

Maria Rosaria Stollo

Neurophenomenology of education



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To Andrea, Guglielmo and Marco

Making the decision to have a child -it is momentous. It is to decide forever to have your heart go walking around outside your body.

E. STONE

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First Part

Neurophenomenology and education

Introduction

The research experience described in this book stems from an attempt to combine the search for pedagogical education theories and practices with the framework of neurophenomenology.

Many of the theoretical and empirical studies related to linking cognitive/educational processes underline the difficulty of successfully applying education and related suggestions generated by experiments carried out in laboratories. Indeed, a direct transfer of the acquisitions of neuroscience to educational practice and/or teaching seems impractical, while the most suitable method appears to be an interdisciplinary approach to the study of cognitive processes in educational contexts.

In a cross-disciplinary context, then, the educational sciences can relate to the cognitive sciences on a plurality of levels connected to as many heuristic targets using a pedagogical approach. When, for example, one refers to research on epistemologies and professional teachers and educators, a social pedagogical approach is used; when the cognitive and emotional processes underlying student antisocial behaviour are addressed or when the purposes and means of citizenship education are considered, a special education or disciplinary teaching approach is used. The goal is to investigate the dynamics underlying the learning processes and related difficulties in schools and formal educational institutions.

In this area of research alone, interest in the results accrued in the cognitive sciences has marked a turning point in relation to teaching practices in academia. Of particular interest are contributions that, given the role that emotions/learning play in teaching and training strategies, have centred on motivational processes and are built using divergent languages.

The research work undertaken here, between a pedagogical approach and a general social pedagogical approach, has deepened the problems related to the training of teachers and psychologists in relation to their role as educators, a

role that requires them to act responsibly and to first consider practices that are more useful rather than those that are more effective in terms of educational processes.

For example, the transition of the conception of the teacher from an official employee to a professional led to a change in the conception of the school and the teacher in the last thirty years of the last century, thus leading to the assumption of the model of reflection-in-action – aimed at acquiring the ability to take creative solutions and educational awareness and facing situations marked by extreme uniqueness, instability and, very often, conflict in place of the traditional model that Schön (1983) defines as “models of Technical Rationality”; that is, the activity of the teacher and of the educator would provide a solution by the mere application of theories and techniques with a scientific basis.

Thus, what was “hidden” within the debates around school or academia was the fact that a teacher is not one who is appointed to the mere transmission of the content of culture but rather is a professional called to act responsibly in sometimes uncertain situations, making choices from his/her knowledge and his/her experience. As such, teachers not only contribute to the dissemination of knowledge but also play a significant role in determining the direction of the cultural, political and social environment in which this knowledge will be disseminated. The recovery and the explanation of the experiential and cultural background of the teacher is, therefore, recognized as a field in which training is needed for general, social, and historical pedagogy.

The training of teachers is no longer limited only to mastery of discipline content; rather, it tends to promote a capacity for self-reflection, to constantly challenge, to criticize the tacit understandings built around experiences, to bring out a practice that requires a full awareness of individuals’ epistemological abilities and accountability, compared to outcomes evaluated not only in terms of time and content acquisition on the part of the students but also in terms of their ability to rework criticism and demonstrate openness to change on the basis of the interpretation of their experience and continuous feedback in the political, social and cultural context in which they are inserted. In summary, because they are scientifically managed, monitored and evaluated, educational practices require theoretical awareness regarding the purpose of the educational process, the achievement of which can inform the choice of the most appropriate instruments.

Today, in the pedagogical reflection of the general social situation with which we are faced, a number of models that define different goals are often conflicting – for example, we can consider the debate over history textbooks or so-called “ethically sensitive” issues or even the different approaches that characterize interpretations of and interventions in bullying, juvenile delinquency,

and education law. However, simply because all are legitimate expressions of different viewpoints and cultural and political rights, it is necessary for the teacher to adopt a position knowing the historical, political and cultural precedents and roots that have contributed to their genesis and their physiognomy, before bothering to acquire the most suitable technique to achieve the objectives identified by the models themselves.

One of the tasks of general pedagogy and social education is to train teachers to identify the links between reflection on the different models of interpretation of the phenomena and emergencies of educational and practical operational implications that flow from them in response to the educational priorities of our time with respect to the formation of free identity, i.e., of “knowing how to be” at the level of individual and social recognition of the insurmountable border between their own and other people’s autonomy. Therefore, it is necessary for the teacher, as an educator and not only as the holder of the knowledge to be transmitted, to be able to independently analyse such models in depth, which, among the others, lend themselves to superficial interpretations, dictated by common sense, even by those who entrust to teachers not only the responsibility of the transmission of content, which has never been the only goal of school, but also that of the education of future citizens. The goals are to train teachers to constantly address their beliefs, convictions and personal reasons and to take responsibility in terms of setting goals and strategies identified in training to build the conditions for the creation of constant feedback among the individual, the professional and the social field. In this sense, the training of teachers is the subject of the research and pedagogical practice of social pedagogy.

Studies in the cognitive sciences (Tokuma-Espinosa, 2010; Strollo, 2008; Rossi, 2011, Nguyen & Larson, 2015; McImerney, 2010; Frauenfelder, 2004) show that this exchange between teachers and society can be greatly amplified by a self-consciousness, which generates a growth of subjective knowledge and allows one to transcend the local environment and time period via the consideration of circumstances beyond one’s experience, e.g., trying to find, build, invent and anticipate new situations (i.e., test situations, critical situations) and trying to locate, determine and challenge prejudices and usual assumptions.

In light of the debate of the last thirty years of the last century, the goal of general and social pedagogy is therefore to provide trainers with scientifically based tools that make it possible for them to review their “spontaneous educational actions” so that they are active and independent manufacturers of theoretical assumptions from which to interpret their educational experience rather than provide theoretical and practical prescriptive frameworks. Encouraging the development of a personality characterized by affective and intellectual autonomy, the educator can realize himself or herself while contributing, through

social and political action, to create objective conditions for the self-realization of the other members of the community. The task of pedagogy is therefore to prospect and critically assess directions for which the above-mentioned self-realization – rather than be other-directed because of the constraints of bio-psycho-social boundaries that deform and block development – can be carried out according to choices geared towards a real improvement, if not a radical transformation of humanity, that is flatly opposed to the current model, sentenced with a split inner fragmentation and concomitant social and political alienation. A pedagogue, then, is one who speaks in the first person and is able to disclose and argue a viewpoint without delegitimizing divergent views but who can simultaneously highlight points of contrast in conventional problematic cores and promote the free choice of optics to which one may adhere.

It thus becomes necessary to take as the central engine of education intentionality associated with the values, which always guides the processes of modelling educational action. With regard to this heuristic objective, the cognitive sciences, which traditionally consist of landmark studies that concern the survey variables underlying learning processes in school and throughout life, seem to offer meaningful suggestions today. In an effort to trace the neurobiological volunteer behavioural roots, a reductionist view is partly accepted and partly rejected, which enables one to recognize at the same time the physical nature of the mind-brain system and the inability to predict anything on the basis of knowledge of the neurophysiological activity of the mind responsible for intentional actions and human freedom. These activities, in fact, can be considered the result of chaotic-intentional processes, where the term chaos does not mean the absence of objective reasons but rather the inability to accurately identify casual-linear meaning with respect to complex phenomena, such as education. The notion of deterministic chaos does not indicate that the phenomena to which it is applied have qualities of unintelligibility or incomprehensibility but rather only that they require special analytic tools. In a chaotic system, there are, in fact, phenomena that obey all the deterministic laws, but because of the multiplicity of variables that come into play, such phenomena can be understood only globally and, very often, analysed only a posteriori.

The neuronal structure also presents, from the neurophenomenological perspective, emergency features: recent surveys conducted in the field of neuroscience have made it possible to support the transition from a conception of the brain as modular, both topologically and functionally, to one that conceives of the brain as operating through the simultaneous action of fragments of modules communicating with each other thanks to phenomena of “resonance”: the occurrence of resonance between cognitive subsets acting simultaneously, even if they are related to specific differentiated functions, reveals the cognitive con-

figuration of the subject in a given time. The result is the inability to trace a global process; although conscious behaviour can refer to only local rules governing the operation of the brain, the emergence, or the specific cognitive configuration, manifests itself as a construction dependent on a relationship among the body in its totality, memory and the environment.

In addition, the neurophenomenological reading of intentionality emphasizes the concept of specularity, a peculiar characteristic of the human organism that, in the absence of action models based on personal experience, allows for the development of models of action based on what we think that another would do in the same situation. The ability depends on the activation of specific circuits of neurons, namely, mirror neurons, which, when subjects interact with others, facilitate, at the elementary level, the neural firing associated with the observed movements and, at a more complex level, an understand of the intentions and emotions of our heritage from motor patterns.

From these considerations, it can be said that time and life experiences are strong influences on the educational theory of the trainer, and these experiences generate a gradual building of preferential neuronal circuits, representing the biological foundation of the generation of voluntary behaviour. As training models enjoyed as part of formal training programmes, the trainer looks in a mirror at the construction of strategies for action.

