Schisming as an Interactional Resource for Learning at the Frontiers of Work and Vocational Training — A Secondary Publication

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Abstract: This paper examines the sorts of interactional competencies and institutional demands required from students as they engage in complex forms of participation combining work and training purposes. It focuses on a series of empirical cases, recorded through video data and analyzed from a conversation analytic perspective, in which mentors make the decision to intervene during work sessions moderated by students. Such interventions do not interrupt the student’s activity and lead to the emergence of two distinct but not impermeable interactional spaces. This complex participation framework, known as “schisming,” contributes to overcoming practical issues within multiparty settings. Our study shows how schisming constitutes a particular sequential phenomenon where participants reorganize the interaction and co-construct a social and cognitive interactional space, thus enabling a shared understanding of the specific training context. Empirical data from the practical training of medical radiographers are used to illustrate how schisming may contribute to learning in the conditions of guided practice.

Keywords: Language and interaction; Student-teacher relations and interactions; Analysis of professional practice; Professional education

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1. Introduction

This article sets out to study educational practices in a particular institutional context, that of vocational training through “apprenticeship,” as it takes place, to a large extent, in work situations. This is an area of educational research which, in contrast to the school context, has received relatively little attention from the educational sciences and its contributing disciplines [1,2]. With the exception of the field of professional didactics [3,4], little work is currently devoted to it. More specifically, we propose to contribute to this field of research by focusing our attention on a particular interactional phenomenon, documented in the literature under the label of “schism.” In the field of study of verbal interactions, schisms refer to configurations of participation in which the interactional process splits into a plurality of foci of action conducted in parallel. We are interested...
in these phenomena because they constitute a highly complex interactional process that has not yet been well documented in social interaction research. Schisms also seem to be frequently observed in service training situations, insofar as, in these contexts, it is difficult for tutors’ guidance to interrupt the work addressed to users. In this respect, schisms are not without their implications for apprenticeships and vocational training. In what follows, we propose to consider “schisms” as “methods,” in the sense of Garfinkel [5], which enable participants to cope with the specific contingencies of the environments they encounter in work situations characterized by training and learning issues. In continuity with our previous work on this object [6-8], we seek to better understand how interactional processes akin to “schisms” are accomplished and how they unfold in the local temporality of social interactions. We also show what contributions these processes can make to the construction of professional skills and to training issues. These questions are addressed in research program No. 169743 funded by the Swiss National Science Foundation (SNSF).

In the following paragraphs, we begin by explaining the theoretical perspective adopted in the research approach concerned. On the one hand, this is in line with the conceptualization of the links between learning and interaction, and on the other hand with the concept of “conversational schism,” as it was initially developed in the field of ethnomethodological conversational analysis. We identify its main characteristics and properties, before extending it to the study of multi-modal interactions. We then carry out an empirical study, rooted in the activity of medical radiology technicians, in which we show how students in training and experienced technicians resort to participation splitting procedures when performing X-rays involving patients in a hospital setting. Finally, we highlight the potential of interactional schisms for training. More specifically, we show how the plasticity of multimodal interactions is likely to constitute, from the point of view of both learners and trainers, opportunities for the assumption of participation positions conducive to learning and the encounter with professional knowledge in work environments.

2. Theoretical framework
2.1. Supported learning in the workplace

In Switzerland, almost two-thirds of young people who have completed compulsory schooling opt for the vocational route and start learning a trade. These are major political, societal, and educational issues that need to be addressed from both a scientific and a multidisciplinary perspective [9]. Beyond the well-established categories that generally set theory against practice, training against work, school against company, and knowledge against skills, the field of vocational training invites us to think in terms of continuity, integration, and transitions of scattered realities, at the frontiers of thought, action, language, and materiality [2,10].

These realities do not leave interactional processes untouched. Those involved in vocational training, whether learners or trainers face multiple challenges when it comes to engaging in interactions in the various institutional contexts in which training takes place. Indeed, these interactions do not take the form exclusively of “dialogues” between trainers and learners, but very often involve a large number of participants, in complex forms of “polylogues” [11]. The activities carried out in training situations are also multiple and do not necessarily take place in a focused and homogenous way, but in parallel or stratified forms, based on a logic of “multi-activity” [12,13] and polyfocalization of action [14,15]. Even more fundamentally, interactions in training situations are frequently characterized by a combination of productive issues and learning logic. In work experience situations in particular, the aim is simultaneously to produce a performance in a form of professional practice and to learn in and through that practice. The demands of work and training are therefore often combined in a subtle and hierarchical way [16], exploiting in varying ways the productive and constructive components that proponents of vocational didactics generally recognize in the performance of the activity [19]. Finally, interactions in training situations confront the
participants with varied “epistemic practices,” often arising from singular and disparate cultures, in which the objects of knowledge are not always put into circulation in an explicit manner, and whose conditions of visibility we must learn to decipher.\textsuperscript{[18,19]}

