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New questionings for interventions and research conducted based on stakeholders' activity.

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Introduction

It was from a double point of view that I read the publication coordinated by Simon Flandrin, Christine Vidal-Gomel and Raquel Becerril Ortega: the point of view of the French-speaking world's ergonomics psychology following in the footsteps of Jacques Leplat, and that of professional didactics in line with the works of Pierre Pastré, in which the analysis of the activity of a subject already on the job is used to organize the intervention of a subject in training. This point of view differs from the CHAT theory (*Cultural-historical activity theory*) developed by Engeström and used to analyse learning (Engeström & Sannino, 2009), since we focus on individual stakeholders instead of a more complex system of activity in which they would be integrated, as well as on situations seen as crucial determining factors of the activity, without getting centred on the instruments of action. Simulation situations appear to be good candidates to help trainees develop skills, as well as situations of action, which are also potential means to develop skills (Savoyant, 2010/2005).

The aforementioned work had me raise some questions about simulation used for training purposes, around which this paper is organized. A very important specificity of those situations is the fact that someone is intervening at once as the object of the action (for care, help, etc.) and as the active and interactive subject in relation to other participants. Models of activity designed in cognitive ergonomics, initially elaborated to analyse situations in the field of industry, must thus be subjected to a significant transposition process. The same can be said of the design and making of professional training sessions or sequences, and all the more so of the design and use of simulation situations as analysed by this school of thought. We will start with presenting the directions in which the categories of situations that could be grounds for simulation-based training have been broadened. We will outline the adaptation of Leplat's framework model (1981; 1997) to

the objectives of care training, acknowledging factors that are important for that transposition. They are mostly organisational factors: in what context do care activities occur – in an institution or at the “patient’s” home – and temporal factors: is it a one-off intervention such as the accompaniment of a nursing act with appeasing words or gestures? Is it the care activity that a care professional or family member acting as a caregiver performs throughout their working day or week, or even their whole career? Finally, we will question the diverse modalities of transposition of the target situations – which should be mastered by the end of the training course – into simulation situations for training, in order to take into account the care-related dimension of an activity that is directed towards another person (from hospital care to home support).

Evolution of the categories of simulation-based training situations

For very many years, simulation has been used as a double-edged tool: for researchers and for trainers who analyse the activity of professionals on the job with a view to design training courses (Béguin & Weill-Fassina, 1997). Regarding this particular use of simulation for training purposes, works in the field of ergonomics psychology (or cognitive ergonomics) have initially dealt with material situations, primarily in the aviation sector, and related to industrial processes and other similar dynamic processes (Bainbridge & Quintanilla, 1989). Process management analysis was also transposed into specific human interaction situations. It has been the case with the activity of teachers in class (Rogalski, 2003; Goigoux, 2005; Roditi, 2008). Clearly, this was not enough to go beyond the analysis of activity and think out a transposition in terms of simulation for teachers’ training. We can point out in particular that in a “strict” – or blind! – transposition, we are faced with the following problem: “Is it possible – and if so, how – to transpose pupils, who are at once the objects of the teachers’ actions, and subjects of their own learning processes?” This difficulty is somewhat subdued if we integrate the fact that the objective is not to simulate “the object of the action” but “the situation of action”. This shift in perspective was developed in the special issue of the journal *Le travail humain*, coordinated by Samurçay and De Keyser (1998). It consists in questioning the extent to which the activity in a simulation situation represents the activity in the target situation and prepares trainees to handle it. In the field of teachers’ training, the most accurate simulation situation seems to be the one in which teachers take on the role of pupils. It is the case, for instance, when a new content is integrated to the curriculum they are in charge of. Trainers help teachers familiarize themselves with this new content and the teachers – possibly with the trainers’ help – must transpose this situation that they have experienced as students into the teaching they will provide to their own pupils. It is that very same perspective that was favoured in Lang’s works (2001), whose objective was to introduce ergonomics in initial professional training courses, so that the students, as future operators, could become ergonomics-savvy stakeholders and thus contribute to the prevention of occupational risks. Teachers were put in the position of students: after being taught about the concepts by teachers-researchers, they had to conduct an analysis of the activity of operators in situation and report the results found. After this experience, they were required to prepare their future teachings. In didactical mathematics, this type of simulation has been called “homology-based training” (Robert & Vivier, 2013); it can thus also be used in professional training.