The result is the emergence of a dual determination, namely, a biological and cultural determination, which, precisely because of its double meaning, allows for pedagogical interventions aimed at trainers and at the revision of educational process modelling. It is precisely the biological key that allows us to ensure the possibility of change by promoting the preservation of autonomy, since the specification of the connections that form between neurons is not contained in the genes but rather is the result of the interaction with the random nature of the environment. The permanence of the connections is, however, ensured by the same genes, as long as these genes are voted helpful and therefore are the result of a causal process.

If the intent associated with values is the ability to exercise free and responsible choices among a number of possibilities considered useful, it is necessary that the mind-brain system is taught to build a plurality of paths of choice. The intention, namely, finding expression in the assumption of models of voluntary action, cannot be considered something inherent in the human being nor something that emerges from simple interaction with the environment; rather, it must be regarded as the outcome of relational processes that enable or inhibit emancipation from the double imprisonment of “natural imprinting” – related to the construction of the neuronal structure based on experience – and “cultural imprinting” – the results of the cultural impositions, which Richard Dawkins

(1976) calls *memes*, or cultural replicators analogous to genes, to which can be attributed what Popper defines as our dispositional knowledge transmission, which is the result of certain behaviours from one generation to another.

It is clear that training models (memes) looking in a mirror can be traced to a single theoretical matrix in a closed cultural environment; however, when one is in a cultural context characterized by a plurality of viewpoints and positions, the risk is to encourage operations of a syncretistic nature between conflicting positions, with the consequence of disorganized and incoherent interventions. In this context, it seems necessary to recognize the educational training of trainers as a vehicle of memic transmission. This recovery does not seem to occur except through a rethinking of the design and persuasive function, and therefore the training/formality, as well as the heuristic function, of pedagogical knowledge that, in terms of research, seems to have unanimously adopted a statute regulating the awareness of its plurality and lack of uniqueness. With respect to the slope of initial and ongoing trainers, it seems to translate that number into one-way routes and not propose it in terms of possible alternatives. It is necessary, in fact, that the trainer, as a professional able to respond with action when faced with questions that appear incompatible or inconsistent, can respond by reflecting appreciation that others have considered similar situations (Stollo, 2008).

This reading of freedom, understood as a property that can be promoted or inhibited by the educational process, inspired recent experiments conducted in the laboratory of educational epistemology and practices. The paths workshop followed a different path than the implementation strategies of self-reflexive skills that are most commonly used because it does not begin with a biographical analysis of the experience; rather, it begins from a preliminary study and a systematization of knowledge of the educational process through the adoption of a comparative-synchronic analysis of the training models. This analysis precedes the choice and the development of an action model, i.e., explication that occurs strategically through the construction of a hypertext.

The comparative approach to training models experienced is considered, therefore, when the preliminary activation of self-reflection strategies and hypertext building operates a reconstruction-explication of the cultural path underlying the modelling process implicit in individuals. The course is aimed at the acquisition of strategies of self-reflection starting from an independent and responsible action that is the outcome of future conscious and critical choices, based on the understanding, control and management of as many alternatives possible.

In this context, the study in a synchronic-comparative key (and not only historical and comparative) of contemporary models of training one opens to the

possibility of a conscious choice not only of a reference model but also of the most appropriate operational tools, enabling more careful review of the same through the implementation of devices for self-reflection. This methodological approach allows future trainers to become active builders of the theoretical premises from which they interpret their own learning experience, rather than providing an interpretative framework outside of which their ability to make critical choices is limited.

The goal of the volume is to promote reflection on the variables involved in the educational process, facilitating the acquisition of more critical and independent research skills with regard to the specific pedagogical and social emergencies of our time.

The goal is to objectify the phenomenal consciousness for liberation from the constraints that guide it through the bi-cognitive allocation allowing individuals to be themselves and others to be themselves in the present, offering the possibility of self-definition. The unity of consciousness is increasingly the result of a recursive loop.

In our case, we question the dynamics underlying the learning processes in formal and informal contexts and how these processes are part of general skills that cover a set of multiple, complex, poly-distributed and allocated functions. Learning mobilizes many levels of mental organization that must be strictly adopted in the organization patterns of practical models of training to translate knowledge under investigation into background knowledge that includes everything that is taken uncritically for granted in the analysis of a problem.

1. Neuroscience and Pedagogy: What kind of alliance is possible?

The enactive approach has been developing over the last twenty years in the field of the cognitive sciences and sciences of education (Frauenfelder, 2004; Azzone, 2005; Blakemore, 2005; Strollo 2008; Dixon & Senior 2011; Vick & Martinez, 2011; Rivoltella, 2012; Beaton, 2013; Margiotta, 2014; Yoo & Loch, 2016) Therefore, intentionality has become central to research concerning cognitive processes. It rejects explanations of consciousness that omit the possibility of an internal/external dialectic. In fact, the enactive approach considers a *process* a result of a *structural coupling* (as a *pairing association* as Husserl would say) between the organism in its wholeness (perception, memory, emotion) and the environment.

The notion of the internal, as a logical system, in contrast to the external, as a source of information, must be left behind. However, we need to understand that if there is not a source of information, then there will not be the possibility of optimizing the adaptation. We have an overabundance of possible worlds, and there is not only one corresponding to the truth.

There is no need to choose between construction and representation to address knowledge as a problem of scientific research within the cognitive sciences. In fact, one can find the mechanisms demonstrating that it is neither construction nor representation but rather a co-definition or a mutual emergence (Varela, 1990).

A pedagogical reflection inspired by neuroscience may have different heuristic goals, or it may question both the educative processes and/or teaching/learning processes.

Interesting results achieved in the cognitive sciences constitute a turning point for teaching practices in schools. However, the difficulty of successfully applying the suggestions from laboratory studies must be underlined. In fact, it seems challenging to directly transfer neuroscience findings to the teaching

practice, which would be implemented only with a transdisciplinary approach to the study of learning processes in school.

As Fischer K.W., Immordino-Yang M.H. & Waber D.P. (2007, p. 4) argue, “there can be no direct transfer of insights from neuroscience and genetics to classroom practice, but only transfer mediated through a joining of practice with research. To connect mind, biology, and education, research must move beyond the ivory tower into real-life settings, and educational practices must be available for scientific scrutiny [...] For scientists to carry out useful research for education and for teachers to optimally educate based on research evidence require interweaving the perspectives of research and practice. Biology and cognitive science have as much to learn from education as education has to learn from them”.

The transdisciplinary approach starts from a conception of science as a “multiple unity”. According to this approach, knowledge becomes important because of the culture in which it can express itself while following, at the same time, the rules of its inner and unitary “*propre morphogénèse*”, thus rendering the disciplines its inseparable subsystems (Le Moigne, 1995).

The aforementioned approach suits the cognitive sciences borne of the aggregation of different disciplines such as artificial intelligence, linguistics, neuroscience, psychology and philosophy of the mind. Those subjects share the same focus on the study of the mind and cognition; additionally, they are in a synergistic relationship concerning this object of investigation.

However, in recent decades, due to a revival of Darwin’s evolutionism, we have understood that cognitive processes are much more diversified than we used to believe. On the one hand, this awareness has led to the consideration of one’s biological roots from a broader perspective. These roots would be in not only the brain but also the whole body and in the coevolution between the organism and the environment, between the body and the ecosystem. On the other hand, we are aware that is not possible to generalize strict techniques from neuroscientific studies.

Studies about cognition do not constitute an independent and united discipline; rather, they are characterized by a plurality of approaches ranging from cognitivism and connectionism, which explain the cognitive processes in terms of representation, to the enactive approach, which explains the same processes in terms of the production of meaning, with the awareness that there is a world that is inseparable from the body, language, and social history.

Pedagogical formation cannot exclude the cognitive dynamics behind human formation. A pedagogical point of view can be identified in a survey on intentionality, which we consider to be a necessary condition for every formative process in education (Fisher, Frey, & Hite, 2016).

In fact, we can define education as a process *intentionally* oriented towards change in individuals and in society. Education is born with man; it naturally belongs to the man who takes care of his baby and who has the intention of directing the baby's behaviour. This intention, which implicitly drives his purposes, is not always conscious.

The link between education and intentionality, or rather between the educational action and the motivation driving it, might be analysed from different points of view: starting from the assumption that every educational action is intentional, intentionality can be considered without any observational counterpart, and it opens up, in pedagogy, to eminently philosophical and theoretical approaches.

On the other hand, the neuroscientific approach explains intentionality as man's distinctive feature in relation to other living beings. It is a distinctive trait of the human organism, emerging from its encounter with the environment. This way of understanding intentionality enables pedagogical researchers to carry out empirical studies concerning both the process of change of people in formation and the models of action created by the trainers due to their educational background.

The opposition between these two approaches is linked to the traditional debate regarding the biological vs. cultural dominance on human action. Both of these dimensions – those concerning the trainer and those concerning the people in formation – have constituted the core of contemporary pedagogy over the last thirty years of the twentieth century. Moreover, they have been investigated through reflection developed, by contrast, in the philosophical and psycho-cognitive fields.

In the first case, the emphasis placed on the idiographic dimension of educational processes has sometimes led to difficulties in the translation of the theoretical discourse into strictly planned educational practices; in the second case, the accentuated curvature on the nomothetic dimension has generated perplexity towards the elaboration of too-rigidly generalizable formative strategies.

