomfortable, was with xxx. He was older than me</i>
21	Interviewer	<i>It seems like you're saying that a workshop assistant with a simple diploma is not prepared enough</i>
22	Land valuation teacher 2	<i>It is not a matter of preparation, but xxx has worked in private practice, and knows better than me how to perform a task. If during the lesson I am talking about something, he immediately connects it to practice. My present workshop assistant just keeps silent</i>

The third issue with the interdisciplinary project is that it causes a heavy workload for students, as pointed out by the topography teacher in speaking (no. 52) above and below:

80	Topography teacher	<i>At the moment I think that the students see the interdisciplinary project as a heavy job rather than an opportunity. I explained them and the parents that their two Grade 5 classes are good classes, hence we do more than what we normally do because we understand we can expect something more</i>
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The land valuation teacher 2 is one of the most sceptical about the interdisciplinary project; he joined the workshops only in the follow-up. Although he believes that the interdisciplinary project is a burden, it will not be a waste of time.

22	Interviewer	<i>Do you see an added value in the interdisciplinary project? Or is it just a burden for the students?</i>
23	Land valuation teacher 2	<i>Surely a burden. There should also be an added value, I hope to find it at the end of the year. At the moment I find the subjects so compartmentalised and I don't see it. I should check it at the end whether it has been a waste of time, but I don't think so</i>

5.3 The Interdisciplinary Project in the Eyes of the Workshop Assistants

In this section, I will illustrate the results of the interviews with the workshop assistants. During the Change Laboratory workshops, their role was defined as essential in connecting the technical subject matters around the common project, and at the moment of the interviews, this is the gap to be filled. However, the two workshop assistants interviewed were not working in the institute the previous year and therefore they did not participate in the Change Laboratory workshops. Similarly with the teachers' interview, I will present a selection of the two workshop assistants' interviews according to characteristics, potentials and risks. In one interview, the workshop assistant did not give consent to be recorded, and therefore, I had to write the answers directly on paper. The other interview was regularly recorded and later transcribed for analysis.

5.3.1 What Are the Features?

Firstly, a difference between the interdisciplinary project and projects regularly carried out in the school is that the interdisciplinary project connects the subjects and makes them real.

4	Interviewer	<i>What is the difference between a regular project and the interdisciplinary project?</i>
5	Workshop assistant 1	<i>When I was a student in this school there was no interdisciplinary project. I think it is a good thing both for design and construction, as you put together everything you have studied. For land valuation for example, how do I apply it? You also sum up topography—I remember that when I was studying here we only did a survey once, and it was in the school corridors</i>

Workshop assistant 2 substantially agrees by explaining in detail how the interdisciplinary project connects subjects through real problems:

7	Interviewer	<i>You already worked in this school, what is the difference between this interdisciplinary project and the other projects?</i>
8	Workshop assistant 2	<i>The students go beyond simple tasks like designing a townhouse. For instance, in topography they are confronted not only with surveying in the field, but also with the procedure for data insertion into the Real Estate Registry. With subjects such as land valuation and geopedology, they deal with the context of public and private green areas, therefore the project becomes interdisciplinary. As their teachers from Grade 3, we observe that students find it hard to connect the technical subjects. For example, during a lesson of Land Valuation, if I ask a question related to another topic, for example if they had the permission to build, they remained silent. It is true that the permission to build pertains to Design, but all the technical subjects are intrinsically connected. This project is good because it will improve their mind-set</i>

With the interdisciplinary project, the students are forced to get real.

8	Interviewer	<i>How do you think the students see the interdisciplinary project?</i>
9	Workshop assistant 1	<i>I think they would like to be free from regulations and use their innovation. However, the need to be real is part of the project, we pretend that the project will be really built and not be Walt Disney's castle, therefore they must consider the regulations</i>

Another characteristic of the interdisciplinary project is that although it does reflect the demands of the surveying industry by focussing on group work, the students are not used to cooperation.

