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VET as transformative, collaborative research: Cross self-confrontation, dialogical artefacts, and the development of organizational dialogue in a Swiss factory

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Abstract

In this article, VET-related collaborative research is discussed as a potential transformative experience for workers/work collectives/work organizations. Three main ideas in the creation of dialogical frameworks for collaborative research are presented: (a) Vygotsky's research focus on provoking development in order to study it (Vygotsky, 1934/1986); (b) Oddone's ideas on close collaboration with professionals in 'associated research groups' to understand and develop work experience (Oddone et al., 1981); (c) Clot's psychological concept of activity (Clot, 1999), which includes both 'realised activity' and 'real activity.' The methodology of cross self-confrontation (Clot et al., 2001; Kloetzer et al., 2015) is based on collective work analysis, thanks to the interplay of two activities – observation and dialogue – within various contexts and for different addressees. Carefully edited video recordings, which we call here 'dialogical artefacts,' support this activity of analysis and transformation. This methodology aims at triggering individual thinking, collective elaboration, and rich institutional discussions, with the goal of transforming everyday work organisation. The paper presents a recently completed research project in a Swiss factory, on knowledge transmission and the training of expert workers. The production of films as dialogical artefacts, and their effects in the research and factory, are discussed. In particular, the collaborative research process shows a transformation of the topics and style of dialogue across hierarchical levels.

Keywords: activity analysis, activity development, cross self-confrontation, collaborative research, dialogue

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Introduction

This paper discusses how a VET-related research in a Swiss factory company, based on a collaborative approach to work analysis through the methodology of Cross Self-Confrontations (CSS), may serve as a transformative experience, potentially triggering the development of individual thinking, collective elaboration, as well as organizational transformations. It will be argued that these transformations happen through the joint-exploration (by practitioners and researchers) of alternative dialogical spaces, which are created and animated for the needs of the research process, but which aim at supporting a multi-dimensional view on development.

In the first part of the article, I will introduce the context and the object of the research, as well as the CSS methodology on which it is based. I will provide a brief overview of the historical relationships of work analysis with vocational or professional training and work transformations, as well as introduce a sociocultural view on expertise.

The second part of the article will be dedicated to a reflection on the dialogical frames implemented in the research process, with a specific focus on the video artefacts that are constructed and used during the research process. This reflection will be drawn from empirical data collected during the research process. In particular, I will show how the collaborative research process aims at supporting a transformation of the topics, objects and style of dialogue across hierarchical levels.

In conclusion, I will come back to the construction and function of video films as dialogical artefacts materializing continuing controversies and multiple perspectives on key work issues, and discuss how transformative research may be facilitated by a more conscious use of the emotional as well as analytical power of these artefacts.

A VET-research in a files factory: transformative perspectives

Context of a collaborative project: *'a file, it's a long story'*

Visiting a factory manufacturing files with its Human Resources Director, I discovered with great interest (but no real surprise, as industrial processes are always extremely rich and fascinating, as my colleagues working on work analysis, VET training or learning in the workplace well know) how complex the manufacturing process of this object was. Even the smallest, expandable nail files required more than 30 production steps and numerous controls – not to mention both robust and sophisticated tools for blacksmithery, forestry, skiing, jewellery or surgery. The number of different file references was enormous, defying both imagination and the rationalization of the production process. These

perfect, distinct tools were manufactured by experienced, specialized and highly-engaged workers on home-made, historical, powerful machines and, according to the HR Director, with long-lasting concerns and difficulties related to knowledge transmission. The world-renowned quality was dependant on embodied skills, whose acquisition was also significantly exceeding the training attempts of HR. Discussing CSS methodology, of which the HR Director was already aware, we explored its potential for the current situation. The first idea of a joint research project was launched, called: *'a file, it's a long story'*[1], a title capturing both the complexity of the production process and its social meaning for the local industry. This research project was discussed with diverse stakeholders in different contexts (informal and formal discussions and presentations with the board of directors, with the managers and field workers from different units, and with staff representatives). These preliminary discussions also informed the research team of the internal background of the research at the factory, as well as of the usual dynamics of communication, decision-making and dialogue. We decided to focus our efforts on a specific category of workers, who exemplified expertise in the sense of mastery of complex, embodied skills: the 'setters'. These expert workers are in charge of preparing and setting the machines. They are also responsible for the quantity and quality of the production for a subset of machines. The research project was finally established at the crossroads of the diverse but joint interests and concerns of these different stakeholders with two joint research questions: How do expert setters maintain high quality production? How to innovate in the transmission of expertise in the factory? The research project was then funded by a grant for innovation from a local foundation, which did not interfere with the objectives or proposed methodology of the research.