The pedagogical production of the last century's late seventies is a turning point from a pedagogy meant as a merely speculative reflection to a discipline meant as the synthesis of different contributions deriving from other disciplines concerning formative processes: a whole series of knowledge becomes part of pedagogy, constituting its irreplaceable *cognitive* base.

However, the pedagogical knowledge would have to start from various sciences, assimilating and orienting them through the analysis of the educational process, but pedagogy goes into crisis when it is confronted with other disciplines. In fact, it becomes deprived of its identity, being split into many specialized sectors without having a nucleus of unitary reflection that gives to pedagogy a disciplinary physiognomy.

We are observing a fragmentation of pedagogical knowledge in a plurality of sectors whose unity should be sought only on the practical-operational level.

The debate is still open, although it is possible to identify some areas of reflection that have significantly contributed to pedagogy's epistemological identity. In fact, some pedagogical "foundational" categories have been identified through critical, hermeneutical, and phenomenological approaches. Those categories are intentionality, reciprocity and responsibility, which return specificity and autonomy to the pedagogical debate despite highlighting the extreme precariousness and problematic nature connected to its theoretical and praxic "double radicality".

Pedagogy is praxic knowledge, since its epistemological justification lies in its openness to the future and in the transformative function. The object of pedagogy is not neutral. It is a formative experience in which normative and phenomenological values intersect, realizing its "objectivity" within a social, cultural and political context that gives it a meaning.

Therefore, no attempt at reconstruction can be exhaustive. It requires a constant interpretative effort. In other words, the trainer always lives (or should live) with a sense of precariousness because of the distance separating the level of planning, or one's "having to be", from the level of the concrete actions, or one's "being in the story". Starting from this tension, one can redefine the owned assumptions and hypothesis system based on the results of empirical analysis.

During the seventies, in the pedagogical field, there were already researchers supporting a possible 'meeting' between these 'apparently conflicting' assumptions. The researchers made a distinction in the pedagogical framework of those years. In fact, they were thinking of a fruitful integration between the 'biological constants', which can be found in the process of human formation by using empirical and experimental investigations, and a speculative reflection on the educational process in which normative and phenomenological values intersect, making partial some positions unilaterally oriented.

In this period, bio-pedagogical studies on learning processes were conducted. Distancing themselves from any explanation of human action in an exclusively genetic-causal or sociocultural manner, they underlined the complementarity of these two dimensions involved.

This complementarity scientifically guarantees human education when it finds its explanation in a biological thesis arguing the extreme plasticity of humans. In fact, human beings would go through continuous functional renovations defined in relation to physical and environmental interactions. From this perspective, learning depends on biological conditions only because of their instrumentality, which is considered the biological element that guarantees the cultural one, which is essential for the formation.

However, this approach to learning studies redeems pedagogy from its reduction to didactic support to the spontaneous maturation and optimization of the formative process set by nature. This approach highlights the “preventive” and “emancipatory” dimensions of the educational project, allowing us to solve the problem of its conditions of possibility more than the problem concerning methods and/or contents. Thanks to the analysis of the biological “mechanism”, one brings out the incidence of the cultural element on species and humans development and growth.

Starting from this premise, it has been possible to study pedagogy in depth and in synergy with biology, neuroscience, and cybernetics. All of this contributed to a more mature reflection on the dynamics underlying people-in-formation learning processes. However, the question concerning studies of consciousness is still open. This category is central to philosophical reflection and is rarely considered as a significant research object in the bio-cognitive sciences. Consequently, in pedagogy, this category is open to philosophical and educational contributions rather than to bio-pedagogical ones.

Therefore, the proposal of a neurophenomenology of education constitutes the result of an investigation that explored the possibility, even through the study of intentionality, of an integration between the objectifying approach of the cognitive sciences and the subjective experience lived in a phenomenological way so that it would create new and fruitful paths of investigation and pedagogical action.

The proposal of such integration comes from the observation that a new transcendental science indicated by the Husserlian phenomenological approach turned to a distinct and separate theme from that of the natural sciences, using “a new, radically new method, as opposed to the ‘natural’ one” (Husserl, 1908). Moreover, the spread of the paradigm of complexity, weakening the boundaries between human sciences and natural sciences, was introducing a non-reductionist approach to the study of man in the contemporary scientific scene to lead to a recovery and a revision of the anti-naturalist Husserlian positions.

The paradigm of complexity has underlined how the rational, linear and mechanistic conceptions, which are peculiar to the biological and physical sciences, presented considerable interpretative limits. The crisis of the “simple explanation” had traditionally connoted natural sciences, which took upon them the non-scientific residues of the human sciences – uncertainty, disorder, contradiction, plurality – attenuating, sometimes until it disappears, the traditional dichotomy between the natural sciences and the sciences of the spirit, between *Naturwissenschaften* and *Geisteswissenschaften*, and between explanation and comprehension.

This framework involves philosophical contributions grown in the cognitive sciences aimed at investigating the possibility of a new naturalized phenomenology, which would integrate the eidetic description of conscious experiences with the most recent scientific-experimental explanations. This approach implies that the phenomenological description would become an integral part of the biological explanation rather than constitute an antithesis (Dreyfus, 1982).

However, according to the previous debate, the encounter between psycho-pedagogical research and phenomenological research, even if educationally reconsidered, could only be “impossible” or very hard to find. In fact, during the seventies, a new existential and phenomenological trend that went against the rigidity of the biological structure of pedagogical cognitivism emerged. This trend refused to assume theoretical “a priori” because it wanted to rescue that dimension from the cultural, affective and relational experiences neglected because of the construction of widely generalized techniques and strategies.

On the one hand, we have those who sometimes assume the “exact sciences” method in an uncritical way, declining it on the educational side because of its responsiveness to technical and applicative goals. These goals are indicated by democratic and programmatic choices, which are achievable in a school “of all” and “for all”. All this happens because of a criticism of the “hidden” ideological structure orienting towards the pedagogical perspective when formulating formative functional models to perpetuate social inequality. Therefore, the issue is not about blaming the ideology’s “nature”, which is nonetheless recognized as “constitutive of human nature”; rather, it concerns the improper use of the latter related to education.

During the last thirty years, there have been many attempts to “reanimate” a pedagogy intended both in a technological-educational way and as a vehicle of knowledge to provide man’s education in its multi-faceted totality. Moreover, significant aspects from the bio-pedagogical perspective have contributed by highlighting the historical and cultural dimensions, identifying some biological “constants” and referring, in particular, to Piaget’s genetic parallelism, according to which ontogenesis recapitulates phylogeny. These dimensions are peculiar, both on a phylogenetic and ontogenetic level, to human education – and even to physiological education.

Therefore, the bio-pedagogical branches of research seem to open new investigative pathways to the study of intentionality, assuming the latter in an educational way as the engine of every formative process – formal, non-formal and informal.

The results of these studies, which led to the transition from *Kultur*, meant as a set of values transcending man and that can be recovered through the con-

templation and interpretation of the past, to *culture*, meant as a process of acquisition in which experience obtains a strong heuristic value, serve, according to some, to underline how formation cannot be reduced only to state, norm or theory, but rather that it is also something that “has to be done”.

Consequently, only a theory of formation, practicable as an intentional action or praxis, would satisfy the role of one-in-formation and of the intentionality, free will, power of choice and responsibility that lie under formation.

“Life praxis” is as important in man’s formation as one’s critical and hermeneutic ability. If this “life praxis” or, as Dewey says, this experience, refers to problematic situations that men address differently according to their motivations, needs, past experiences, then it will be possible to build a theory of formation that will practically start different and diversified interventions based on and respecting these individual differences.

We should pursue a synthesis of the theoretical dimension, which underlines the relational element existing between the individual’s environment and the lived experience, and the praxic dimension, which focuses on the organization of the educational offer, which concerns one’s needs. According to this approach, a pedagogical reflection around the concept of formation should be developed.

Therefore, starting from this interpretation of the pedagogical discipline, it seemed inevitable “to test” what was theorized from the study about intentionality in a phenomenological and neo-phenomenological way, constructing pathways that methodologically resumed the theoretical suggestions, translating them into trainers’ “experiences” of formation and self-formation.

2. Intentionality between phenomenology and the cognitive sciences

An *immediate* connection between the educational and neuroscientific perspectives can be supported by didactic goals, which are strictly connected to the management of education dynamics. It does not seem practicable according to the pedagogical perspective when we are in front of an object of research whose relevant aspects are manifold, complex and changeable because they are historically and culturally determined. The thought about the educational action, as intentionally oriented, needs to be demarcated and fenced to focus on what constitutes its essential, basic components.

Furthermore, we need philosophy mostly for the analysis of the basis of education. We cannot conduct science if we do not circumscribe the research object. However, Metelli di Lallo (1966) reminds us that a bio-pedagogical path should lead us to “discriminate between the delineation of features common to all men beyond the historical-environmental differences”, but it becomes necessary to refer to philosophy and to the philosophy of education in order to define which features one has to investigate because they are significant for the purposes of the pedagogical discourse, which, it should be remembered, is historically, culturally, socially and politically determined.

The research path addressing the drift of the bio-cognitive sciences is impervious according to the study of intentionality in general and of intentionality seen from an educational perspective, since the sciences addressing the nature of consciousness and intentionality find themselves lacking a univocal and always-convincing answer.