11	Workshop assistant 1	<i>In design they were divided into groups and each had a specific role. To say it better, the general idea of the project was shared while the single tasks were divided between the components. During the evaluation of the students' work, the subject teacher and I figured out that the group work had vacillated, which is natural for young people. If I write the technical report and you draw the blueprint, I can't tell if you are making mistakes</i>
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5.3.2 What Are the Potentials?

One of its potentials is that it will increase employability and be useful for both university and working life.

2	Interviewer	<i>What do you think the interdisciplinary project is?</i>
3	Workshop assistant 1	<i>It is the most useful thing, because you put together all you have learnt in previous years in an overall project that recalls all the subjects in a practical fashion. This is very good for working life and even university</i>

Workshop assistant 2 agrees with their colleague's conception, stating:

1	Interviewer	<i>How would you define it?</i>
3	Workshop assistant 2	<i>An interdisciplinary project, a project that prepares the students for working life</i>

The interdisciplinary project has the potential to increase the enrolments in the school, provided it deals with an up to date object. In doing so, it has a transformative potential of the curriculum aligning the course with the market needs.

14	Interviewer	<i>Do you see any contribution from the interdisciplinary project to a possible increase in the number of enrolments?</i>
15	Workshop assistant 1	<i>I think that the parents' priority is to choose a school that provides working opportunity for their children, so the interdisciplinary project helps to confront an interconnected real problem. Concerning the increase of enrolments in surveying, although the interdisciplinary project doesn't change the way the school is seen outside, it can be of help for the students' working life. During open days parents ask if surveying can make their children employable, as they observe that no new building is under construction now. We reassure parents by saying that surveyors are still in demand and can be employed in municipalities. Perhaps an interdisciplinary project on restructuring an old building would be more up to date. We should think about something to increase the enrolments, something that is currently happening and which parents hear about on the news</i>

As it is something practical, the interdisciplinary project can promote inclusion among low achievers.

16	Interviewer	<i>Do you think that the students work differently compared to regular lessons?</i>
17	Workshop assistant 1	<i>I don't know, I see them only during the workshops, but as the project is something practical, even the students who normally struggle are happy to work</i>

5.3.3 What Are the Challenges?

Firstly, the students' workload is not considered excessive for the workshop assistant 1.

6	Interviewer	<i>Do you think the workload of the students is adequate?</i>
7	Workshop assistant 1	<i>At the moment I only see a part of the interdisciplinary project, I don't know what was done before I arrived. I think that the workload in construction and design is adequate, but don't know about what occurred in topography before I arrived</i>

The following excerpt of workshop assistant 1, likewise 7 above, emphasises the workshop assistants' turnover.

12	Interviewer	<i>What do you think about the role of workshop assistants in the interdisciplinary project?</i>
13	Workshop assistant 1	<i>I don't know what to say. It is the key figure as it is interdisciplinary. It was hard for me as I am newly employed and couldn't follow the project since its beginning</i>

The same account was given by workshop assistant 2.

1	Interviewer	<i>How would you describe the interdisciplinary project?</i>
2	Workshop assistant 2	<i>It is something very useful for students. However, I was thrown in this situation, the idea was already there when I came</i>

According to this testimony, Workshop assistants feel subordinated to the subject's teacher. As such, it is up to the teacher to decide what to do in the lesson and designate the workshop assistant's role. This relationship undermines the role of a Workshop assistant to act as a connecting element between subjects.

20	Workshop assistant 1	<i>The interdisciplinary project is carried out only in certain specific subjects, in other subjects the teacher explains and the workshop assistant remains seated. The teacher has the last word and decides when to proceed with the curriculum</i>
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The same problem is identified by Workshop assistant 2 who proposes to allocate specific time to deal with the interdisciplinary project holistically.