From the beginning, this research project can be considered as collaborative, in the sense that its goal, object, and method, have been jointly defined by the researchers, management and the field workers. In French-speaking ergonomics[2], the concept of *command* designates how the problem is expressed from the perspective of management in the interaction with the researchers: this is the request for intervention, which is usually the entry point of the research project. The concept of *demand* refers to how the command might appear from the perspective of the field workers, or how the field workers themselves (re)define the problem/question with the help of the researchers (see for example Daniellou, 1995, 2005). Of course, these two perspectives on the definition of the problem might largely differ, therefore *the dialogue between command and demand* is one of the first tasks of the researchers. The expression of a demand considered as *true enough* (expressed by workers in their own terms without pressure from the management) is the necessary bedrock of any intervention in activity analysis, which could not proceed without it. Here, this dialogue included two parallel discussions: one was on the ethical engagement from the research and man-

agement team on how the data and results of the research process, especially video films, were to be used. We contractualized who would have access to them, how they would use them, and whose property the data was, at all steps of the research process (covering rushes, working films, final films, and other final products like scientific papers). The key concern of the researchers[3] was mostly to preserve the confidentiality of the data collected and to give the workers full rights to decide what to show and what not to show to their colleagues, managers, and directors, as well as to preserve their own freedom and independence as researchers. The second discussion was on the boundaries of the expertise, and explored which kinds of files were the most interesting for this limited analysis. It introduced the complexity of work experiences and processes into the construction of the research process. Following this discussion, a group of 6 volunteers (5 expert setters, 1 novice setter) was created. One of their first choices was to decide which types of files to analyse. The setters selected them according to the type of carving, as comparisons across types of files were considered confusing.

The larger organizational context leading to the possibility of a collaborative research project on the transmission of professional expertise deserves consideration. It is linked to the renewal of the Direction Board (new CEO, new HR director, new production director), which led to a renewed perspective on the strengths and weaknesses of the production process, and the critical importance of workers' expertise in product quality. The HR director in particular was sensitive to the risk of loosing expertise when some workers retired after 20 years of experience (or more). She acknowledged that expertise was mostly constituted by tacit, embodied knowledge, with few written descriptions of work procedures and workers supposedly 'ill at ease' with written instructions. The research project was therefore part of the strategic plan of the HR director, supported by the production director, with aims at highlighting the critical importance of the employees' knowledge in the factory, and creating a 'knowledge centre' for internal vocational training. The HR and production directors were therefore interested in our concrete, unconventional and collaborative methodology for reflecting on workers' knowledge. The workers themselves were eager to 'give back' to the company what they had received, discuss and share their knowledge, and willing to engage into the research project.

Understanding the next steps of the research process requires a detour to present the CSS methodology in the perspective of the French-speaking tradition of research and intervention in the workplace.

Work analysis as a training tool and transformative experience in the Francophone tradition

Work analysis (de Keyser, 1991; Leplat, 1997; Ombredane & Faverge, 1955; Wisner, 1972) is an influential tradition in French-speaking ergonomics and

work psychology, under the label of 'activity analysis', which highlights a 'holistic' approach to work (Guérin, Laville & Daniellou, 1997). Conceptualizations and models of human activity deeply inspired by the works of Vygotsky and Leontiev have been integrated into an intervention perspective (see for example Daniellou & Rabardel, 2005; also Filliettaz & Billett, 2015, for an introduction to contemporary perspectives). Francophone activity analysis has been historically developed in tension with the rationalization of work triggered by Taylor's scientific management of work, and this original tension continues in its relations to work organization. I would like to highlight briefly three dimensions of this tradition: first, its relations to what has been recently called the practice approach; secondly, to social transformation; and thirdly, to vocational or professional training. This overview of some key dimensions of the activity analysis perspective will allow us to specify how Activity Clinic pursues and develops this activity analysis tradition.

Firstly, compared with the practice turn in social sciences (Nicolini, 2012), the cultural-historical psychology on which activity analysis is based jointly analyses the subjective, intersubjective and institutional levels. It integrates the subjective work experience with its social, technical, legal and economical context, thanks to input by the concrete activity of the workers and managers. Models of activity link the internal and external (material, interpersonal, organizational) dimensions (see for example Leplat, 1997, and some discussions on models of human activity at work summarized in Kloetzer & Clot, 2016). It can therefore not be considered as a purely institutional nor a purely individual analysis of the work process.

Secondly, since its conception, activity analysis has been oriented towards work transformation, as recalled by the title of a famous French ergonomics manual, '*Comprendre le travail pour le transformer: La pratique de l'ergonomie*' – (*Understanding and transforming work: The practice of ergonomics)* (Guérin et al., 1997). Therefore, discussing activity analysis from a purely theoretical perspective is tackling the problem upside down, as ergonomics defines activity analysis as *an action method*: it is primarily an intervention method, which aims at understanding the complexity of the activity of the workers to face the constraints of the work situation and at adapting the work organization to promote health (see for example Wisner, 1997). Command and demand jointly define the field of the intervention, and the intervention contributes to the understanding of the real work activity, supporting a re-definition of the problems, re-conception of tools, decision-making processes related to work organization, or vocational and professional training. Activity analysis pursues two goals, a *pragmatic goal* and *a scientific goal (*Pastré, 1999). According to Pastré (1999), the pragmatic orientation tends to answer the practical problem – for example, designing a system, increasing safety or improving training, whereas the scientific orientation is dedicated to understanding how this solution can be useful for other cases.