Studying consciousness constitutes a primarily methodological “hard problem”. Inside of it, the observed cognitive events are associated and intertwined with the experiential elements of the observer, and often, the study of this twine is left behind, reducing conscious experience to mere observed data: “The most difficult problem (the hard problem) of consciousness is the experience. When we think or perceive, there’s an enormous information processing activity, but

there is also a subjective aspect. As Nagel says, one feels something in being a conscious organism. This subjective aspect is the experience” (Chalmers, 1995, p. 202).

Addressing the problem of consciousness, a rich scientific production has formulated hypotheses explaining it as a specific property of the neural networks working in connection with each other. In fact, according to Francis Crick and his ‘Astonishing Hypothesis’, the oscillations that take place in the cerebral cortex in a certain frequency band would activate mental abilities such as self-awareness (Crick, 1995).

Nevertheless, according to Stuart Hameroff and Roger Penrose (1996), the microtubules, microphysical structures inserted in the cellular structure, would produce fundamental quantum effects in the functioning of consciousness, constituting a sort of self-organized network inside of each element in connection within the macro-nervous network.

These studies refer to consciousness in terms of “awareness”, “attention”, and a “mental image of reality” (*representation*), i.e., an entity that is explicit and shareable, rather than in terms of “intention” and “deep motivation”, which are not similarly communicable (Gallagher, 1996). The previously mentioned meaning of intentionality and consciousness is often believed, according to the cognitive sciences, to be lacking an observable counterpart and is therefore susceptible to a theoretical/speculative study rather than to an empirical/experimental study.

However, philosophy and specifically phenomenology show new research perspectives in the cognitive sciences: concerning the investigation of intentionality, phenomenology is seen from the perspective of the paradigm of complexity and free from the suspicious attitudes towards the natural sciences that currently, thanks to this paradigm, seem to have undergone a revolutionary transformation, which is, precisely, that of reflecting on cognitive processes!

Giovanni Piana (1966) argues that it would be totally incorrect to counterpose the reflective person to the perceiving one, presenting the first one as *abstract* and the second one as *concrete*. We need to refuse a naive opposition between abstract and concrete, understanding, instead, the different levels of our thematic abstractions and precisely defining their meaning. Finally, this consideration is valid not only for properly phenomenological research but also generally for every study, which must necessarily isolate an object, separating it from the concrete context in which it is inserted, concentrating on what it is in itself, and then eventually bringing it back within that context, thus having clarified its internal relations.

Phenomenological intentionality is *ab imis* the principle and the outcome of a “human” action that takes place in a time and space and whose first moment

is the perception: every conscious experience is, to a certain degree, perceptive consciousness; it is inhering things through the body (Merleau-Ponty, 1945, p. 194).

We do not already have a constituent consciousness of things, as idealism proposes, or a preordaining of things to consciousness, as realism proposes (given that what interests us is that they are indiscernible, as they both affirm the adequacy of the thing and of the spirit); rather, with our body, our senses, our gaze, and our power to understand and speak words, we have measurers of the Being, of the dimensions in which we can bring it back, and not a relationship of adequacy or immanence. The perception of the world and of history is the practice of this measure, the identification of their gap or our difference towards our norms. If we ourselves are in question in the development of our lives, “it is because we are” a perpetual enterprise of detecting ourselves in the constellations of the world and of things in our dimensions (Merleau-Ponty, 1964).

In any case, although phenomenology presents a sophisticated analysis of perception in all its forms – one might think about all of Merleau-Ponty’s work – it limits itself, grasping the intentional correlation of perceptive acts without saying anything about the actual structure of the acts themselves. In an open and reciprocal exchange relationship, phenomenology can therefore offer to the cognitive sciences a “process of exploration of the experience”, in which the cognitive sciences would confirm or revise certain intuitions related to the “phenomenal” consciousness, in particular to its being – according to the definitions that, even with different nuances, were given by Husserl and Merleau-Ponty: *constitutive* (constructive), *anonymous* (implicit) and *intersubjective*.

2.1. Intentionality’s constitutive nature

Husserl uses the term ‘constituting’ (konstituieren) analogously to its juridical meaning: saying, for example, that “I make a debtor in default” does not mean that I actually make someone become a debtor while he is not; rather, it indicates that I am giving, through my actions, a juridically formal qualification to the debtor’s *fact*, transforming an insolvency *de facto* into a declared insolvency, which is legally relevant. Doing so, I certainly will not give birth to the insolvency, and yet in a certain sense, in the sense of the juridical relevance, I put it into being: in short, I bring it into being in a new way.

In this sense, the constitutive nature of the intentional experience is taken up by Merleau-Ponty in the *Phenomenology of Perception* when the author states the following: perception is precisely that act which in a single part creates, with the constellation of data, the sense that links them - that act that does not

limit itself to discover the meaning that the data have, but makes sure that they make sense; the perceived object and the perceiving subject owe their thickness to feeling. It is the intentional plot that the effort of knowledge will try to break down (Merleau-Ponty, 1945).

One of the most important aspects for the pedagogical reflection on intentionality, which takes place in the Husserlian work and was confirmed by recent neurological studies on mirror neurons, is that one related to the interpretation of the body in terms of the sensory-motor apparatus as a generator of the voluntary act. Husserl faces this problem in paragraphs 38 and 39 of the second volume of *Ideas pertaining to Pure Phenomenology and Phenomenological Philosophy* (1859), in which the living body is defined in terms of the organ of the will of free movements: *Leib* (which has a layer of localized sensations) is the organ of will and is the only object that the will of my transcendental ego can freely and spontaneously move and that is a mean to produce a spontaneous and mediated movement of other things. For example, my hand, if spontaneously and immediately moved, can push, grab, raise, etc. Merely material things can only be mechanically moved; they are spontaneously movable only in a mediated line, and only the lived bodies can be spontaneously and immediately (“freely”) moved. This phenomenon occurs because of the free ego and its will, which inheres to the *Leib*. These free acts are those for which a world of objects is constituted, a world of bodily spatial things (and, in this world, also the *Leib*-thing). A person, which constitutes a correspondent of the material nature, is (as far as we have seen) an ego to which a living body inheres as a field of localization of its sensations; this ego has the “faculty” (I can) to freely move this *Leib*, or the organs in which it is articulated, and through them, to perceive an external world.

Husserl gives importance to the construction of the action, defined by neurosciences studies about coevolution as a hedonistic modality, based on the pleasure/unpleasure principle: the localization given by an immediate insight and the link to *Leib* that finds itself in this insight, do not belong only to the sensory sensations that are constitutive of the sensorial things, of the objects showing up in the space. Rather, they also relate to *sensations given by completely different groups*, for instance, “sensitive” feelings, feelings of pleasure and pain, the sense of well-being that runs through and fills the whole body, the general discomfort deriving from a “bodily indisposition”.

Here, therefore, groups of sensations for evaluative acts come together, as for intentional experiences of sentiment’s sphere, or for the constitution of values as intentional correlates. They all play a role of materials that is analogous to that played by primary sensations for intentional experiences in the sphere of the experience, or to constitute the space and thingness of the objects.

Moreover, several sensations become part of this field. Those are difficult to analyse and illustrate, creating part of the desire's life and will, energy sensations of tension and relaxation, sensations of internal inhibition, paralysis, liberation, etc. All these groups of sensations, as they are localized, have an immediate somatic localization, so that they belong in an immediately intuitive way to every man's *Leib* as one's own *Leib*, as a subjective objectivity that is distinguished from *Körper*, a merely material thing, through this layer of localized sensations.

From a philosophical perspective, neurophenomenological approach roots have to be found in the Husserlian and Merleau-Pontian phenomenology as well as in Heidegger's and Gadamer's early works: the term hermeneutics is understood as "enaction" or "production" of the meaning sprung from a knowledge's background, depending on the existence in a world inseparable from the body, language, and social history.

Human action is meant as the fulcrum of an incessant *process of signification*, which concerns not only cognition but also the historical and individual-emotional dimension, a process whose explicit nature goes along with action's implicit levels. The signification process uses – according to Merleau-Ponty's definition taken up by the cognitive sciences (Varela, 1992a) – "embodied patterns" that are not personal or peculiar to the individual who experiences them and uses them; rather, they result as culturally shared experiential modalities.

Enactive theory's core is the concept of an action that is perceptually guided. According to representationalism, the starting point to understanding perception corresponds to the problem, which is related to the elaboration of information and of the reconstructing world's pre-established properties. The starting point of the enactive approach concerns, instead, a perceiver's way of guiding his actions in his own particular situation. Because of the constant changes of specific situations due to the effect of the perceiver's activity, the reference point for understanding perception is no longer a pre-established world that is independent of the perceiver but rather the sensorimotor structure of the perceiver (Varela, Thompson & Rosch, 1991)

Enaction indicates that every human action (and every human action is intentional experience) is exclusively produced through sensory-motor manipulative acts. According to the enactive approach, perception is not only bounded by the surrounding environment, but it also contributes to the environment's effective activation, so that the organism, at the same time, starts off and is formed by the environment. (Varela, 1992b)

On the methodological level, it is possible to trace the adoption of a procedure very close to that proposed by the phenomenological tradition, since

the correlation between the subjective act and the data to which this act is addressed precedes and explains the separation between the thing and the ways in which the thing manifests itself. The subjective acts of perception explain the appearance of the independent reality of the thing and vice versa.