A similar simulation situation can exist, but only under specific conditions of activity: it is called “modeling-based” training. The trainer works “as closely as possible” with the student or apprentice and makes the content of his activity explicit; the student/apprentice follows and reproduces the trainer’s actions, which models their own actions.

We can interpret in terms of “modeling” a situation where a trainer films a lecture given in front of simulated students/apprentices, so that teachers-in-training can later reproduce in their actual work situations what the “model” has done in the recording, which they get to watch and analyse. Here, notably, some properties of video recording are exploited: the possibility to freeze the image or go backwards allows for a detailed observation and a finer analysis. We personally participated in one of those training sessions, acting as a trainee (Janine Rogalski and Renan Samurçay). A video recording focusing on the trainer was taken in order to be used as a model by the next trainer. In this particular case, the trainer must mobilize their acting skills, since they must consider the simulation in front of them as an actual group of professionals attending a training course.

This modeling-based training can be seen as a derived form of “teach your twin” training (Oddone, Ré & Briante, 1981; Saujat, 2004). We chose to allude briefly to those examples, since care situations share an essential property with training situations: the object of the action is another human subject with their own autonomy, and simulation situations for training purposes thus pose partly similar problems.

We are now going to present a framework for analysis that will allow us to orient and specify the questions that can be raised in these types of simulation-based training courses: i.e., the double regulation of activity model proposed by Leplat (1981; 1997). We will then propose a list of questions that should be answered in the study, design and use of such simulation situations.

A framework model for analysing care-related activity and designing simulation situations: Leplat’s double regulation of activity model

In the collective work he published, “*Apprendre par la simulation. De l’analyse du travail aux apprentissages professionnels*” (“*Learning through simulation. From work analysis to professional training*”, 2015), Pastré develops the idea that the link between the analysis of activity and the use of work situations for training purposes is at the core of professional didactics, these two dimensions walking hand in hand. Daniellou and Rabardel (Daniellou, 2005; Daniellou & Rabardel, 2005) restated the key principles of the French-speaking world’s ergonomics tradition and specified the links between this tradition and the input contributed by the theories of activity developed in Russia in the footsteps of Vygotsky (1978) and Léontiev (1979). We will use here one of the components of this very same research tradition, initiated by Leplat: the double regulation of activity model (1997).

This model, introduced and developed in work psychology by Leplat (1997) is a conceptual tool which we are going to use to present the dynamics of activity in a care-related situation. The analysis of activity, its conditions and the professional skills involved were first brought into play for studying the security of systems (Leplat, 1981)

and human/machine interactions (Leplat, 1989; de Montmollin, 1991), then for designing computer systems. We will then propose a model for care-related activity, drawing inspiration from the work done in the studies related to teachers' activity.

Leplat's model is built around two main ideas: the double determination of the activity and the effects produced by its being carried out. This model can be directly transposed in the case of collective activity (Leplat, 1994, p. 213), which allows for the analysis to go beyond individual stakeholders. On the one hand, the activity is determined by factors that are related to both the situation which the activity responds to, and the subject who develops it; on the other hand, a subject's action has effects both on the object targeted by this action (the target-state) and on the subject themselves. Darses presents the state of the works relying on activity analysis: [...] "from a psychological point of view, as the product of a coupling between a task (which provides external determinants), and a subject (who provides internal determinants)" (Darses, 2016, p. 193). The activity in itself is motivated by personal and social factors (it is always "addressed" to another person – or several other people), it aims at reaching goals and organizes operations to achieve them (Leontiev, 1979; Savoyant, 2010/1979).