However, while vocational training situations confront participants with difficulties to be resolved, they also offer them, in certain circumstances, resources enabling them to cope with these difficulties. From this point of view, interactional processes are not only challenges for training, they can also be seen as opportunities and tools for training. This is the position defended by a wide range of socioculturally inspired studies from different traditions such as vocational didactics\textsuperscript{[20,21]}, the cultural anthropology of learning\textsuperscript{[22]} and the Workplace Learning movement\textsuperscript{[23,24]}. From this perspective, social interactions, whether direct or indirect, are necessary conditions for learning in the workplace. In particular, it is through mechanisms of participation in collectively distributed activities mediated by semiotic resources that novice workers learn to solve the problems they encounter in the tasks they have to perform. It is thanks to these forms of support offered by experienced workers that they can identify the determining characteristics of the situations they face, and that they can be guided towards modes of action recognized as legitimate and efficient.

These are the positions we have also adopted in our recent work, in which we have shown that distinct and specific interactional configurations of participation are discernible in the situations of professional practice supported, and which make it possible to characterize different forms of coordination relationships between trainees and experienced workers taking on the role of tutor\textsuperscript{[25-27]}. This work has enabled us to illustrate the idea that learning processes in a work situation cannot be reduced to mechanisms for transmitting or transposing knowledge, but are the result of a collective and dynamic arrangement of the conditions under which individuals participate in the interactions that bring them together. In this context, the processes by which participation is split up constitute interaction formats that are both specific and recognizable, and which show how tutors and learners can become reactively involved in the contexts which they encounter in their day-to-day work.

2.2. Achieving “schisms” in social interactions
The problem of “schisms” in social relations was already raised by Simmel\textsuperscript{[28]}, who observed that the number of participants in a group helps to determine the social forms of organization that characterize it. More recently, the phenomenon of “schism” has been revisited by proponents of ethnomethodological conversational analysis. In her work on verbal interactions at family meals, Egbert\textsuperscript{[29,30]} observed that mealtime conversations often split into different conversational foci deployed in parallel. Following in the footsteps of Sacks and his colleagues\textsuperscript{[31]}, she describes these configurations as “conversational schisms”: “In conversations involving four or more participants, it can sometimes be observed that the conversation splits into two or more interactions. This transformation is referred to as a schism”\textsuperscript{[29]}.

From this perspective, “conversational schisms” designate interactive configurations that have the following properties. At least four participants must be co-present, in a joint material environment, so as to make it possible to conduct two interactional processes in parallel. At a particular point in a focused conversation, transformations can be identified in the framework of participation\textsuperscript{[32]}: one of the participants disengages from the conversation in progress to address one of the participants present, which leads to the possibility of a new conversation being conducted in parallel with the first. If the participant being addressed ratifies this proposal to induce a new conversation, the schism is completed and two parallel systems of taking turns to speak are simultaneously deployed, without these being perceptible as competing overlaps of turns. These two conversations deal with distinct themes, deployed by the different co-present participants: A and B interact on one theme, while C and D do the same on a second theme.
Interestingly, Egbert\textsuperscript{[29,30]} observed that “interfaces” or “interdependencies” exist between the two conversational foci. Even if they do not show competition or overlap in their turn-taking, participants tend to exhibit an orientation toward forms of coordination between the different foci of the conversation schism. For example, at the time of the closure and resolution of splits, it is not uncommon to see the two foci synchronize to allow the conversation to once again take a mono-focused direction. It therefore appears that the splitting processes follow a specific and socially identifiable sequential order. Schisms begin with an induction mechanism, continue through a maintenance phase, and are resolved by closure procedures (Figure 1).