9	Interviewer	<i>How would you describe the role of workshop assistants in the interdisciplinary project? What problems are you facing?</i>
10	Workshop assistant 2	<i>The role of workshop assistants could be key, the problem is that it is not structured well</i>
11	Interviewer	<i>It should act as connecting element as you assist each technical subject</i>
12	Workshop assistant 2	<i>I am always there in all technical subjects. The problem is that during my hours I cannot deal with the project from a interdisciplinary perspective. If the teaching hour is topography, we only talk about topography; if the teaching hour is design, we only talk about design. I suggest organising the workshop assistant's teaching hours differently. For example, an afternoon dedicated to check the whole interdisciplinary project. We need to allocate a weekly hour specifically for the interdisciplinary project</i>

This activity would be badly needed as students do not see technical subjects as interdependent.

21	Interviewer	<i>How do you think the students see this interdisciplinary project?</i>
24	Workshop assistant 2	<i>They get involved but cannot understand the importance of this. They don't see the overall project, but only bits. For instance, they know they have the deadline with the Design teacher and only think about design. [In design] they don't wonder about the green areas outside, if the trees can resist the climate, therefore don't ask these questions of the land valuation teacher. They think that the school is like this, and study the subjects as discrete areas</i>

5.4 The Interdisciplinary Project with the Class a Students' Eyes

This section and the next identify the characteristics of the interdisciplinary projects for the students of Grade 5 A and B classes. The outcomes of the two focus groups are kept separated as the interdisciplinary project was carried out in a slightly different way. Although there are similarities—both analyses point out features of the interdisciplinary project such as group work, real tasks and connection between technical subjects—there are also significant differences. For example, while class A deepens the features of the interdisciplinary project, class B emphasises its future possibilities and challenges. In both classes, the respective Design teacher was present during the focus group, and took part in the conversation with their reflections, with the aim of explaining to students why some choices have been made. I believe it is important to report these reflections in the focus groups so as not to lose the context where they had been made (Ravitch & Carl, 2015). Two teachers participated in the discussion with the students: Design teacher 3 for section A, while Design teacher 1 for section B.

In class A during the analysis, I could only find features of the interdisciplinary project.

Firstly, a student defines the interdisciplinary project as group work.

37	Student	<i>It is a group work where we work to build and design a public building, in this case a canteen</i>
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The Design teacher 3 explains why group work is particularly important in surveying.

69	Design teacher 3	<i>[...] Working in groups is important nowadays. As the surveying profession is so articulated, it is hard for a practitioner to have all the competences needed: structure, design, surveying, plants, energy saving. Hence group work seeks to put together all the competences needed to carry out tasks effectively. Group work is not easy and we should learn it; we are not used to it, especially myself. Sometimes I see that only one or two students in the group are working, they all don't work with the same pace [...]</i>
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The main concern for teachers is a fair division of labour. Even though the groups are small (only 3 components), some students get involved and may work alone while others could loaf, thus making the evaluation difficult.

80	Design teacher 3	<i>This creates issues for the evaluation, since it is hard to evaluate the single contributions in the whole project, I can only have a rough idea on who did what and mistakes. However, during group work it is important to understand that what counts eventually is the group, and there is the good or the bad for all</i>
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This testimony below shows how measures have been taken to improve collaboration and thus the quality of the final project. The teacher explains very well how he organised the work and what it means to group work.

106	Design teacher 3	<i>I believe there has been good group work, since I organised it so that everyone had first to make an individual proposal, thus preparing the best solution. Only after having seen the individual works did I form the groups. Within groups you had to find a synthesis and this must have triggered discussion, I don't think you just drew. The final project you made were all different from the initial projects. It is obvious that you later divided the tasks between the group members, since group work doesn't mean drawing one line each on the same sheet. Group work consists of studying together the problem, only then each group component performs a certain task</i>
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One student finds it hard to cooperate.

70	Student	<i>I believe that group work has been an issue rather than a help. Because our competencies more or less are the same, in group work it is difficult to coordinate our effort, find common ideas, arrange tasks. If we had worked individually we would have carried out the project better and in less time</i>
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Other students seem not to agree with this statement.