The study of perception does not include the consideration of a pre-existing world that is independent of one's perception. Instead, scholars consider the cognitive agent's sensory-motor structure, or the way in which the nervous system connects the sensory and motor surfaces (*ibidem*). The outside, or the environment, has a disturbing function that initiates the activation of perception, but when it operates in local situations, those functions constantly change because the subject of perception, namely, the sensory-motor structure, determines how this subject can act and how it can be modulated by environmental events.

The experience is not lived as *physical-computational* but rather as *embodied-dynamics*. Using the word *embodied*, Varela intends to highlight two ideas. First, cognition depends on the type of experience deriving from the possession of a body with different sensorimotor capacities, and second, such individual sensorimotor capacities are themselves included in a broader biological, psychological and cultural context. Using the word *action*, we want to underline, once again, that in lived cognition, the sensory and motor processes, perception and action, are fundamentally inseparable. These two aspects in the individual are not only contingently linked but are also simultaneously evolved (Varela, 1992b).

The enactive model's peculiarity does not depend, therefore, on the origin of the representations; rather, it concerns their development and their progressive transformation into knowledge, which is meant in terms of the "collateral effect" of experience.

According to the visual perception, what the subject sees "depends on how one is made rather than on how the world is made"; "perception is not simply involved and bounded by the surrounding world but it also contributes to world's enaction/production", so that the organism generates the environment and at the same time is shaped by the latter, i.e., "the events taking place at the retina's level only have the effect of modulating the activity of neuronal aggregates to which the retina is connected".

Therefore, it is simpler and more natural to say that the system acquires an internal coherence through its interconnections among different regions; this coherence is modulated by a coupling interface with the outside, such as the retina. The key of such a structured system is therefore the synthesis and diversity of its self-behaviours rather than the nature of the perturbations modulating them. For example, it is possible to show that, apart from exceptional cases, the

perception of a colour is virtually independent of light's physical features hitting the eye. The internal mechanism that defines the colour is a comparative operation between two levels of neuronal activity (Varela, Thompson & Rosch, 1991).

On the one hand, the fundamental role played in the cognitive processes by the individual "constructions" connected to the perceptual experience is the overcoming of the deterministic vision of the innatism (Varela, 1999, p. 270), after which the re-evaluation of the time's role and experience become evident. Learning from the other, namely, the disturbing role of the environment, which, precisely because it poses a kind of *confused problem* – to resume the use of the Merleau-Pontyan terminology – activates the same constructive processes.

Perceptual action, or rather the perceptual experience, must be understood as the outcome of the relationship between the inside and the outside instead of merely internal or external to the body. Internal is not related to the neural structure but rather to *the organism in its totality*.

2.2. Intentionality's implicit nature

Phenomenological intentionality must be meant in procedural and planning terms. "It is not a static consciousness-of, but it continuously and dynamically overcomes its own dynamic; it is not just *being*, it *works*; in every experience, intentionality *works* as an implicit project and, at the same time, as a retrospective look" (Brand, 1955). Intentionality is *anonymous* or, rather, *implicit*. In its constituting the objects of experience, in fact, intentionality does not pick them from nothing but rather explicates what first was implicit. In other words, "having consciousness" is not the same as "being aware"; the fact that an act is aware is a new quality that it can possess or not (Piana, 1966).

Therefore, Giovanni Piana claims that when we say that every subjective act has an intentional structure, we also want to understand the acts that I "inadvertently" perform "without realizing it", and so on (ivi, p. 93). The implicit nature of consciousness is also supported by Merleau-Ponty when he states that when perceiving, we will not think of the object and we do not think about ourselves while thinking of said object; rather, we inhere to the object and we get confused with this body that knows more than us about the world and the reasons and the means that we have to make the synthesis (Merleau-Ponty, 1945).

It is an aspect circularly connected to the constitutive nature of the perceptive consciousness: in what we call, in every moment, our reason or our ideas, we would always find, if we were developing all the presuppositions, experi-

ences that have not been explicated, masses of the past and of the present, a whole sedimented history that does not only concern the *genesis* of my thought but also determines its meaning.

Regarding the internal dynamics, the *emergency* principle introduces the possibility of considering each action as characterized by the co-participation between different *brain regions* (Varela, 1992b, p. 77), functionally distinct and topographically distributed, and their *sensory-motor incarnation* (Varela, 1999, p. 271).

Recent investigations, carried out in the neuroscientific field, have allowed us to support the change from a modular conception of the brain, both from the topological and functional point of view, to one that envisions it as operating through the simultaneous action of module fragments communicating with each other because of “resonance” phenomena: the occurrence of a resonance between cognitive subsets that act simultaneously, even if assigned to specific differentiated functions, brings out the cognitive configuration of the subject at that precise moment (Varela, 1995, p. 42).

These actions result in the impossibility of tracing a global process, such as conscious behaviour, exclusively to the local rules governing cerebral functioning: the *emergence*, or the *specific cognitive configuration*, manifests itself as a construction depending on a relationship between the *organism's totality* and the environment.

Consequently, the traditional notion of a cognitive agent, which collects information and decides on subsequent actions, is replaced by the concept of *transitory configuration* emerging in a moment and disappearing in the following moment, with this pattern continuing for every fraction of a second (ivi, pp. 43-45).

Talking about an emerging action is the same as saying that it is a continually changing structure, or the provisional result of a codetermination of neural elements and a global cognitive subject, and precisely because it is the product of a global process, it does not allow itself to be analytically decomposed in separate elements (memory, emotion, reason): “Ordinary life is necessarily one of situated agents, continually coming up with what to do faced with ongoing parallel activities in their various perceptuo-motor systems. This continual redefinition of what to do is not at all like a plan, stored in a repertoire of potential alternatives, but enormously dependent on contingency improvisation, and more flexible than planning. Situatedness means that a cognitive entity has – by definition – a perspective. This means that it is not related to its environment “objectively”, which is independent of the system’s location, heading, attitudes and history. Instead, it relates to it in relation to the perspective established by the constantly emerging properties of the agent itself and in terms of the

role such running redefinition plays in the system's entire coherence" (Varela, 1992c, p. 11).

From this, it follows that reason cannot be considered the central engine of cognition, while every prereflective, affective, non-conceptual, prenoetic aspect of human experience takes on importance. All cognitive phenomena are, therefore, also emotional-affective phenomena.

2.3. Intentionality's intersubjective nature

Entropathy (*Einfühlung*) is the core of the Husserlian phenomenology; it recalls the ability "transfer" to an organic body (which is foreign but which one recognizes as analogous to one's own body) the "localization" of one's own psychic acts. However, this attribution constitutes only the first step in an understanding of the other and of ourselves.

In introducing a psychicity into another person, I will be able to recognize it in myself: I am transferring in the objective living body, standing in front of me, the localization already internally accomplished in my body. Then, I will transfer the result of this first transfer onto me; thus, I am transferring the whole man-unity onto me.

At the same time, the ego distinguishes itself from another, recognizing the latter's unfamiliarity. In that, the ego experiences its being directed towards objects different from its intended ones: since the other body there enters into a *pairing association* with my body here and, being given perceptually, becomes the core of an appresentation, the core of my experience of a coexisting ego, that ego, according to the whole sense-giving course of the association, must be appresented as an ego now coexisting in the mode There, "such as I should be if I were there". My own ego, however, the ego given in constant self-perception, is actual now with the content belonging to his Here. Therefore, an ego is appresented, as other than mine (Husserl, 1859).

Pedagogical studies inspired by phenomenology have focused on this topic, claiming that the aim of the educational relationship wishes that the student were able to gradually implement an *Einfühlung* movement towards the educator, and more generally, in relation to the others: knowing that such perspective will only be possible if the educator will have spoken the educator's language, starting from his own experience.

The second section of this volume will show how the enrichment of the *Einfühlung* with the notion of specularity relates to the need for a recovery of the formal dimension of formators pedagogical formation as well as the informal dimension.

The intersubjective dimension, in any case, is closely connected to the anonymous dimension emerging from the analysis carried out by Merleau-Ponty, which regards the emotional expressions:

“The fact is that the behaviour associated with anger or love is not the same in Japanese and Occidental culture. Or, to be more precise, the difference in behaviour corresponds to a difference in the emotions themselves. It is not only the gesture that is contingent on the body’s organization, but it is also the manner itself in which we meet the situation and live it. The angry Japanese person smiles; the Westerner goes red and stamps his foot or else goes pale and hisses his words. It is not enough for two conscious subjects to have the same organs and nervous system for the same emotions to produce in both the same signs. What is important is how they use their bodies, the simultaneous patterning of body and world in emotion” (Merleau-Ponty, 1945).

The use that man makes of his body is not, therefore, directly related to his biological system: everything is both manufactured and natural in man, as it were, in the sense that there is not a word, not a form of behaviour that does not owe something to purely biological being – and which at the same time does not elude the simplicity of animal life, and cause forms of vital behaviour to deviate from their pre-ordained direction through a sort of leakage and through a genius for ambiguity that might serve to define man (*ibidem*).