The scientific goal requires a generalisation process from one case to a category of cases that are considered similar on some dimensions. How these pragmatic and scientific goals are connected, how the intervention process and the research process are related, are both practical and theoretical issues.

Thirdly, the relationship between activity analysis and occupational training is twofold: numerous papers report how activity analysis brings real workplace complexity into occupational training (see for example, Durand & Filliettaz, 2009; Pastré, 2009) and adds a fine-grained understanding of occupational expertise in context, discrepancies between work organisation and work demands, as well as first-person reports of the meaning of actions. Conversely, vocational training may similarly trigger activity analysis, becoming an incentive to conduct activity analysis, which has a potentially transformative dimension on the whole system. However, what gets transformed by activity analysis depends on who gets affected by the analysis: the scope of the actors who are engaged from the beginning into the research process is therefore critical for its potentially transformative effects.

With this background in mind, we can now consider how activity analysis is performed in the Activity Clinic tradition, in order to support the development of the subject's power to act (Clot, 2008).

CSS as a transformative method: theoretical and methodological introduction

The CSS methodology (Clot, Faïta, Fernandez & Scheller, 2001) is an intervention and research methodology extending the French-speaking tradition of activity analysis and continuying the transformative Vygotskian project implied by historico-cultural psychology (Stetsenko, 2016). It was created by Yves Clot and his colleagues within the Activity Clinic team at CNAM (Conservatoire National des Arts et Métiers), Paris. It bears some similarities to the Change Lab methodology and Developmental Work Research of Yrjö Engeström and colleagues, which cannot be presented here, but are discussed by Kloetzer, Clot, and Quillerou-Grivot (2015). The CSS methodology aims at developing the power to act (Clot, 1999) of all partners taking part in the intervention. The power to act, inspired by Spinoza's work, is defined as measuring: '*the radius of effective action of the subject or of subjects in their everyday professional milieu, what is called the radiance of activity, its power of re-creation*[4] ' (Clot, 2008, p. 13). The CSS methodology is therefore defined as a method for action, with a goal of transformation, and as a method of research, with a goal of production of scientific knowledge. Transformation is possible thanks to clinical and developmental methodologies, which associate a careful and detailed process of work analysis within a structured dialogical framework. In CSS, an intervention fuses two tracks:

> The first track is focused on conducting a clinical co-analysis of the work activities with a group of volunteers. The detailed analysis of actual work activities with

> volunteer subjects, who constitute the associated research group, is the vital first step required to question the organisational procedures and requirements in a documented and constructive way. On the second track, this detailed co-analysis, jointly performed with the workers within the steering committee formed for the intervention, triggers and constrains the discussions between managers, workers, and the experts who design the work organisation. The clinical co-analysis with workers becomes a tool to transform the conditions of the dialogue at all hierarchical levels in the company. (Kloetzer et al., 2015, p. 51).

The research process strongly engages two ad-hoc groups of participants: On the one hand, there is a homogenous group of fieldworkers, here setters, who volunteer to investigate their way of working, and reflect on it collectively. Following Ivar Oddone (Oddone, Re, Briante & Clot, 1981), we call them the 'associated research group.' On the other hand, there is also a heterogeneous Steering Committee, composed of mixed profiles (HR director, production director, two line managers, one staff representative, researchers, later joined by delegates of the associated research group). One important step of the research process to bring these two groups to life, and to organize meeting points between them, which are important alternative dialogical spaces to the everyday work organization. In this article, I will argue that videos produced in the research process constitute dialogical artefacts, inasmuch as they generate professional explorations and controversies, which are then integrated into the design of these videos in an iterative, reflexive process.

The CSS methodology owes its name to its core step, which is a process of confrontation with one's own activity and the activity of others, and to the perspective of the others on their own and one's own activity. Confrontation with the alternative perspective of the other begins within the initial phase of the research, when researchers come to the workplace to observe the activity and interact with the workers. In comparison to observations conducted in ergonomic interventions for example, here the researchers attempt to place the workers in a position to observe their own activity (Simonet, Caroly & Clot, 2011). The confrontation process continues during the phases of interviews in simple confrontation and cross confrontation. In simple confrontation, the workers discover their own way of working with a renewed perspective, thanks to video recordings and the active presence and questioning of the researcher, who does not primarily attempt to understand but to make the workers *think* about their activity. In cross self confrontation, this is intensified by the presence of a colleague, who engages in a peer discussion. Thanks to detailed, concrete, observable traces of the work activity, the puzzle of the realised activity can be worked on through dialogue. The French-speaking tradition of ergonomics focuses on the *realised activity* (what is done by the workers to answer the demands of the situation, in relation to their official *task* – or mandate, Leplat, 1997; Ombredane, 1955). Yves Clot (1999) suggests to expand its concept to the *real activity*. The *real activity* is defined as the psychological activity of the subject, including what is done, but also what is not done and why, what couldn't get done, what should

be done differently, what is to be done again, etc. Therefore, the *real activity*, with its partly unrealized possibilities, has some transformative potential. In the methodology of CSS, some aspects of the real activity enter the public scene for potential debate, therefore highlighting this transformative potential. Expanding the power to act of the participants relies on structured confrontation, based on embodied experience, and dedicated to '*transform[ing] past experience into an instrument for dealing with future experiences*' (Clot, 2008, p. 148).