117	Student	<i>[...] Concerning the organisation, the teacher made recommendations: look at the trees, compare, help each other. We worked together even during the workshops and found the errors of our colleagues. [...] It is clear we are not so confident on group work, but ...</i>
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Later on, the same student of speaking (no. 70) wants to explain better what he meant:

128	Student	<i>I wanted to say that if we had presented projects alone we would have lacked details. We put together more minds. For example, I say one thing, and my colleague says "Yes, but we could also add this" I couldn't arrive on my own. Eventually the project has come out better, comparing ideas comes natural, so group work has been a positive thing</i>
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And another student contends:

174	Student	<i>Speaking for my group, I believe there has always been good dialogue. One component would modify a detail, and immediately send an email to classmates asking them to check it. There has always been sharing both a school and at home by telephone. This is key because we cannot do things alone</i>
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Second, the interdisciplinary project involves various disciplines and is more real, thus giving a holistic understanding of surveying.

47	Student	<i>It is a work by project</i>
48	Design teacher 3	<i>It means that it is a work we perform in a wider area of interest by involving more disciplines</i>

56	Student	<i>In doing so, it is more complete, we look at all aspects contemporaneously</i>
57	Interviewer	<i>Or one after the other</i>
58	Student	<i>Yes, but we take into consideration all aspects</i>
59	Student	<i>It is more realistic</i>
60	Interviewer	<i>Ah!</i>
61	Student	<i>Because in working life this will be the way. If we had to build a self-service, first we would make the survey and see the arboreal species, then present the project to the client. It involves more disciplines</i>
63	Student	<i>I think it is useful to understand what we are doing at school, to carry out a project "touching on" all the technical disciplines</i>

For the Design teacher, the aim of the interdisciplinary project is to also acquire a holistic understanding of surveying.

208	Design teacher 3	<i>Regardless of the interdisciplinary project, we arrive at Grade 5 with a complex level of understanding of design. But the fact of needing to involve the other disciplines, as you said before, makes you better understand [the whole of the surveying]. For example, if you make a project you must know the area, it is not enough to have a glance on Google maps. You must be aware of the surroundings, the trees, the driveability [...]. [With this interdisciplinary project], we became aware of many things that you deal with when you really work. It is less theoretical and more practical</i>
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Third, the interdisciplinary project promotes competence-based education:

67	Interviewer	<i>(turning to the teacher) What do you think? Did the students say it right about what the interdisciplinary project is?</i>
68	Design teacher 3	<i>I think that the students answered well enough. However, what we want them to understand is that to carry out a project, a vast array of competences are necessary: not only competences given by one discipline but wide competences</i>

With the words of a student:

206	Student	<i>Compared to previous years, there has been a leap forward which has been difficult for us. Until last year, we were used to design a little home, or to design a detail without seeing the whole. This year has been much more challenging but also more interesting because we dealt with diverse subjects in reality. We touched with our hands the whole process. Instead, the previous year we carried out the project of a home, but the area was seen on a photo, some topics were not dealt with and eventually it was theoretical</i>
208	Design teacher 3	<i>[...] In Grade 5 there is more complete work as you summarise the competencies acquired in diverse subjects, and we deepen the topics we have dealt with in previous years</i>

5.5 The Interdisciplinary Project with the Class B Students' Eyes

Unlike Class A and similarly to the interviews to teachers and workshop assistants, during the class B focus group's analysis I found the features of the interdisciplinary project, its potentials and challenges.

5.5.1 What Are the Features?

The first characteristic of the interdisciplinary project is that it is a real project connecting the various technical disciplines.

13	Student	<i>The interdisciplinary project is an activity sufficiently concrete where we connect more disciplines, and for each discipline we carry out a specific function. We regard the overall outcome as positive, even though we would have needed more availability from the teachers, for example for a more accurate survey</i>
14	Design teacher 1	<i>Please say your opinions ...</i>
15	Workshop assistant 2	<i>What do you think it is the difference between a normal project and the interdisciplinary project?</i>
16	Student	<i>We can understand the relationship between disciplines, they are not isolated. For example, in design we understand the relationship between structures and the environment</i>

22	Student	<i>Interdisciplinary means that it concerns all the subjects we deal with at school. Let's say that it concerns technical matters hence topography, design, land valuation, management of the building site. It doesn't deal with literature and English</i>
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The students make two examples on concrete tasks they had to cope with.