It has been said that opening to the intentionality’s inquiry in the scientific field is indicated by the same philosophy. A first methodological indication comes from Merleau-Ponty, who states that our body is in the world like the heart is in the organism: it continuously keeps the visible spectacle alive; it animates it, internally nourishing it and creating a system with it. The phenomenological reflection, despite correlating consciousness to the peculiar sensory-motor structure of the human organism, does not identify it in it. This phenomenological reflection can be considered a consciousness emerging from the relationship among three distinct and related phenomena: the body, the world, the others.

Consciousness results from the relationship among these phenomena. It does not require purely materialistic explanations but rather methodological procedures taking into account its procedural nature connected to its emergence from the experience of the world in a determined time and space. Merleau-Ponty still offers us suggestions in this sense: as far as I have a body through which I act in the world, space and time are not, for me, a collection of adjacent points, nor are they a limitless number of relations synthesized by my consciousness, and into which it draws my body. I am not in space and time, nor do I conceive space and time; I belong to them, my body combines with them and includes them.

The organism and the environment, “sensitive and sensible”, need to stand in front of each other. If the sensation is not an eruption of the sensible in the sentient” but rather is the result of a coupling, of a synchronization between the internal and external, an analysis that takes into account only one of the poles of the relationship would only be partial or misleading. In fact, the external environment pays my body a confused problem. It is necessary for me to find the attitude that will enable my body to determine itself. In addition, I’m only doing it after its solicitation.

Thus, from the phenomenological analysis of the corporeity derives a fundamental methodological indication not only for the cognitive sciences but also for the pedagogy: it is impossible to study the intentionality disregarding the relationship between two poles, namely, the individual and the environment. Once phenomenology has come to support the inseparability of consciousness from human action, it becomes impossible to grasp subjectivity in its fullness exclusively through speculative analyses. It will be necessary to widen the research to that actuality in which the subject objectifies itself, to those real contents of movement portraying man’s worldliness and of which the so-called anthropological sciences, i.e., biology and anthropology, are addressed.

Therefore, empirical and transcendental analysis cannot be considered an opposing but rather a single analysis “aimed at understanding the wholeness of the absolute phenomenon, of the concrete experience of the authentically ‘human’”. Consequently, the empirical study of intentionality requires a particular methodological procedure: the intimate connection of human action with spatiality and temporality does not allow for an analysis assuming “theoretical a priori”, while it requires a temporary “suspension of judgement”. It requires, as well, the exercise of a systematic capacity to reflect in real time upon the phenomenon “as it appears”, which does not exclude the possibility of identifying “constants” that are common to a plurality of phenomena.

3. Neurophenomenology and didactics of Pedagogy

In the field of the evolutionist epistemology, formation is defined as the willingness to change, allowing a living organism to maintain its autonomy in different and dynamic environments.

It therefore presupposes a cognitive ability that immediately reacts to a great variety of situations. According to the enactive approach, defining the “human formation” in evolutionary terms recalls a concept of human action that, far from being susceptible to an objective and a mechanistic reduction, underlines how the subjective processes are closely connected to the historical and social environments in which they occur.

Form emerges in “successive interactions”. Far from being imposed on matter by some agent, it is a function of the reactivity of matter at many hierarchical levels and of the responsiveness of those interactions to each other. Because mutual selectivity, reactivity, and constraint take place only in actual processes, it is these that [...] make genetic and environmental influences interdependent as genes and gene products are environment to each other as the extraorganismic environment is made internal by psychological and biochemical assimilation, as the internal state is externalized through products and behaviour that select and organize the surrounding world (Oyama, 1985, p. 22).

The coevolutionary perspective starts from the consideration that in a simplified ecosystem, the adaptation is not imposed from the outside; rather, it emerges from a “dance” in which everyone constantly tries to adapt to everyone else. In this regard, M. Waldrop (1993) refers to the metaphor of the fly (prey) and of the frog (predator): to achieve coevolution between the frog and the fly, it is necessary for both of them to adapt their development and their behavioural strategies to those of the other one, which does not mean eliminating the conflict inherent in the relationship between prey/predator but instead maintaining a situation of *dynamic equilibrium in which both of the evolutions become possible*.

Therefore, in a stable ecosystem in which all the agents have adapted to each other, there is little evolutionary pressure to change. However, if one of the agents undergoes a change large enough to let it out of its equilibrium conditions, then it will cause a change in one of its neighbours, causing an avalanche of changes until each part stops changing and a new equilibrium is reached. [...] This explains why it does not correspond to the complexity of the real world the fact that the frog always tries to catch the fly with its long sticky tongue and the fox always chases the rabbit and so on. It happens, however, that if the frog evolves with a longer tongue, the fly must learn to escape more quickly, and if the fly develops a chemical substance to make it more unpleasant to taste, the frog must learn to tolerate it (Waldrop, 1993, p. 500).

Starting from the results of these studies (Holland, 1975; Brooks & Wiley, 1986; Buss, 1987; Bourguine, 1996; Waldrop, 1993; Kauffman, 1993), three types of human action have been identified: a reactive modality, a hedonistic modality and an educative modality, reflecting the cognitive levels that underlie the evolution of the human species.

The differences among the three constructive schemes depends on different cognitive factors that intervene when building the action. The reactive action does not require the use of particular cognitive strategies and allows for the adaptation to complex environments exclusively for very simple tasks. More sophisticated actions, carried in an evolutionary environment, require the elaboration of the action based on one's own experience, referring to a principle of pleasure/displeasure. This is the hedonistic level: because of self-reinforcing processes, the agent operates some anticipations to be capable of using new strategies. At a hedonistic level, these strategies are stiff and slowly evolving. The only way for an agent to modify inappropriate strategies in real time is *eduction*, which is the ability to mentally simulate future actions, regardless of one's direct experience or imitation, and starting from models of one's cognitive and symbolic functional dynamics to the strategies to be implemented. Therefore, education designates the agent's ability to simulate numerous cognitive trajectories when necessary and to self-learn from these virtual trajectories (Bourguine, 1996).

We should emphasize how intentionality is not considered, such as the reason for human evolution, but as a result: "*Human perception* of meaning and function in nature is an evolutionary product that has accompanied the emergence of *intentionality* from the physics of our brains. Human behaviour is largely determined by the capacity of ours to set up intentional goals and to make tools and other artefacts adapted to these goals. In any case, intentionality and conscious design, the result of the human and a few other animal species' evolution, are cognitive capacities exhibited by those species, but do not necessarily characterize the process of evolution itself" (Atlan, 1994, p. 143).

The limit for an isolated agent consists of the possibility of using models of action only built on the basis of one's experience: there is one way to build models, which are not just based on the individual experience, and it lies in the possibility of using models, which raise from the experience of other agents. It assumes a new ability, the *specularity*: one was thinking, modelling and reasoning, in a given situation, as the others would think, model, reason in the same situation. This is one of the main aspects of the notion of *specularity*, which is useful to analyse the cohesion of human societies. When addressing a new situation, the human being builds up models as a function of what one observes but also, and above all, as a function of what one thinks that the other people would modelize if they were in one's shoes.

One of the most important elements of enactive formation is the intersubjectivity, the complementarity of different selves involved in the formation processes. *In fact, one of the distinctive elements of superior primates would be to excel in providing an interpretation of another person's mind.* This ability represents a particular kind of intelligence connected to the understanding of mental states, such as desires, intentions and beliefs, based on the bodily presence of the other, or to one's face, posture and sound (Varela, 2000, p. 12).

Therefore, the other person is assimilated, not as an object but as another similar subjectivity, an *alter-ego*, sharing the same organic structure embodied in the same vital field: "this dual dimension of the body, which is organic and lived, is the basis of formation and 'human evolution', meant in terms of co-evolution".

At this point, integrating Piaget's genetic parallelism with the studies on coevolution supports the coexistence of three modes of constructing the action – reactive, hedonistic and eductive – which, individuated at the phylogenetic level, would also constitute the basis of the processes of change on the ontogenetic level: when developing, the reflexive modes of action, peculiar to a more mature age, would not take the place of the reactive modalities, implying a lack of reflexivity that is peculiar to the first years of life, but rather would cohabit with them.

For example, Mounoud's theory starts from Piaget's stage theory, revising its basic structure especially with regard to the conception of the sensory-motor stage, in which consciousness and intentionality are considered transients' phenomena that are necessary for all developmental and learning processes rather than constitutive phenomena of psychic mental structures (Mounoud, 1990, p. 206). It follows that not all actions need a reflexive consciousness, but there are direct and immediate behaviours, which does not mean that the behaviour is defined by the structure of information but rather that there would be an optimal adjustment between the organization or the structure of the col-

lected stimuli and the organization of the action procedures of the subject (*ibidem*).

We can therefore consider the process of formation in terms of an alternation between the *adaptation phases*, which are characterized by reactive and implicit behaviours, and the *reorganization phases*, which are characterized by “transitory awareness traits giving to the behaviours an active, intentional and explicit nature”. Therefore, “we are faced with the following paradox: adapted behaviours do not make intentionality intervene, as an active production of connections or involvement relations”; it only implicitly happens. “In contrast, the behaviours manifesting a maladjustment are those that simultaneously manifest one’s ‘intelligent’ abilities and the phenomena of consciousness” (*ibidem*).

Starting from these premises, in part, we both have to accept and reject the reductionist idea of intentionality, recognizing, at the same time, the physical nature of the mind-brain system and the impossibility of predicting the activities of the neurophysiological processes on the basis of the knowledge of neurophysiological processes that are responsible for voluntary behaviour and human freedom.