In summary, I argue that the early steps of the research process create a partly shared/joint investigation object – *a boundary object*, in the original meaning of Star and Griesemer (1989), which is here the exploration and transmission of expertise (or exploration through transmission, but also transmission through exploration…). Around this research object, collaboration is organized as a 'multi-party' process interlinking two different working groups: collaboration between researchers/management/trade unions/other relevant stakeholders within the steering committee; collaboration between researchers/workers within the associated research group. The aim is to improve collaboration between workers/management and other key stakeholders through the mediation of the researchers and partly shared research objects. The analyses and discussions going on in the associated research group thanks to the CSS methodology may then become resources for collaborative work in the Steering Committee, and for larger collaboration within the company.

Video recordings of all the discussions constitute the raw data that the researchers work on to construct short video films, which will support the reflection and discussion process in the steering committee. Discussing the role of these video recordings in the different discussion spaces opened by the research process will be the focus of the second part of this article.

Dialogical frames and dialogical artefacts in a developmental intervention

Video-supported reflections in a dialogical frame: videos as dialogical artefacts

The research process produces a lot of videos. Focusing our attention on videos helps us analyse the interplay between observation, analysis, dialogue and transformation in the research process. I will call 'chronotopes' (Bakhtin, 1978) specific spaces and moments of the research process in which the activities of observation, analysis, dialogue and transformation interplay through video-supported joint reflection. I will use therefore use the Bakthinian concept of chronotopes in a weak sense, to refer to changes in the spatial, temporal and social dimensions of the research, without integrating its symbolic dimensions which are critical in Bakthin's chronotopes within literary critics. Here I will

highlight how these chronotopes differ from one another, despite their shared function for stimulating thinking and the development of the subjects' power to act.

The key chronotopes of the research process are the simple self-confrontation interview (chronotope 1); the cross self-confrontation interview (chronotope 2); the meetings of the associated research group (chronotope 3); the meetings of the steering committees (chronotope 4); and the final presentation to all factory workers of the units in which the research took place (chronotope 5). They differ in the participants involved, the material and temporal settings, the goals and instructions set by the researchers, and they also trigger different speech genres (Bakhtin, 1986).

From the beginning of the research project (just after the early steps in which the research goal, method and process are discussed and defined) to its end, these chronotopes are characterized by a mix of video films and dialogues. The researchers deliver instructions on how to watch the videos, and instructions on the kind of dialogues expected in these situations. Regarding the videos, participants are encouraged to watch the video films carefully, following specific instructions according to the moment of the research. In the chronotope 1 (Simple Self-Confrontation interview), the participants are instructed to watch the videorecording of their own activity and react to what they see by commenting for the researchers, for example, by stopping the videorecording and telling the researchers each time they see something that surprises them, is interesting for them, or that they wouldn't have expected to do that way. In the chronotope 2 (Cross Self Confrontation interview), the participants watch two videorecordings, one for each worker. The workers are instructed to react to what they see by commenting the video of their counterpart, for example by asking questions or suggesting differences. Therefore, the instructions which define orientations on how to watch the videorecordings are simultaneously defining orientations on how to dialogue. This combination of the joint observation of the video with the specific orientation of a collaborative project and a well-defined dialogic frame, creates the specific dynamics of exploration and discussion.

The social perimeter varies a lot from one chronotope to the other: 2 people in simple self-confrontations, 3 to 4 in cross self-confrontations, 8 in the associated research group meetings, 8 to 16 in the steering committee meetings, 80+ for the final presentation meeting.