25	Interviewer	<i>Is it more concrete than another project?</i>
26	Everybody	<i>Definitely!</i>
27	Interviewer	<i>How is it more concrete?</i>
28	Student	<i>This time we have used a real lot and not an invented area. We should have surveyed the field, and now we are finding issues with the sewage system, landscape and historical binds. In sum, we have bumped into a whole host of problems that we wouldn't have found in an invented lot</i>
29	Interviewer	<i>So would you say it's a realistic task?</i>
30	Student	<i>Yes</i>
31	Interviewer	<i>Can someone make another example of project concreteness?</i>
32	Workshop assistant 2	<i>Please speak up!</i>
33	Student	<i>For example, we dealt with the public bodies, we had to write the reports according to their criteria. This isn't school stuff but concrete things that one day we could deal with as professionals</i>

Also for the Design teacher, working on practical problems has a positive impact on the students:

153	Design teacher 1	<i>I did that and I must say that in my subject it is possible and positive, because students touch with their hands the reality of concrete needs. Indeed they have grown to be able to do more than just dealing with a small house</i>
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Secondly, the interdisciplinary project is characterised by group work, which is a positive experience.

167	Student	<i>Group work is useful, because there is a lot of work in structuring a metrical computation. One individual alone wouldn't perform it in one month, not even by working night and day</i>
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186	Student	<i>Group work is essential because we can compare our ideas and sometimes we confront each other</i>
190	Student	<i>Even confronting with a classmate because he is late, at the end we always arrive at a solution, but we must think it over. If you don't think when you do group work you don't go anywhere, so group work is positive</i>

5.5.2 What Are the Potentials?

Since the interdisciplinary project entails real problems and is based on projects, it is useful for both university and working life.

34	Interviewer	<i>Do you think it may be useful for working life or even university?</i>
35	Student	<i>For the modality [it is delivered] also the university, because the projects assigned on CAD, subdivisions, etcetera have roughly the same size [at the university]</i>
36	Student	<i>[It is also good for] working life, for example the evaluation of the state of works and the metrical computations. If you want to become surveyor you deal with a lot of them, the interdisciplinary project can therefore serve to understand how to do them</i>

Group work is also recommended by students since it provides preparation for working life.

182	Interviewer	<i>What do you think about the fact that 20% of your final mark will come from your ability to do group work?</i>
183	Student	<i>Interesting</i>
184	Interviewer	<i>Everything starts from the previous year and the flipped classroom, do you remember?</i>
185	Student	<i>It makes sense. In working life, apart from the small private practices where you do many things, [group work is necessary] if you work in bigger private practices. As we saw last year, you deal with specific things and always work in groups</i>

Third, the interdisciplinary project changes the relationship between students and teachers, as it was a work relationship.

296	Student	<i>I would like to connect with the question you made at the beginning on the differences the way teachers behave compared with Grade 3 and 4. Indeed I have noticed more collaboration. While in Grade 3 and 4 we were given a standardised task: "this is the house and the square metres", here we have more freedom and when we go for revision it's more like a conversation</i>
297	Researcher	<i>[Are you saying that] the teacher acts as tutor?</i>
298	Student	<i>Exactly! I give him my ideas, and he answers with other types of solutions as if it was a work relationship</i>

This relationship requires the teacher to mentor the students and provide a formative feedback.

5.5.3 What Are the Challenges?

The first of the issues I detected is that the interdisciplinary project can be hampered by the lack of teachers' participation. Likewise in speaking (no 13 and 28) above, and in the speaking turn below, the students regret it was not possible to survey the field because their topography teacher had not yet started his programme connected with the interdisciplinary project.