Mind is here understood according to the definition given by A.R. Damasio in his *Feeling of What Happens* (1999), including conscious and unconscious operations. It is a *process*, not a thing. What we know as a mind, with the help of consciousness, is a continuous stream of mental configurations, many of which are logically linked. The flow moves forward in time, quickly or slowly, in a regular manner or jumping, and from time to time, it advances along several currents. Sometimes the currents proceed in parallel, sometimes they converge and sometimes they diverge, and sometimes they overlap (p. 407 sgg.).

Therefore, mental activities can be considered the result of *chaotic-intentional* processes, where chaos does not represent the absence of objective causes but rather the inability to accurately identify said causes in the casual-linear sense, which are complex phenomena such as education. The notion of deterministic chaos does not indicate that the phenomena to which it is applied have characteristics of unintelligibility or incomprehensibility but only that they require particular instruments of analysis, and therefore, it does not weaken at all the determinist conception of the world; rather, it constitutes a support. Introducing chaos overcomes the conflict between the strictly deterministic-mechanistic vision of the world and the existence of human freedom, which would apparently be incompatible with deterministic laws.

It is a model applied to those systems with three main characteristics:

- a) they are subject to the simultaneous action of many factors;
- b) microscopic variations can be accompanied by macroscopic effects;
- c) the initial conditions of the system are not exactly known.

The result of the coexistence of these factors lies under those imperceptible causes that have macroscopic effects. Therefore, in a chaotic system, there are phenomena that obey deterministic laws, but due to the multiplicity of variables, such phenomena can be only globally understood and analysed *a posteriori*.

Regarding the mind-brain system, the chaotic-intentional perspective originates from the assumption that voluntary behaviour results from the activation of preferential neuronal circuits, gradually constructed from the experience, but it cannot be reduced to those circuits since it reflects the possibility to choose some circuits among the others (varying the system's information content) and a tendency to a subsequent stabilization of the choice. The interaction with the environment and the evaluation is followed by the choice (or selection) of the structures that are more efficient or more suitable and then their stabilization and their reinforcement, that is, the production of other similar structures, but even more efficient and in greater numbers.

Thus, the system increases the number of structures with a greater functional efficiency, as well as the overall efficiency of the system and its information content. Concerning the mind-brain system, variability and instability are related to the fluidity of synaptic connections within neuronal networks, and fluidity causes a continuous interruption and reformation of the connections. The mind-brain system can be seen as an extremely fluid network made of trillions of synaptic connections, subject to a continuous reorganization and self-organization, as a result of the lived experiences, in parallel both with the performance of the functional tasks and independently from said development (Azzone, 2005, p. 127).

The neurophenomenological reading of intentionality highlights the concept of specularity, a peculiar characteristic of the human organism, which *in absentia of action models based on the personal experience, allows for the development of action models based on what we think that another person would do in the same situation*.

This ability is reflected in the activation of specific neuron circuits, namely, the mirror neurons, which allow, when the subjects interact with each other on an elementary level, the correlation between the observed movements to one's own movements and to recognize the meaning, on a more complex level, to understand the intentions and emotions of the other person starting from our motor skills.

The observer's act is a potentiality caused by the activation of mirror neurons, which encode the sensory information in motor terms and make it possible that 'reciprocity' of acts and intentions that constitute our immediate recognition of the other gestures' meaning. Understanding people's intentions' here has nothing of the 'theoretical', but it lays on the automatic selection of those

strategies of action that, according to our motor skills, become always more compatible with the observed scenario (Rizzolatti & Sinigaglia, 2006, p. 127).

Starting from these reflections, we can affirm that they certainly affect trainer's implicit pedagogical theory. It is not only about life experiences, which generate a gradual construction of *preferential neuronal circuits* that represent the biological foundation generating voluntary behaviours. Most of the effect is given by the formation models used in the context of formal training courses, to which the trainer looks in a specular way in the construction of strategies for action. This results in the emergence of a dual determination, biological and cultural, which, precisely by virtue of its dual value, opens the way to pedagogical interventions aimed at trainers and aimed at revising the processes of modelling the educational action.

Only an approach balancing autonomy and heteronomy makes a project of education feasible for free and responsible choice, which is played between change and resistance to it. The biological perspective allows us to guarantee the possibility of change by promoting the conservation of autonomy since the specification of the connections forming between the neurons is not contained in the genes; rather, it results from the random interaction with the environment.

Connections permanence is guaranteed by genes as long as they are "deemed useful". Therefore, this is the result of a *causal* process: genes provide the specifications for those processes arousing the growth of immense populations of neurons – a number of neurons higher than what will be actually used by our brain – and said neurons emit random exploratory branches. Thus, many of these neurons connect to other neurons in useful ways (considered useful by the unintentional processes of brain pruning). These successful connections tend to survive, while the missing connections die, so they are dismantled to recycle their parts a few days later for the next generation of promising neuronal development (Dennett, 2003).

As previously stated, a bio-pedagogical study about intentionality did not refute the theoretical assumptions outlined by the traditional pedagogical investigation; rather, it constituted a deepening of the latter.

Reinterpreting some authors gives to the research a new perspective. We refer, for instance, to Husserl and his *Cartesian Meditations* or to Merleau-Ponty with the *Phenomenology of Perception*. Somehow, those authors support the possibility of deepening the studies about intentionality, which is embodied through contributions ripening in the cognitive sciences. On the other hand, a chance is given by the most recent and mature suggestions of the bio-pedagogical investigation that, owning the paradigm of complex dynamic systems, overcome a mechanistic perspective of education. Therefore, opening to a problematic interpretation of the individual-environment relationship, ac-

ording to which the environment that triggers the dynamics of change, is “metabolized through a device that is certainly much more intricate and complex than the adaptive operation”.

During the 1990s, Frauenfelder carried out significant studies in this regard, starting from Maturana’s and Varela’s hypothesis, according to which living beings are autopoietic systems that are able to produce their own identity. Frauenfelder claims a “radical redefinition of the concept of adaptation that, according to the traditional definition, used to consider the environment as the origin of the system changes”; in this sense, the input-output scheme is dominant, and the adaptation is defined as a response of the system to the needs of the environment. In the new sense, however, what becomes a priority in adaptation is the preservation of the autonomy of the system, that is, the conservation of the vital cycles defining its organization” (Frauenfelder, 1994, p. 94).

Interpreting the environmental effects on the human system in terms of “perturbations” has generated various pedagogical implications. Traditionally, in fact, the environment stimulates an adaptive force in the relationship, which affects, or it is supposed to affect, the construction of learning with a quantitative-qualitative push, closely linked to the input, depending on it.

This “game”, despite articulating between two elements and depending on both elements, finds in the environment something that influences learning, and this not only for the direction that originates from the latter (the result) but also for the modalities (the process), which, despite being very articulated and differentiated, are built in a close relationship with the external.

In contrast, when the input is lived as a “perturbation”, it triggers an autopoietic defence process responding to the input by restructuring the subjectivity in its entirety. In this passage, in which the maintenance of one’s subjective being is preponderant, the output becomes, above all, a product of the biological subject.

This branch of bio-pedagogical research seems to embrace new investigative paths for the study of intentionality, assuming the latter in an educational way, or meaning it as the engine of every formative process, whether it is formal, non-formal or informal, and denying the possibility of a reduction of consciousness to forgetful explanations of the possibility of an internal/external dialectic, to which a process-based reading is opposed, as the result of a structural coupling between the organism in its totality (perception, memory, emotion) and the environment.

From these assumptions derive three aspects of intentionality: its being a *constructive*, *implicit* and *intersubjective* element of human action. These dimensions, fully examined by Husserl’s and Merleau-Ponty’s philosophical reflections and reinterpreted because of experimental studies carried out in the

cognitive sciences, seem to offer considerable suggestions to the reconsideration of intentionality in an educational key.

These dimensions support the opening of the bio-pedagogical discourse in relation to a reinterpretation of the formative processes from the historical, cultural and biological perspective, and those dimensions support this openness because the “biological constants” underlying the intentional processes and set in the human organism direct towards a reading of the formative process in terms of *spatially and temporally defined experiential process*.

Starting from these premises, it is necessary to rethink formative strategies, and above all, education’s meaning and its “purposes”. The consideration of intentionality as emerging and as a co-definition between the subject and the environment involves the partial surrender of an investigation that, apart from the individual relational contexts, is able to provide “certain” and generalizable data when formation models are formulated according to a theoretical/practical value. This process culminates in the awareness that formulation’s guide line has to explicitly descend from “purposes” as well as from “data”.

Therefore, it is not about “finding in reality” (in a reality somehow investigated and caught in different ways) the foundation of value and of the educational action, but finding, instead, in the value the foundation of reality of education. Elsewhere, we have already pointed out (Strollo, 2004) how this perspective leads, in the field of theoretical and educational research, to the necessity of a pedagogy “speaking in first person”. In other words, one has to be aware that, in every speech construction – even of the pedagogical discourse – a decisive role is played by intentionality, which has to be always be explicated, in any context within which our “point of view”, our “stance”, or our “choices” are expressed.