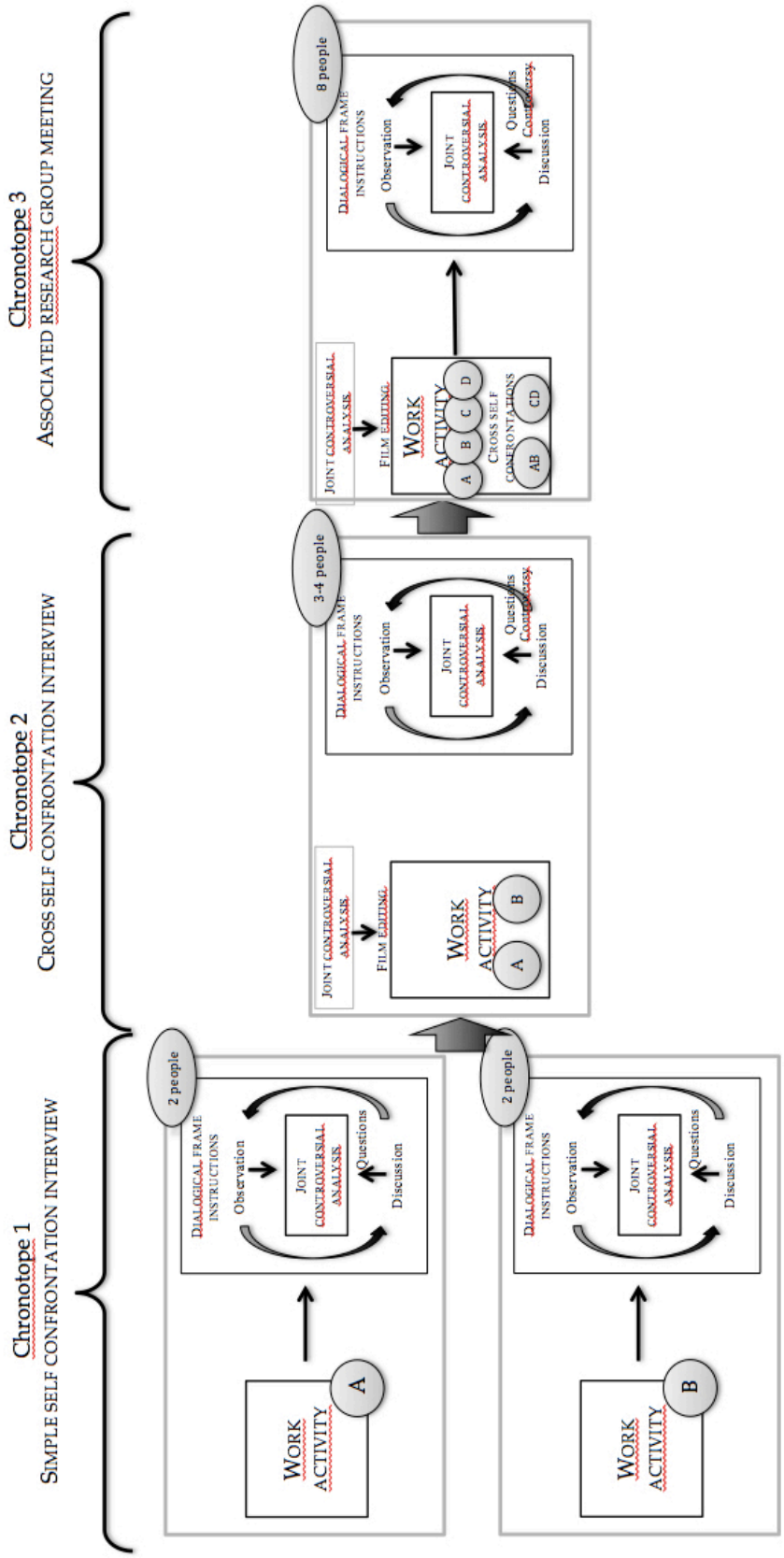
Of course, in this context, what is shown in the video films plays an important role in which kind of critical discussions the participants may engage. The video films are edited from the data collected in the research process: early on in the research process (for Simple Self-Confrontations), they represent only selected sequences of the work activity. The sequences are selected by the researchers, on the basis of the objects, goals and critical moments discussed within the associated research group, as well as on their own understanding of the

critical episodes in the field. Later in the process, they integrate sequences of work activity moments with sequences of dialogue in the simple and cross self-confrontation interviews. Together, they therefore present complex work situations and activities with perspectives on these activities expressed in dialogue. As the researchers do not look for immediate convergences, but encourage silent thinking and expressions of disagreement, alternative views, questioning, and even controversies, these perspectives may well appear multiple. Therefore, the video films present real work activities with dialogues commenting on these activities with a specific 'colour,' which is the colour of the joint efforts of investigation, exploration and analysis of the participants.

This process of edition, observation, analysis and discussion, is useful for the participants as it supports their individual and collective reflection on their work activity and organisation. It therefore serves action and transformation in the work situation. It also serves the scientific work. Conversely, the researchers gain an understanding of the work process – and of the nature of the expertise – through the direct explanations by the workers, but also indirectly through controversies emerging between experts, and between experts and their hierarchy, in these dialogical frames.