20	Student	<i>We went on the site but left the work unfinished. Topography provides the base for design, and only then we should have started the project by designing the blueprints and more</i>
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In other words, the coordination between Design and Topography has not worked. This outcome is admitted by the Design teacher:

116	Design teacher 1	<i>There has be the willingness from everyone to get involved in the interdisciplinary project. For example the street project to make a road in the mountains is 30 years' old. Here we live on a plain, therefore it would be better to design an underpass or round about connected to the interdisciplinary project instead of an abstract street project</i>
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Nevertheless:

145	Design teacher 1	<i>After all we did our job. I believe that at the end of the month we will see nice works. Unfortunately, the project hasn't been shared as much as we had agreed</i>
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Moreover, the same topography teacher joined in two months after the focus group, and finally, the students went for an accurate survey of the lot. Connected to this there is the risk that as the teachers not involved proceed with their programme and projects, the workload for students could increase.

85	Student	<i>This project is interesting, but as it does not cover all disciplines, the teachers who aren't involved create other things and we end up with a massive workload</i>
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112	Student	<i>From January, we have to prepare the essays and the project of street topography</i>
113	Student	<i>With the subject Management of the Building Site we are running yet another project</i>

These issues, however, call for better sequencing and coordination between teachers. Another risk is that the interdisciplinary project is considered by teachers as complementary to the regular curriculum. This perspective results in more work being distributed rather than space being given for students to reflect on how they can improve their skills. In other words, instead of considering the interdisciplinary project an ideal corollary, the competence-based interdisciplinary project ends up by competing with the knowledge based curriculum.

86	Student	<i>We also must consider the teachers' workload because they must complete their programs and simply cannot dedicate sufficient time to both the curriculum and the interdisciplinary project</i>
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In this regard, the students suggest that the interdisciplinary project should be run continuously throughout the school year as a common and main objective:

148	Student	<i>The initiative is good but should be carried out throughout the whole year. It shouldn't be an additional burden and the program should be simply adapted to it</i>
149	Interviewer	<i>That's what we had decided during the Change Laboratory</i>
150	Student	<i>It should be something where every teacher works on the same project. For example, last year there was a contest for an important brand making printers, and 6 or 7 students in our school took part in the contest, together with other schools</i>
151	Workshop assistant 2	<i>I remember I was there, it was 2 years ago</i>
152	Student	<i>We were on Grade 3, and the students from other schools who were there said that they had prepared the project throughout the whole year and had adapted the subjects to that aim</i>

Talking about connecting disciplines, the students recognise the key role of the workshop assistant but also the challenge of fully exploiting such a role.

101	Interviewer	<i>Do you think that teachers are working differently in this interdisciplinary project? Perhaps the workshop assistants are working differently?</i>
102	Student	<i>The presence of workshop assistants is important to connect design, topography and land valuation. This is because they participate in each subject and have an eye on the whole situation</i>
103	Interviewer	<i>Is such coordination functioning?</i>
104	Workshop assistant 2	<i>It's not possible unless the workshop assistant is given one teaching hour in the morning or in the afternoon to see the project from a 360 degrees' perspective. We already look at the project but in relationship to design, and we can only see that part. In land valuation the same, while in topography there are bigger problems. The workshop assistant should have their own space, even one hour per week would be enough</i>
105	Student	<i>At the beginning, we were told that some mornings would be dedicated to oversee the project on all appropriate subjects, but this never started. It would have been interesting</i>

When I conducted these interviews, the interdisciplinary project was already running in the two Grade 5 classes. From a CHAT point of view, a potential germ cell, the interdisciplinary project, had been developed into an object and a running activity. This chapter has displayed how the object has been enriched in its practical arrangements, while also positing how it is a multifaceted and contested living entity, which is never established once for all, but it is continuously negotiated by the community (students and teachers mostly) who are working in that activity. The students' perspectives involved in this interdisciplinary project, as well as the teachers and workshop assistants' point of view, with its features, potentials and challenges

were summarised with the help of a diagram that is available on Appendix B. The next chapter will show how this diagram was discussed and vetted with the people involved in the interdisciplinary project during a follow-up workshop.

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