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{schism_diagram.png}
\caption{Sequential organization of the deployment of “schisms,” inspired by Egbert\textsuperscript{[29]}}
\end{figure}

In the conversationalist perspective in which they were described and theorized by Egbert, “conversational schisms” are accomplished collectively and in a temporally ordered manner, in necessarily singular and specific contexts. Because these situations consist of family meals, the splitting phenomena are characterized by a strong verbal component. However, it would be wrong to reduce the conditions under which “schisms” occur to exclusively linguistic realities. Empirical analyses show that non-verbal resources, such as glances, gestures, and bodily orientation in particular\textsuperscript{[6]} play a non-negligible role in the conditions under which participation splits are achieved and identified. Moreover, since the actions in which participants are likely to engage may also consist of non-verbal manipulative activities—praxis gestures\textsuperscript{[33]}—it seems necessary to broaden Egbert’s perspective to include realities that are not strictly “conversational,” and which do not necessarily involve four participants engaged in two verbal exchanges. From this broader perspective, we propose to define “interactional schisms” as configurations of participation in which a set of individuals greater than two, after having jointly contributed to the accomplishment of a convergent focus of action, direct their respective actions towards a focus that they recognize as distinct, thereby causing a temporally ordered splitting of their objects of attention and of the actions by which they make this orientation manifest. In this respect, “interactional schisms” constitute configurations of multi-activity, and designate a particular sub-category.

Once this framework has been established, it is appropriate to ask how “interactional schisms” are achieved in the institutional contexts of vocational training in work situations and how they can contribute to the learning processes targeted by these contexts. This is what we propose to do in the following paragraphs, using an empirical research approach.

3. Method

3.1. Background and research program

The research approach is part of a specific professional practice, that of medical radiology. In Switzerland, the professionals responsible for producing medical images hold the title of medical radiology technician (MRT).
MRTs produce images of the human body using a variety of methods (X-rays, scans, magnetic resonance, etc.), in order to provide radiologists with the information they need to carry out their work and make a diagnosis. On medical delegation, they also apply therapeutic treatments. This is a profession with a significant technical component, but one that cannot be reduced to interaction with technological environments. The relationship established with patients when they are greeted, installed and during the image-taking process is a constant preoccupation for MRTs, who attribute a “caring” dimension to the gestures they perform in their work.

In French-speaking Switzerland, MRTs are trained at the tertiary level of the Universities of Applied Sciences (HES). To ensure the best possible integration between the theoretical and practical components of the training, the systems put in place aim for an integrative or at least cooperative form of alternation: activities offered within vocational schools consist, through simulation and reflective practice, of forging links with the practical experience accumulated during work placements; conversely, work placements are supervised by training practitioners, who have a qualification in the field of pedagogical support in vocational training. During their training, students undertake work placements at least twice a year, lasting between 8 and 16 weeks and taking place in the various contexts in which medical radiology is practiced (conventional radiology rooms, scanner or MRI rooms, radiotherapy centers, etc.), whether in public institutions or private imaging centers.

The research presented here is part of a partnership between the University of Geneva’s Pôle Travail & Formation, the Geneva University Hospitals (HUG), and the Geneva School of Health (HEdS). This research program, entitled “Becoming a Medical Radiology Technician,” is under the responsibility of Marc Durand, Germain Poizat, and Laurence Seferdjeli, and is funded by the Swiss National Science Foundation (SNSF). This research was conducted with the dual aim of producing knowledge about the work of MRTs in different hospital departments and contributing to the design of innovative training courses in the professional context and at the Geneva University of Applied Sciences (HEdS). In particular, the aim was to study, on the basis of work analysis approaches, what the culture of the profession specific to MRTs consists of, how this culture is transmitted in the various work and training environments, and how this culture can be supported and developed by means of innovative systems inspired by different currents in work analysis.

3.2. System, participants, and data collection

Our own contribution to this collective research program focused on the issue of placements and the conditions under which they are carried out, through interactions between trainees and the experienced professionals in charge of supporting them. Students were observed at two different points in their training: during an 8-week placement in the first year of training; and during the same placement in the third year. During these placements, audio-video recordings were made of radiological patient management activities. These activities were observed and recorded on three occasions, at different times during the placements: at the beginning, in the middle, and at the end. These recordings were made at different sites, covering various departments representative of medical radiology: (a) a conventional radiology room set up specifically for placement situations (school room), (b) a conventional radiology room in a radiology department, (c) a scanner room in an emergency department, (d) a conventional radiology room in an emergency department. The recordings covered the activities of welcoming, setting up, and taking images of patient body parts, carried out by 6 student trainees, under the supervision of one or more other technicians and often other health professionals (nurses, doctors, etc.). Situations of “interactional schisms” were therefore frequently observable in these contexts. In total, 13 hours of recordings were collected, including approximately 7 hours for the first-year course and 6 hours for the third-year course (Table 1).
Table 1. Data available for the training of medical radiology technicians