The regulation of the activity is due to the fact that it changes over time according to two types of effects produced depending on the subject's intentions. The first dimension of this regulation is taking into account the state in which the action has put the object, compared to what the goal of the action was. This regulation is well-known in learning psychology, but also as an effect of professional experience. The second dimension of the regulation is the adaptation of the activity according to its impact on the stakeholder themselves (their tiredness, their interest, their emotions, their social relationships at work, etc.). It can lead them, for instance, to carry out the most complicated operations first: this is called regulation by anticipation and helps prevent risks (see for example, Clot & Simonet, 2015).

The initial double regulation model does not specify over what time span the action is being considered, but it can be completed and adapted to various temporalities. In the field of work, we can distinguish three main time spans that are relevant; they correspond to three levels of "granularity" in the analysis of the subject's activity (be it individual or collective). At "micro" level, the activity is analysed over a "short" time span (depending on the object of the action and the dynamics at play: it can be only a few seconds long in the case of plane piloting). For people-oriented tasks, it can be a specific intervention for a patient in an institution or at home (helping the patient shower, doing the dishes, tidying up the room, etc.). For training situations, it can be a practical exercise that the trainee must carry out. At "meso" level, the whole duration of the activity in a specific work position is being considered: for a trainer, it corresponds to one day of training course or even a whole session; for care professionals, to their entire working period in one position (or one day with the professional's own "patients"). At "macro" level, we consider the longest time span associated with each kind of task: the school year of a teacher in charge of organizing the implementation of the curriculum in a certain class; a professional training course in the long run; the long-term activity – depending on the results – of therapists such as, for example, physiotherapists or speech pathologists.

The regulation of the care-related dimension in a people-oriented activity

As far as care is concerned, two different situations must a priori be distinguished. In the first type of situation, the care professionals act within the context of an organization such as that of a hospital or an establishment for dependent people. In the second case, they work with patients who are independent enough to live at home, but need help in their day-to-day life.

Two dimensions then take on different values: the temporal dimension of the organization of the activity and the social dimension of collective action. Indeed, within the context of an institution, on the one hand, a group of care professionals is in charge of a number of patients, all in the same location, for the duration of the working day. On the other hand, they have the possibility to help each other perform some care-related actions, and must “physically” cooperate with each other (to turn over a bedridden patient, change sheets, help a patient move from their bed to their wheelchair, etc.). The move from one patient to another happens over a short time span, since they all are in the same functional space.

In a work situation at the patient’s home, the constraints are different: they are related to the organization and layout of the person’s place, the number of at-home visits that must be carried out in a day, the trips that must be taken, the administrative follow-up of the patients, etc. In most cases, professionals who work at the patients’ home have comparatively less people in their care than those who work in institutions, but the travel time needed to carry out the necessary visits is a limiting factor and can be stress-inducing. Moreover, those stakeholders cannot get immediate help when an unplanned difficulty arises. The working collective is also more “distant” which makes it more complicated to discuss patients and their care routines as well as talk about various work-related difficulties and exchange views on the way to deal with them. In this case too, albeit not for the same reasons than in institutions, the knowledge that “time is running out” is a factor that puts pressure on the relationship between the professional and the patient, and causes tensions in the caregivers’ activity. Indeed, care is centred on the interpersonal dimension of the “patient’s” well-being. The positive impact of affective social interactions on mental and physical health has been proven: such interactions may need time to develop and produce an effect. Furthermore, the cooperation with other stakeholders mostly takes place remotely, which increases the need for anticipation and, potentially, the caregivers’ decision-taking responsibility (we can think of pain management, which depends on a medical decision but is implemented by nurses – in particular when the painkillers can have serious side effects).

What model(s) of activity apply for care stakeholders?

The question of simulation for training purposes is not limited to the determining elements that we have just gone back over. It calls for an analysis of the activity itself as it is being carried out. One of the goals of training is indeed to outline a reference activity for trainees. The analysis makes it possible to mark out the elements of the activity which care stakeholders are going to be trained for, or that will contribute to their development as professionals. The distinction between technical and non-technical skills is well-

known in the field of collective work situations analysis: in this case, the non-technical skills are those that are directed towards human interaction during a specific task, as shown by Salas et al. (Bedwell, Fiore, & Salas, 2014). Here, we focus on those that are at stake in care-related situations that occur between the stakeholder and their “patient”.