Looking at the nature of the video films shown in these situations, we can draw the following figure (Figure 1, p. 74–75). The carefully edited video films can be considered as 'dialogical artefacts', because they are designed with a strong focus, facilitated by the researchers, on supporting multiple and controversial perspectives on the same object. These videos, watched in a specifically and carefully designed dialogical frame, produce effects at the interpersonal level, as well as at the intrapersonal level: they 'fracture' established positions, by introducing other's perspectives within one's own; from a Vygotskian perspective, the dynamics follow the double law of development: from the interpersonal dialogue and controversy to the intrapersonal dialogue and controversy, in a repeated way, which might open new possibilities for interpersonal dialogue, collective understanding, and transformative action. Interestingly, the researchers insist on the 'working status' of the video films that are constructed and used in the research process: they are presented as 'movies for working with,' with little artistic ambition. This claim is important, as it gives these videos an open status: it is not something that can please or displease the participants, but a specific moment in the collective project of joint elaboration and innovation. However, these videos combine an analytic impact, which we have discussed above, and an emotional impact, which we haven't discussed yet. This emotional impact lies at the core of the entire analytical process by engaging the viewers. In the initial steps of the research, this emotional process is rather unrefined: it comes from the direct and usually critical engagement of the viewer with his own activity projected onto the screen. However, the more the videos have to be edited (in order to integrate a growing number of hours of

recordings in a limited format of around 15 to 30 minutes), the more they integrate multiple perspectives expressed in dialogue and display joint efforts of analysis, the more they reach people beyond protected circles, for example in steering committees and ultimately for the full audience of fellow workers, the more they combine an analytical impact and an aesthetic impact, for which the researchers are largely responsible.


Chronotope 1
SIMPLE SELF CONFRONTATION INTERVIEW
Chronotope 2
CROSS SELF CONFRONTATION INTERVIEW
Chronotope 3
ASSOCIATED RESEARCH GROUP MEETING
WORK ACTIVITY
A
B
2 people
DIALOGICAL FRAME INSTRUCTIONS
Observation
JOINT CONTROVERSIAL ANALYSIS
Questions
Discussion
JOINT CONTROVERSIAL ANALYSIS
FILM EDITING
3-4 people
C
D
CROSS SELF CONFRONTATIONS
AB
CD
8 people
Controversy

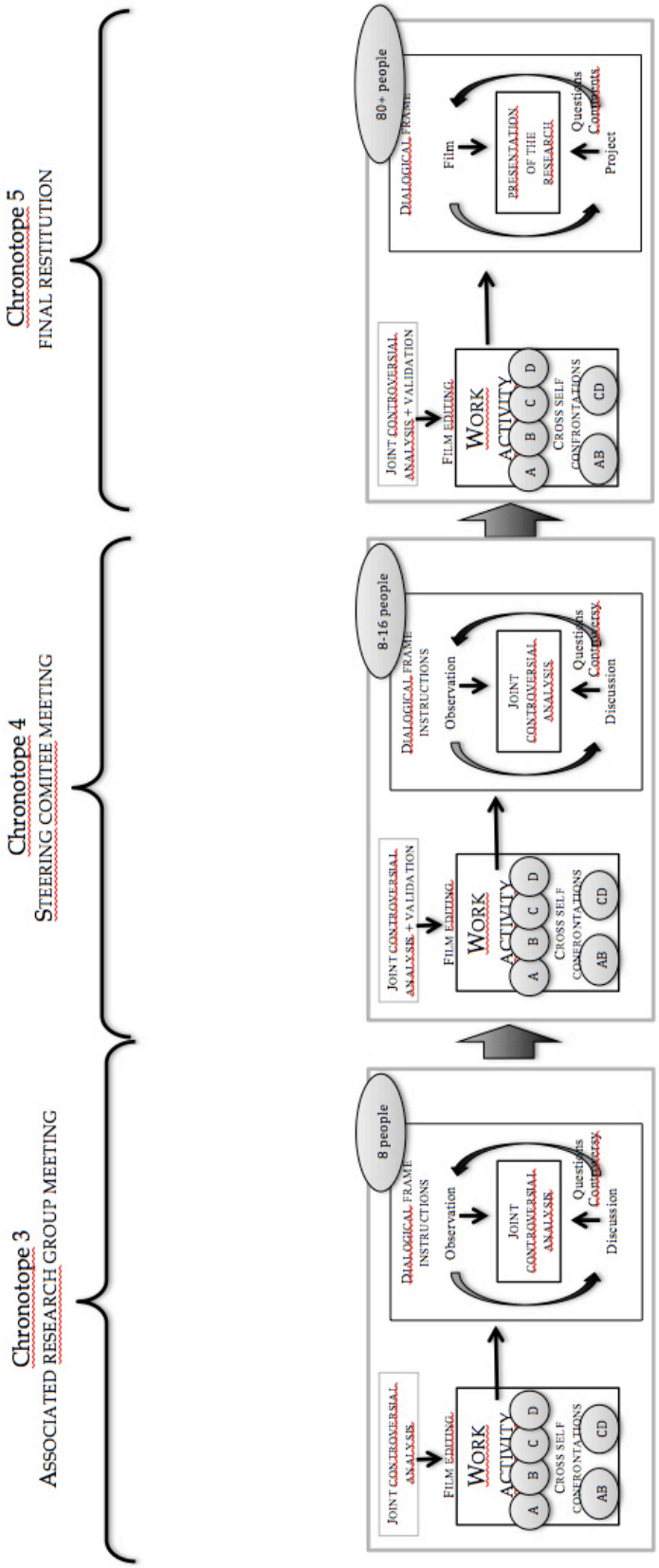


Figure 1. Chronotopes from the video films.