<table>
<thead>
<tr>
<th></th>
<th>1st-year placement</th>
<th></th>
<th></th>
<th>3rd-year placement</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Start</td>
<td>During</td>
<td>End</td>
<td>Start</td>
<td>During</td>
</tr>
<tr>
<td>Website</td>
<td>School hall</td>
<td>Radiology convention al</td>
<td>Radiology convention al</td>
<td>Computer tomography (CT)</td>
<td>Emergencies</td>
</tr>
<tr>
<td>Actions</td>
<td>Leg</td>
<td>Foot</td>
<td>Collarbone</td>
<td>Thorax cervical</td>
<td>Spine Pelvis</td>
</tr>
<tr>
<td>Duration</td>
<td>2h 51min</td>
<td>2h 15min</td>
<td>1h 38min</td>
<td>5h 08min</td>
<td>19 minutes</td>
</tr>
</tbody>
</table>

3.3. Data processing

These recordings were collected with the consent of the participants and the approval of the relevant ethics committees. They were compiled in a database using Transana Multi-User 2.61 software and were first described synoptically and then transcribed multimodally. The data was then processed by creating systematic collections to group together the occurrences of “interactional schisms” in the corpus. The creation of collections is a well-documented practice in the field of conversational analysis [34]. While the particularity of the analysis of singular cases consists in rendering a given situation intelligible in all its complexity, an approach geared towards the collection of interactional phenomena makes it possible to list the occurrences of these phenomena in different corpora of empirical data. An analysis by collection therefore focuses on a particular phenomenon in different data, with the aim of showing its systematics. In this sense, the aim of using a collection analysis may be to uncover interactional phenomena that are new in relation to the corpora available. By highlighting their systematic recurrence throughout the corpus, such an approach constitutes a form of generalization of the analysis of the phenomena observed. Another way of using collections in interaction analysis is to identify contrasts, or even typical phenomena, between occurrences of the same interactional phenomenon.

In the transcribed database, interaction segments meeting the criteria for identifying schisms were identified and grouped together. Sequences presenting a parallel sequence of interactions carried out simultaneously by different participants were systematically identified. In the Transana software, a clip was created for each segment and coded using keywords, enabling different categories and sub-categories of schisms to be identified. Finally, for each clip, the processes of induction, maintenance, and closure were identified and systematically described using the tools of interactional analysis [35].

From an analytical point of view, adopting an interactional point of view on the interpretation of splitting phenomena in interaction amounts to assuming three postulates. The first postulate recognizes the very close links that are established between the observable behaviors of the members of a group and the practical, material, historical, and social conditions in which they are performed and interpreted. These links can be referred to as indexical relations. In continuity with an ethnomethodological perspective [5], these behaviors only acquire their orderly and meaningful character in the conditions in which they are performed. They are, so to speak, inseparable from the circumstances in which they can be observed. These interactional behaviors need to be interpreted, not just from the point of view of an analyst external to the situation, but from the point of view of the partners involved in the coordination processes involved in carrying out joint action. Herein lies the endogenous point of view of the analytical perspective adopted, which is interested in the behaviors performed by the partners in an interaction with a view to making them mutually interpretable.

The second analytical postulate recognizes the jointly constructed and co-elaborated nature of the realities
involved in interactions. From a perspective inspired by conversational analysis \[^{31}\], the meaning and order of situated actions are established jointly, step by step, in an ongoing process of negotiation between the partners in the interaction. This meaning is not given a priori; nor is it the result of isolated, individually apprehended actions. It is the result of sequential logic and interdependencies between turns of speech. The dynamic and sequential organization of interaction therefore leads the analyst never to be interested in isolated acts, but to consider that it is the sequence of “turns of action,” whether verbal or non-verbal, which constitutes the relevant unit of analysis for examining the involvement of individuals in interaction. It is by looking at an inter-speaker’s reactions to an utterance that we can determine how it has been interpreted. As a result of this procedure, meanings in interaction always have both an emergent and a dynamically negotiated character: they are constructed turn by turn, in a situated and local manner, and a subsequent turn may reinforce or, on the contrary, call into question an earlier interpretation. The order of interaction is therefore neither general and abstract, nor decontextualized. Its overall coherence is constructed and constantly reworked in the course of the action itself, according to the context and contingencies of the moment. In this sense, interactions appear to be a complex process of coordination, during which the participants They “make mutually intelligible the meaning of their actions and their understanding of what is happening” \[^{36}\].

Finally, the third analytical postulate recognizes the character, both linguistic and more generally multimodal, of the processes by which the meaning in the act of the behaviors of participants in interactions is co-constructed and negotiated. In line with multimodal approaches in discourse and interaction analysis \[^{37,38}\], these meanings are based on a wide range of resources (e.g. speech, precedence, gestures, body postures, material objects, scriptural practices, etc.). These varied semiotic resources combine and aggregate into complex forms of signification.