This analysis can be conducted from two different perspectives: either it is centred on the activity of the “caregiver” stakeholder, who takes another human stakeholder as the object of his action, or it concerns the interaction between the two stakeholders, who are in an “request and answer” situation where the caregiver carries out actions that the person cared for cannot perform on their own. From the theoretical point of view of cognitive ergonomics, the first perspective is that of an individual action, whereas the second perspective takes into consideration the activity of a collective, in a strongly dissymmetrical relationship. We chose here to take the first approach in order to analyse the care stakeholders’ activity (vis-à-vis those in need of care), taking into account their training goals. Several aspects of the activity can be integrated in the training course.

For instance, a review of questions about care for seriously ill people highlights the expectations related to care: “[it] encompasses the patient and family being respected, given complete information, involved in decision-making and supported in their physical, psychological, social and existential needs. The studies highlight the importance of [...] structuring service organization to enable care continuity” (authors' abstract, Guisti et al., 2020).

We also keep in mind the works of Naweed, Stahlut, and Keeffe (2021) whose detailed analyses are consistent with Leplat’s model (op. cit.) and allow us to identify a number of avenues for reflection about stakeholders’ training. They bring to light determining factors of the situation that can have negative effects on the activity being carried out and its results on the patient’s care, their well-being or even that of the care professionals themselves: “*contextual factors in scenarios highlighted inadequate staffing and procedures, inadequate training, challenging residents, time poverty, and low support*”. From the perspective of the caregivers’ activity, they underline the development of “*close relationships with residents, influencing care provision but blurring personal boundaries*” (which, by contrast, highlights the necessity to maintain professional detachment). The results of these works (op. cit.) bring to light the occurrence of adaptation processes in the course of the activity: “*individually directed adaptive strategies [...] used to alleviate dissonance and maintain emotional resilience*”, and the place of diagnosis and prognosis processes, “*including dynamic risk assessment involving rule breaking*”. Their analyses were conducted at the macro or meso levels of analysis of the activity (expected or carried out).

One element that seems to have been left out of the studies in this questions review is the management of the tension that exists between the various goals related to the same “patient”, i.e. carrying out a care or help-related action for the patient’s benefit while also interacting with them in a quality way. Achieving this type of joined objectives is an integral part of the short-term activity of caregivers (at the meso-level of granularity in the analysis of activity). This type of goal can give rise to the elaboration of collective strategies. For instance, in an ongoing research survey (Renaudin, in preparation), we can identify a strategy for managing aggressiveness in elderly patients suffering from cognitive impairments during their washing routine. This particularly complicated and

hazardous moment relies on a specific distribution of tasks: one of the caregivers attentively interacts with the patient in order to divert their attention from the ongoing washing, while the other caregiver carries out the washing gestures. The interaction becomes more intensive at the trickiest moments. Strategies of that kind are precious for initial and ongoing training. They can be analysed, debated, improved. They participate at once in the prevention of occupational risks and the fostering of the patient's well-being. Those compromises that can be identified in the analysis of activity at micro-level can occur in every type of care or home-support organization.

In the paragraphs above, we have oriented our questioning towards the care-related dimension of an activity directed towards another person. This dimension can also be present in collective actions between co-workers (in "horizontal cooperation" as in the example mentioned) or between stakeholders in a hierarchical relationship (in "vertical cooperation"). Examples of this have been given in this book, about stakeholders in civil security or police forces, highlighting the possibility to design simulations for their training (see Dubois, Vanderstrate & Van Daele's chapter). Furthermore, the hierarchical relationship can also be used for care-related purposes in order to circumvent defensive behaviours; for instance, a chief first responder systematically requests the services of a hospital psychiatrist for first-responder fire fighters under his command who are confronted to tragic situations affecting people, thus avoiding possible denial regarding the psychological impact of their intervention. In this case, it is not easy to see how the situation could be transposed and integrated in a relevant manner into the training of new chief first responders.