An example from our research data: multiple perspectives – and lost opportunities – on quality control

I will now introduce a short extract of our research data, to discuss what potentially gets transformed in the research process. After numerous hours of observations and analyses with the expert workers, the researchers finally decided to produce one final movie for each of the three big types of cutting (each of them being 20 minutes long), plus one transversal film dealing with recurrent organizational issues and the organizational competences of the workers to solve them (that one is 30 minutes). The discussion below happens after this film on 'organizational competence' has been shown in the final Steering Committee. This final Steering Committee was interesting, as all setters were invited to join. The goal of the researchers in inviting the whole associated research group to the Steering Committee was to expand the discussion across hierarchical levels. In this short sequence, we see that one expert setter takes the initiative of bringing back one issue that has been repeatedly discussed in the associated research group into this discussion space: the problem of coordination with the final quality control. His point is that the visual aspects of the intermediate product and of the final product are so different, that they cannot be compared. This implicitly means that his team cannot be expected to deliver products which will pass without default through the final quality control, because at that intermediate step, the workers cannot see the flaws that will become visible only later on, after the thermal treatment. His point is further developed in a complementary direction by another expert setter, who highlights the need for communication with the final control: what will finally be considered as a flaw is unclear, since the final margins of tolerances are not shared. We also see how the line manager supports the view of these two professionals, by using his personal experience of manager as an argumentative resource to confirm that the flaws cannot be visually detected before thermal treatment. At this point, the discussion could go in different directions: for example, (a) a challenging discussion could follow on how to detect these invisible flaws at an intermediary step; or (b) the expectations and tolerances of the final control could be made publically explicit and discussed. However, the production director engages in a partly consonant, partly dissonant talk. He firstly confirms that what the units do is the right thing to do, i.e. discuss with the final control, 'to know what is a flaw and what isn't a flaw', 'as well as the way in which to detect it as soon as possible'. However, he ignores the point put across by the expert setters and the line manager, according to whom there are different flaws that can be detected at different steps of the production process. The production director also explains the rationale of the current improvement projects to deal with this problem. Although his point is perfectly rational, according to a global analysis of the production, it doesn't address the issue introduced above: by saying that 'there's no point in continuing with the various operations, the thermal treat-

ment and everything, unless we repair it from the beginning' to avoid useless additional costs, his intervention does not address the problem of early recognition and treatment of flaws which are invisible at an early production stage. Sensing that the discussion does not fully address the main point, one of the researchers intervenes but also misses the opportunity to reframe the key question. Instead of discussing the invisible flaws, the researcher brings the discussion back to issues of communication. In this sequence, we finally see how the researchers intend to encourage the discussion on work organization, by defining the dialogical space as a protected and operational experimentation zone.

> Transcription of a short sequence of dialogue in the final steering committee:
>
> Setter 1: The final control has come back into discussion. The roughly carved lime and the finished lime have nothing to do with each other! There are always flaws.
>
> Setter 2: You also need to know about their tolerances regarding flaws.
>
> Line manager: Certainly, control testing at the end of the line, before and after thermal treatment, is not going to be the same. We realised this because if I need to do a test at the end of the line, and if I take someone doing the final control test, they won't see anything. It's two different control tests with two very different visions. Thermal treatment allows us to the see the flaws which aren't visible otherwise, undetectable at the end of the line. And that, those could be the scraps that are inevitable with this vision in mind.
>
> Production director: What needs to happen is what you're already doing, discuss the final control tests to know what is a flaw and what isn't a flaw, as well as the way in which to detect it as soon as possible.
>
> Line manager: Exactly.
>
> Production director: Maybe it's nonsense, what I'm about to say, but we include the defects in our final tally. We make allowances for these defects and it doesn't help the company much. It's better to catch the flaws from the very beginning, or to remove them. There's no point in continuing with the various operations, the thermal treatment and everything, unless we repair it from the beginning. But this is a big project to start working on, in my opinion it will need time but it will start falling into place.
>
> Researcher 1: What's interesting in the film is that you see different ways of discussing the final control test: there's a direct way, a meeting between the regulator and the final tester, there are discussions going on between the heads, the intermediaries in certain cases, the background checks which come into the discussion, it's not the final control test but it also has an impact on the quality. I find it interesting because it highlights different ways for thinking about this dialogue. Everyone knows that there's a discussion to be had, and feedback on the final control test to communicate upwards, and probably intermediary tests to do but how, it gives some direction as to how to start thinking about how best to do it. […]

This last intervention of one of the researchers opens a general debate, in which what to control and when gets discussed by the experts. They suggest controlling the pieces even before they enter their stage of production and discuss which flaws should be searched for in priority, and at which stage of production. The later discussion partly reconnects with the missed opportunity to discuss how to make invisible flaws detectable.