4. Results: Learning to position the ankle in conventional radiology

This is a case study based on data observed during a first-year placement in the “training room” of the conventional radiology department. The “training room” contains real patients and allows images to be taken that are in every way similar to those taken in the department. However, it has specific features: (a) it is equipped with older, less automated equipment, enabling trainees to learn how to make adjustments manually, (b) the patients scheduled in this room are programmed at a lower rate than is usually the case in the conventional radiology department. Patients are informed that they are being cared for by MRTs undergoing training and supervised by qualified staff. These adapted conditions of participation \[^{22}\] enable trainees to take charge of patients in a way that is closely supervised by the tutors, and without having to deal with the time constraints that usually govern the work of MRTs.

The situation takes place during the first week of work experience for two students in their first year of training (STA1 and STA2). A patient (PAT) was seen with a prescription for an ankle X-ray. The patient was complaining of post-operative pain in this area. A qualified and experienced technician (MRT) acts as a tutor to the student trainees. She has entrusted them with the tasks of preparing to take the image, installing the patient, and setting up the X-ray equipment; she supervises the way in which the trainees carry out these tasks. To take the image, patients sometimes lie on a horizontal table with the “X-ray tube” above them (Figure 2). X-rays are sent from the tube, through the organ to be radiographed, and print the image on the “plate” that the MRTs have placed under the organ.

![Figure 2. Illustration of the situation observed](image-url)
When preparing the image, the MRTs sometimes ask the patient about his or her pathology, in order to check the prescription and obtain additional information useful for adjusting the equipment.

The extracts transcribed relate to the first of two X-rays taken by one of the trainees (STA1), under the supervision of her tutor. They concern the operations of positioning the patient’s ankle and setting up the X-ray equipment before the image is taken. The aim of analyzing these extracts is to provide a detailed and dynamic description of the way in which the participants engage in the interactional processes at the different stages of these adjustment operations. More specifically, it consists of identifying the conditions of emergence, maintenance, and closure of the “interactional schisms” in the situation observed, and highlighting the opportunities that these interactional mechanisms represent for vocational training.

4.1. Experimenting with ankle positioning

Extract 1 below shows how the student in charge of taking the images positions the ankle and adjusts the equipment, in the presence of her tutor and another trainee.

The interactions observed in the transcribed extract unfold in the form of changing configurations of participation, which stabilize locally by taking different forms.

In the first stage of this extract, a direct interaction can be observed between SAT1 and the patient. The student selects the patient as her direct addressee and gives him instructions (“I am just going to ask you to stand up,” l.-1). The patient complies with these instructions and performs the body movement requested (l.-2), which triggers thanks from STA1 (“thank you and then XXX,” l.-3) and allows her to proceed with positioning the plate (l.-4), then adjusting the tube (l.-5). What we see here is a temporally and sequentially ordered progression, in which a positioning and adjustment procedure is carried out step by step by SAT1 and PAT.

Extract 1. Student in charge of taking the images positions the ankle and adjusts the equipment (the transcription conventions can be found in Appendix 1 at the end of this article)
At that moment, this activity was the focus of attention for all the participants, with the tutor (TRM) and the other student (STA2) observing the activity in progress (Figure 3).

However, this mono-focused configuration of interaction is established for a short time. The situation soon changed significantly. As early as line 7, the MRT tutor changes her visual orientation and asks the patient a question (“you do not have any equipment,” l.-8). In so doing, she makes a change in the framework of participation, spontaneously leaving her place as a ratified witness to assume the position of speaker, and assigning the patient the reciprocal position of addressed recipient. A split in participation is induced here, with a new conversational theme being introduced by the MRT, which concerns the equipment placed on the patient’s leg during the operation. From line 9 onwards, the patient responds to the MRT’s request, first by orienting his body, then by taking turns to answer the questions asked (“not in the ankle, no,” l.-14; “just above it, in fact,” l.-18). He thus ratifies the proposal to initiate this new exchange and engages in a new interaction that presents a sequentially ordered progression, and in which he and the MRT alternate their turns.

The new focus of interaction initiated by the MRT and ratified by the patient does not lead to the initial activity of positioning the ankle and adjusting the equipment being suspended. While the exchange between the MRT and PAT is unfolding, the two trainees continue to engage in the positioning and adjustment procedure: STA continues to adjust the tube (l.-14) while STA2 observes (l.-18). Two areas of interaction thus unfold in parallel: a verbal exchange between the MRT and the patient, and a manipulative action by the student trainee on the material environment (Figure 4). Here we can consider that a schism has clearly been achieved, the split induced by the MRT being both ratified by the patient and confirmed by the continuation of the initial activity of the two trainees. However, the two foci that make up this configuration of participation are not mutually exclusive. Interfaces are clearly visible between these foci, particularly when the tutor, while interacting with the patient, repeatedly directs her gaze towards the trainees’ activity (l.-16-17, l.-20).