Transposing the care-related dimension from situations of action to training situations via simulation

The model of activity analysis we worked on shows the diversity of perspectives that can be considered and makes it possible to orient the transposition of those objectives and the characteristics of the target situations towards simulation-based training. It allows us to see the impact of the choice of components and the relationships at play in the target situations that will be reproduced in a simulation situation according to the goals of the training course.

Another dimension of the analysis of activity for training purposes, and its transposition into didactic simulations, is that of the three levels of functioning in a work situation, developed by J. Rasmussen (1983), i.e., respectively, the skill-based, rule-based and knowledge-based levels. At skill-based level, routines of professional functioning and automatisms are at play; at rule-based level, the stakeholder draws from a basis of action processes that can be expressed in terms of involvement: "in case of situation S1, carry out action A1". At knowledge-based level, the stakeholder is faced with a problem of which he must design the resolution (or to which he must find an acceptable enough solution). It is easy to see that the level that is most easily transposed into training is the one that aims at assimilating rules (rule-based level) by adapting into simulations a series of cases in which this or that rule will be applicable. It seems to us that it is this level that is at stake, for instance, in Naweed, Stahlut and O'Keeffe's analyses (2021), which consider that "versatility as an adaptive response to challenges [...]" in elderly people's

care is the “essence of care”.

The skill-based level is very strongly linked to the multiplicity of experiences that have thus become sedimented (Rogalski & Leplat, 2011): in initial training, it can thus be aimed at for professional development, relying on oriented simulations called “drills” – i.e. learning through rehearsal, repetition and practice of a task – based on repeated interactions with a high-physical fidelity simulator.

A simulator with a high functional fidelity but a low physical one will only be appropriate for knowledge-based processes, while a simulation that is faithful on a conceptual level but modifies the conditions of information gathering and action in the target situation will pose problems with regard to the processes of representation of the situation (indispensable for functioning at rule-based level).

In the field of care, simulation can, for instance, aim at building up a representation of this “other, sick or elderly” who is the object of a trainees’ action. Thus, Eost-Telling, Kingston, Taylor and Emmerson (2021) present “ageing simulation equipment” (impeding movements and walk, affecting sight and hearing, etc.) to enable caregivers in training “to undergo experiences which potentially affect older patients and by asking the learner to act the role of patient this may be more effective in developing greater empathy [...]”. The authors, however, do not underestimate conceptual and theoretical training (which aims at reaching knowledge-based level), but use that simulation “to challenge ageist attitudes and behaviour”.

The question of taking into account the three levels of functioning in the prospect of designing and performing simulation situations, which has already been raised in Rogalski (1997), brings up another, much trickier question: what role can simulations play in the process of acquiring a particular component of professional skill, i.e. the possibility to switch from one level of functioning to another over the course of the activity? It seems to us that this last question has hardly been explored by research in the field of professional activity analysis, and that it is particularly crucial in situations of action exerted “on” or directed “towards” another person, when it comes to training professionals to take into account the care-related dimension of such situations.

We hope to show that broad avenues are still open to research and action in the schools of thought that mobilize theories on activity, with a both an epistemic and a pragmatic dimension.

Renaudin, R. (in preparation). Caregivers' strategies for working with potentially aggressive cognitively impaired elderly patients. Master Education sciences. Nantes University, FR: Department of Education and Training Sciences.

We talk of simulation, not experimentation of a new teaching or a new pedagogical method, given that the “pupils” in the training course are not the actual pupils targeted by the teaching but teachers in the position of pupils.

Professional didactics is a school of thought that allies research and intervention in professional training, and relies at once on the contributions of Leplat’s cognitive ergonomics and Vergnaud’s model of conceptualization in action (1990). Mayen (2015) gives a detailed presentation of it.

We use the term “situation” to refer to the task system, with a system of resources and constraints, within an organization of stakeholders and prescribers. We can see this term as a development of Leplat’s definition of task (following Leontiev’s, op. cit.): a goal to reach under certain conditions.

We nevertheless also mention here the specific situations created by long-term illnesses or pathologies, where the patients can become “expert patients” and interact with care professionals on an equal footing. Personal communication. Anonymity was requested.