Despite its apparent inconclusiveness, the sequence displays the impressive engagement of all partners (expert workers, line manager, and production director) in a technical discussion on a problematic production issue. What gets transformed in this situation may be the way the different partners perceive each other's expertise on the production process; as well as the kind of dialogues that could happen in the company between different hierarchical levels, the objects of these dialogues, and the place of the partners in the dialogue.

This discussion was initially triggered by the film, which highlights various questionings of the experts on quality issues, through images of work activity, and discussions in simple and cross self-confrontations. The careful selection of the images which were finally presented to the Steering Committee reflects the discussions which happened earlier in the research process: in the field, during the observations and recordings; between expert setters during the meetings of the associated research group; within the Steering Committee. The editing process highlights some topics for collective reflection, discussion, and transformation. In this editing process, the researchers chose the sequences that best capture the questioning and controversies, in their analytic and emotional dimensions.

Discussion: on transformative and performative science

If the researchers intentionally assume the responsibility of conveying both analytical impulses and emotions, they are skirting the field of Performative Social Science, which is defined 'as the deployment of different forms of artistic performance in the execution of a scientific project' (Gergen & Gergen, 2011, p. 291). The questions underlying a performative approach are inseparable from a transformative stance: Who is the audience? What audiences are excluded? What responses do we hope to achieve? What skills are needed in the performance? (Gergen, 1982, p. 11).

The specific goal of displaying the 'spirit' and the main findings of the research to a large audience, which is unfamiliar with the details of its process and objectives, requires one to go one step further in the use of artistic forms. In this research, the photographs happened to play a critical role in this diffusion process. A selection of photographs of the members of the associated research group at work was displayed in an animated presentation, each of them being associated to one of the core professional values, or *virtues*, in the sense of Daston and Galison (2007), and Hay, Williams, Stahl and Wingate (2013), identified during the fieldwork. This presentation was accompanied by music. The entire presentation lasted 2 minutes 30 seconds. It was not planned to be an outcome of the research process, it just happened to become an essential and powerful part of its outreach, leading to applause by the fellow workers during the final presentation, and shown in parallel to the shareholders during the next Admin-

istration Board, to demonstrate the strategic orientations of the new HR and production directors.

Conclusion: transforming dialogue thanks to dialogical artefacts, to develop the subjects' power to act

This article intended to make three main points. Firstly, following a well-documented tradition of Francophone Activity Analysis, it shows how a research project dedicated to Vocational Education and Training may have a transformational potential for the organization, providing it adopts an activist stance and extends the boundary of the research project across hierarchical levels, involving both fieldworkers, managers and directors. Secondly, it discussed how these transformations, when they happen, depend on the transformation of the conditions, mediations and objects of dialogue among these partners. Thirdly, it discussed the place and role of video films within these dialogical transformations, showing how the process of film-editing, which is an intrinsic part of the research process, aims at improving its analytical value as well as its emotional value. This is particularly crucial when the research project is presented beyond the circle of the participants, who are familiar with its details. To keep its transformative power for an extended audience, the video films may need to loose their openly work-in-progress character, and display the research spirit and findings with a more conscious artistic ambition.

At the end of the research process, during the final presentation to their fellow workers, one of the experts introduced the final movies and presentation by reading a statement prepared by the associated research group to share their experience of the research. Here is the research process described in his own words:

> It wasn't easy for us to come up with acting. I hope that you will excuse our lack of knowledge in this field. You'll see that we present the basic settings of the different machines for the different shapes and sizes of steel files, as well as the quality control where we give instructions as to the making of the prongs as well as to the general quality of the files. Our work is not only to prepare the machines but also to keep in constant contact with the foreman, in order to get information about the priorities and organisation of the work. Also, with the other departments, internal accounting, the planning department, maintenance for the broken machines, the management of our fleet of machines and the staff who work with us, training new setters and operators. We need to have constant contact with our colleagues who execute these tasks upwards and downwards, setters, deburrers, in order to anticipate and manage our settings with the dippers, sanders and controllers during quality testing. Craftsmanship lies at the heart of all of these competencies. We hope to have met management's expectations in this film on our craft. We have tried to be clear and precise without going too much into technical detail. Above all, knowledge and craftsmanship is learnt on the job and needs time and patience.

These words capture the large sociocultural perspective on embodied, professional expertise in a beautiful manner.

Endnotes

[1] In French: 'Une lime, c'est toute une histoire', which is a word game with deux meanings of this sentence: it requires many complex steps; and it has a long, local history.
[2] The 'French-speaking ergonomics' is a tradition of intervention in workplaces based on close work analysis and aiming at organizational transformations (see for example Wisner, 1996). It has been developed mostly in France and Canada from World War II, and is used for example to design tools, spaces, or training programmes.
[3] The research team was formed by Laure Kloetzer, lead researcher, and Valérie Bauwens, research collaborator.
[4] Le pouvoir d'agir 'mesure le rayon d'action effectif du sujet ou des sujets dans leur milieu professionnel habituel, ce qu'on appelle le rayonnement de l'activité, son pouvoir de recréation' (Clot, 2008, p. 13).

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