Figure 3. STA1 installs the plate under the foot of the PAT, while STA2 and TRM look on

Figure 4. TRM questions PAT while STA1 continues to adjust the tube
Gradually, new transformations emerge in this configuration of participation. From line 29, the two trainees stop engaging in the activity of adjusting the tube and clearly turn their attention to the interaction between the MRT and the patient. This reorientation of their focus of attention leads to the closure of the “schism” and the return to a mono-focused situation, in which all the participants are directed towards the same activity. It should be noted, however, that this new joint focus of the group is no longer on the initial activity of positioning the ankle and adjusting the tube, but on the emerging activity initiated by the tutor, in interaction with the patient. These processes of induction, maintenance, and resolution of the interactional schism can be schematized (Figure 5).

![Figure 5. Induction, maintenance, and closure of an initial interactional schism](image)

4.2. Training in ankle positioning

After returning to a focused configuration, the procedure for preparing the image is continued. The MRT talks to the students and explains how to adjust the tube and center it in this case.

At the beginning of Extract 2 transcribed below, a new configuration of participation is put in place. In line 38, the tutor produces a marker for structuring the conversation [39]—“then”—and makes visible a state of progression and transition in the activity. She explicitly addresses the students and no longer the patient, as indicated by the use of the pronoun “you” and her bodily orientation: “you know what we are going to do/” (l.-39). A new conversational theme is then introduced, focusing on the adjustments to be made to the positioning procedure. Instructions are given here by the tutor to the student trainees (“we will just,” l.-43; “we will just go down,” l.-45; “we will go down for an ankle,” l.-47-50; “but on the other hand we will open well,” l.-52-54 l.-56-59) while performing manipulative actions on the plate (l.-42, l.-44) and on the patient’s foot (l.-40, l.-41). The students quickly adapted to this new configuration of participation.
Extract 2. Procedure for preparing the image

They ratified the position of designated recipients in which they were placed by the tutor and assumed the position of active receivers of the instructions transmitted by the MRT. They made eye contact with the tutor (Figure 6), produced listening signals and verbally or gesturally validated what was said to them (l.-46, l.-51). As for the patient, unlike in the previous configuration, at this point, he is no longer the intended recipient of the exchanges but is placed in the position of the ratified witness, which he validates by withdrawing from the verbal interaction.

This new way of organizing interaction highlights the fact that the issues that characterize the framework of activity are no longer limited to the performance of a work procedure, but include epistemic issues linked to training practices. The aim here is to provide instruction by guiding people through the task, and not just to perform a task. Thus, the forms of sequential progression that characterize the order of the interaction at this moment of image-taking concern the step-by-step deployment of instructional discourse, making it possible to perform an epistemic practice between participants who are distinguished by asymmetrical positions of “knowing” and “non-knowing”. Consequently, if this stage of the interaction seems to focus the attention
of all the participants, it does so in a way that is both complex and hybrid, combining the issues of work performance and vocational training.

This hybrid activity of work performance and training does not take place exclusively in a mono-focused mode. In line 56, following the tutor’s turn to speak (“we will open it properly,” l.-54), STA1 straightens up and starts adjusting the tube again (Figure 7). She thus shows that she has correctly interpreted the tutor’s earlier words as an instruction and sets about carrying it out. This spatial and material reorientation is not without consequences for the participation configuration, since it reorientates STA1 into a new focus of action distinct from the MRT’s explanations, that of carrying out the positioning. As the tutor continued her explanations in parallel with this adjustment activity, a new split in participation emerged, as two kinds of action were carried out in parallel: an instructional activity addressed by the referee to the trainees; and an emerging activity of a new adjustment of the tube by the trainee in charge of taking the image.

This second “interactional schism” appears to be fleeting, as the tutor quickly moves towards the end of her explanation. In line 59, she finishes her turn to speak (“the same gag as before, I think”), before placing her mask back over her mouth (l.-60), which marks the end of her speech in gestural and material terms. From this point on, the activity progresses again in a mono-focused mode. STA1 continued to adjust the tube, watched by the tutor, the other trainee, and the patient.

The conditions of induction, maintenance, and closure of this second “interactional schism” can be illustrated in Figure 8.

![Figure 6. MRT issues instructions to student trainees](image6)

![Figure 7. STA1 adjusts the tube while the tutor continues her instruction](image7)
Figure 8. Induction, maintenance, and closure of a second interactional schism

It shows how, on the basis of an activity that is focused but hybrid, combining both productive and training activities, the framework of participation can be split up from time to time to enable the student trainee to anticipate the resumption of the work procedure, in parallel with an instructional activity that has not yet reached its conclusion.

5. Discussion and conclusion
5.1. Hybridity and plasticity of interactions in vocational training
The data analyzed show how a positioning and adjustment activity that is a constituent of professional practice in the field of medical radiology can be the subject of both successive and simultaneous experimentation by trainee students and formative support by an experienced MRT. This dynamic process of participation, which can be observed at the different stages of the image-taking process, can be summarized in Figure 9.

Figure 9. Diagram of participation dynamics
This schematization makes it possible to highlight the successive transformations undergone by the participation configurations specific to this situation at the different stages of its development. In particular, it shows how these configurations alternate between mono-focused forms, in which the participants are jointly committed to a single focus of action, and poly-focused situations, in which the action splits into several focuses managed in parallel. Thus, in the data considered, two examples of “interactional schisms” can be identified. The first is initiated by the MRT in the form of a question to the patient, while the student trainee in charge of image-taking operations continues her work setting up the equipment. The second is initiated by the trainee when she decides to adjust the equipment in parallel with the tutor’s instructions. These processes of splitting participation appear to be temporary, even fleeting; they are made and unmade in an ephemeral way, at moments of micro-transitions between more established configurations of participation.

These interactional processes also appear to be profoundly dynamic and collective. For example, the processes of inducing schism are rarely the work of just one of the participants. In the first extract, the offer to split participation is certainly induced by the question put by the MRT to the patient. However, it is only achieved interactionally by the patient’s response and, above all, by the trainee’s continued involvement in her own activity. In the second example, it is on the trainee’s initiative that the action of adjusting the X-ray tube is reactivated, but it is the tutor’s continuation of her explanation that gives the participation configuration a split and parallel character. Interestingly, the “interactional schisms” observable in the data considered do not necessarily construct the performance of actions in a continuous and coherent way; they can also sometimes displace and reframe them, through successive adjustments. In our two examples, we can therefore see that the mono-focused activities that are established following the procedures for closing the schisms do not generally resume the course of the initial action, but that of the emerging action. However, at the end of the second split, the focused action resumes its initial course, that of setting up the radio equipment. From this point of view, the “schisms” seem to attest to a relative plasticity in the conduct of the action, i.e. a form of permanence through the logic of permanent transformations.

As our analyses underline, the conditions for the emergence and resolution of participation splitting processes are not exclusively the result of verbal behaviors but proceed from a combination and integration of various semiotic modes. For example, the procedures for inducing new foci of action are often marked not only by verbal cues and direct addressing processes but also by specific bodily orientations and gaze games. These schism inductions become effective when non-verbal actions and manipulations of objects in the material environment are maintained or initiated. Interfaces between parallel action areas are sometimes achieved by means of glances and games of observation between the participants. Finally, schism closure operations involve syntactic completeness, prosodic marking and even, as in our second extract, non-verbal actions such as replacing the mask on a participant’s mouth. So it is the affordances specific to the semiotic resources used in context that make possible the conditions conducive to the emergence of interactional schisms and enable them to be accomplished.

5.2. The formative ingredients of the share split

In what way are the “schisms” observable in interactions likely to contribute to learning processes in the workplace and, more generally, to vocational training practices? This is the second line of questioning that structures our research program. In the light of our case study, they may represent opportunities to learning in at least two areas: firstly, participation mechanisms and secondly, epistemic practices.

In the register of what is commonly called, following Lave and Wenger, legitimate peripheral participation, the interactional organization of the “schisms” enables the student trainees to experiment with a
plurality of positions of participation: firstly, that of performing a positioning and adjustment task; secondly, that of observing this task; and finally, that of receiving instruction about the task. The split makes it possible to experiment with these different positions simultaneously and not just successively. It should also be noted that, in the context of our data, these forms of participation appear to be highly guided. The student trainees are not alone in taking charge of the patient. On the contrary, they are closely accompanied by the tutor, in various ways: (a) by having an exchange with the patient, in the presence of the students, (b) by the constant visual monitoring of the trainee’s actions, (c) by the production, in the second extract in particular, of instructions formulated for the students. The splitting mechanisms discernible in the participation formats also enable the tutor to produce acts of support in different registers, without interrupting the progress of the work activity. Finally, it should also be noted that the “interactional schisms” are suitable places for the participants to express their power of action over the situations they encounter. Student trainees do not simply passively undergo the scissions induced by the experienced MRT. They also help to initiate them, as is the case in the second extract, and they ratify them by maintaining their commitment to their own activity.

The splits in participation are also linked to the epistemic issues that individuals encounter when they engage in professional training practices. In particular, it appears from our examples that the conditions of induction, maintenance, and closure of “interactional schisms” are likely to have an impact on the degree of visibility of the knowledge mobilized and implemented in the action. In the first extract, the experienced MRT uses her questioning of the patient to elicit knowledge about the location of the surgical equipment that was previously unavailable in the image-taking situation. In the second extract, she explains the consequences of such knowledge on the positioning of the ankle and the adjustment of the tube. Clearly, the hybridization and complexity of the participation formats made possible by the splitting procedures are not indifferent to the registers of convocation for the production of knowledge in interaction. For example, in the first extract, STA1’s interruption of her activity of adjusting the tube makes it clear that she is orienting herself toward the relevance of the knowledge produced by the MRT and the patient for the conduct of the activity in progress. In the second extract, this same trainee’s return to the activity of adjusting the tube shows how she appropriates the knowledge of action contained in her tutor’s instructions. In other words, it appears that the processes of splitting up participation are in themselves contributions to “epistemic practices.”

5.3. The conditions for didactizing the processes of splitting participation in vocational training

These few observations invite us to take a fresh look at the question of the relationship between work and training, and at the problem of learning in a work situation. The processes of splitting participation into interactions are not unfamiliar to these issues, since they enable participants to perform several actions at the same time and, in particular, to reconcile the demands of performing work with making the knowledge associated with these actions visible. In this respect, it should also be noted that the learning opportunities that emerge in work situations are not the direct result of institutional contexts that have been stabilized and given once and for all. On the contrary, they result from the conditions of engagement of the participants and the particular dynamics of their participation. It is in this sense that “interactional schisms” are likely to constitute fertile methods enabling participants to respond to the challenges of the complex and hybrid situations they encounter in vocational training practices.

Highlighting these “methods” is part of a specific analytical mentality, which can be reduced neither to a subjective point of view nor to an external description of the action performed. These analyses resolutely distance the interactional approach from a so-called “first-person” posture. They do not aim to understand
the action from the point of view of “what the subject experienced as he saw it” [44]. But these elements of positioning also distance themselves from a so-called “third-person” posture, which “would not be interested in this testimony, but only in what is observable.” From an interactional perspective, it is not the behaviors as such, captured from the point of view of an outsider, that feed into the interpretation, but these behaviors insofar as they are both addressed and interpreted by the partners as they jointly engage in the interaction. It is the intersubjective process of adjustment and coordination as captured in the real conditions of its public performance that is the object of analysis. Such a perspective opens up alternatives to the “external” observation of activity or to a “first-person psychology.” It adopts the point of view of the participants at the moment when they address each other and apply themselves to make their behavior mutually interpretable. This is a valuable methodological resource for understanding the specific logics that organize educational activities and the environments in which they take place. It is for this reason that the analysis of verbal interactions is more than just an object of study; it also forms the basis of an educational research method.

Identifying the processes of participation in interaction and the complex forms they can take during schisms is not only the object of a comprehensive and ethnographic approach, aimed at describing observable phenomena. It can also be the product of a didactic approach, enabling the participants themselves to observe their own activity and understand the conditions under which it is carried out and deployed in the logic of coordination and mutual adjustment. In a different empirical field, that of childhood education, Trébert and Durand [45] have recently shown, for example, how educators taking on a tutorial role with regard to trainees can appropriate methods of interactive analysis to better understand their role in supporting novices. These approaches, based on collective analysis of film recordings and their transcription, are still largely exploratory and are sometimes difficult to implement in work environments with significant time constraints. However, they are proving to be a promising way of making visible the contributions made by professionals to training, going beyond putting knowledge into words and a transmissive vision of professions reduced to categories of content. It is in this respect that the interactional analysis approach may, beyond its uses in research, constitute a promising avenue for vocational training and the professionalization of trainers.

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This article is a tribute to Isabelle Durand, our dear colleague who passed away too soon. Isabelle Durand actively contributed to the production of this article, before succumbing to a long illness.

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References


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Appendix

[ overlapping behavior
par- truncation
/\ upward/downward intonation
geste non-verbal gestures
STA> direct speech relationship
"xxx" voice volume reduction
+xxx+ voice volume increase
(.(.) micro-pauses
XXX inaudible segment
eXTRA accented segment
: vowel lengthening
| separation between two homes

Appendix 1. Transcription conventions