In fact, research and pedagogical formation intervene in “the theoretical and cognitive apparatus, the preferences, the researcher and/or subjects involved and their choices of merit and the assumptions of awareness of their constant possible transformation; in particular, the knowing subject should construct the research based on one’s theoretical reference system, on choosing theories that allow for the identification and definition of the epistemic objects, the intersubjective exchange between interpretative models”.

One has also to reorganize oneself and one’s research because of the interferences that the “case” presents as unpredictable conditions of change. Thus, when researching, we are able to overcome the empirical residue that investigates to confirm a hypothesis with facts to enhance the researcher’s autonomous and original constructive activity in the aspect of conscious choice of categories, theories and procedures and the subsequent coherent selection of systems intervention strategies.

A “pedagogy” that speaks in first person is, therefore, a “pedagogy” that assumes the ethical responsibility of its choices and of the underlying demands and, at the same time, while aspiring to approval and sharing, recognizes their partiality; it is a pedagogy that respects the plurality of points of view, recognizing their existence, and even encouraging it, even when it does not share the others’ proposals.

We assume that every human action, regardless of its nature, as a result of intentionality, implies a choice. Therefore, the problem does not concern as much one’s right of individual choice as avoiding the transformation into an “antecedent and final structure”. We need to explain the choice reasons’ to take responsibility in the first person. Since we are creatures with lives to live and find ourselves within an uncertain environment, we are constructed to note and judge in terms of bearing upon weal and woe upon value. Acknowledgements of this fact is a very different thing, however, from the transformation effected by philosophers of the traits they find good (simplicity, certainty, nobility, permanence, etc.) into fixed traits of real Being. The former presents something to be accomplished, to be brought about by the actions in which choice is manifested and made genuine. The latter ignores the need of action to effect the better and to prove the honesty of choice; it converts what is desired into the antecedent and final features of a reality that is supposed to require only logical warrant to be contemplatively enjoyed as true Being (Dewey, 1958).

In other words, the constructive, implicit and intersubjective nature of human intentionality, although supported by a bio-pedagogical approach allowing the identification of its root in the human biological system, generates pluri-directional and pluri-articulated pedagogical suggestions responding to specific cultural and political questions. The following reflections do not constitute an a historical and generalizable path, according to a vision of gradual and cumulative progress of the pedagogical knowledge, but rather a need to rethink the intentionality underlying the formative processes in response to a cultural and democratic question. According to a democratic viewpoint, the bio-pedagogical reinterpretation of intentionality produces, in first instance, a twofold path of reflection concerning two segments of inquiry – closely interconnected – to which a reference was made at the opening of the lecture: the role of intentionality in dynamics underlying both people-in-formation processes of change and the modelling processes of the training action. Concerning the first segment, we have to pass through a conception of the formation process meant as a *social strategy* aimed at achieving a “permanently optimized” equilibrium of individuals with society to a conception that means it in terms of a *relational strategy*, essential to take part to the *permanent and disturbing* evolutionary process of the environment. Equilibrium here is not the correspondence between the in-

dividual attitudes and performance needs expressed by society at a certain historical moment but rather the subject's ability to actively participate in social change. In other words, the ability to balance the environment is achieved in the *management and production of innovation*. For a long time, the formation process has been interpreted in terms of the *stable optimization of the relationship between the individual and the social environment* through the use of heteronomous or autonomous strategies. In the case of heteronomous strategies, we start from the assumption that at the origins of individual actions, a decisive role is played by the cultural and economic constraints posed by the environment.

For example, in the approaches of a structuralist mould, the formative intervention is entirely based on intentionality, which is expressed from the outside, and it is very often limited to supply the subjects in formation with useful information to benefit from the environmental "possibilities" to build a more "secure" project of the self.

In the second case, when the formative intervention aims at stimulating one's autonomous strategies, the individual autonomy, in relation to the environmental constraints, increases the "diagnostic" nature of the formative intervention, without leaving space to the needs expressed by sociocultural contexts.

Formation in terms of *relational strategy*, aimed at active participation in the evolutionary process of society, implies that individual actions have to emerge from the individual/environmental relationship. According to this hypothesis, in fact, the need for social and cultural integration certainly constitutes a limit to the autonomy of the individual and to his or her "originality", as it creates cognitive paths and circuits that are consistent with one's belonging culture and eliminates countless potentials (Morin, 1990).

Often, individuals, even in the most closed cultural environments, passively obey the social order and cultural injunctions (ivi, p. 25). Every individual, in the process of formation, retains a potential for autonomy and divergence with respect to social norms and the dominant culture that allows one to resist cultural imprinting and to participate actively in the process of social evolution.

E. Morin recalls that, when in a *democratic climate* "the dialogue of opposing opinions" is established, the ascendant of the environment is reduced, and "plurality", "separations", "oppositions", "polycentrism" are introduced. Thus begins appear "the imprinting cracks, the breaches in the system of reduction and change of invariance, the jams in the normalization. All this enlarges the 'individual autonomy'; room. At this point, the subject is able to use one's 'potential for autonomy' beyond the confines of the 'private room'" (ivi, p. 40).

In other words, in a democratic climate, formation is *the product of the way in which the subjects plan their lives in spatially and culturally determined contexts*; therefore, the formative intervention aims to acquire critical planning

of the self, which is played between conservation and change. We outline a sense of intentionality so that the subject in formation is induced to grasp what the real formative possibilities are. This process occurs through interventions aimed at developing the ability to plan one's life in a flexible and open way to change, to produce and cope with innovations, and to actively participate in social, cultural and economic evolution. Hence, it derives a turning point in pedagogical research: the latter cannot limit itself identifying social, cultural and historical constraints that trap the individual autonomy, but it also has to build conditions that mitigate normalization.

These conditions are realized within a “cognitive democracy” that recognizes, but at the same time, it is able to weaken, the nature of sociocultural determinations that present themselves in a double aspect. On the one hand, those are “positive” because they prescribe what one has to think and know; on the other hand, they are “negative” because they exclude what one does not have to think nor know. “This ‘negative’ nature recognizes the invisible presence of the virtual, which is not physically manifest. In fact, every system equipped with regulation, that is, of deviance cancellation, is a system that continually eliminates a virtual one that could or would like to access existence” (ivi, p. 84).

In this regard, Stuart A. Kauffman in *The Origin of Order: Self-Organization and Selection in Evolution* (1993) formulated a coevolution theory distinguishing between three different equilibrium regimes: an ordered regime in which everyone is at the peak of adaptation and in perfect mutual coordination, but in which the peaks are moderate; a chaotic regime in which “every time I make a change, I put you in trouble, and vice versa. We never reach the heights because you keep throwing me backwards and I do the same with you, like Sisyphus who tries in vain to push the rock to the top”; and a regime of chaos in which the process of coevolution leads the system towards a maximum situation of adaptation.

Therefore, starting from a regime of chaos, it begins an orienting process meant as an evolutionary change, rather than a static, orderly, “steadily optimized” equilibrium regime.

We have to give away “optimality”, looking for something that works. Many people complain, saying, “So are you giving up the best for something worse?” No, because optimization is not better defined. What we are trying to do is to maximize the resistance, or the ability to survive, in front of a poorly defined future. This makes it more important *to achieve the greatest awareness of non-linear reactions and random paths*. The world is scrutinized, and lasting circumstances are not expected (Waldrop, 1993, p. 583).

Now, in the coevolutive perspective, every evolution starts from a virtuality accessing existence, assuming the shape of deviance, thus becoming a trans-

forming tendency. Deviance assumes here a positive value: if “deviance” is synonymous with autonomy, from the pedagogical point of view, it becomes a priority to operate on those traits that present themselves as peculiar characteristics, expressing energy and emotions, inhibition, and non-reflexiveness in order to channel them towards socially acceptable paths, while leaving the peculiar subversive and non-conformist character unchanged.

However, for an individual to enjoy these permissive conditions, one had been able to take advantage of multiple and multiform possibilities, in one’s education or ineducation, in the relationship with one’s family and friends, when meeting a possible protector or in the solution of one’s vital problems, in the overcoming or in the sublimation of one’s inner conflicts, in the stimulus represented by unexpected events, in the favourable conditions of research or meditation (Morin, 1991, p. 53).

In *Experience and Nature*, Dewey (1958) lingers on the perennial oscillation between surrendering to the external world and the affirmation of the internal world that conditions individual existence. Dewey claims that only an individual who does not feel in balance with the environment is then able to change in first person and transform the context of belonging:

Thus, an individual existence has a double status and import. There is the individual that belongs in a continuous system of connected events that reinforce its activities and that form a world in which one is at home, consistently at one with its own preferences, satisfying its requirements. Such an individual is in its world as a member, extending as far as the moving equilibrium of which it is a part lends support. It is a natural end, not as an abrupt and immediate termination but as a fulfilment. Then, there is the individual that finds a gap between its distinctive bias and the operations of the things through which alone its need can be satisfied; it is broken off, discrete because it is at odds with its surroundings. It either surrenders, conforms, and for the sake of peace becomes a parasitical subordinate, indulges in egotistical solitude; or its activities set out to remake conditions in accord with desire. In the latter process, intelligence is born not mind which appropriates and enjoys the whole of which it is a part but mind as individualized, initiating, adventuring, experimenting, dissolving. Its possessed powers, its accomplished unions with the world, are now reduced to uncertain agencies to be forged into efficient instrumentalities in the stress and strain of trial. The individual, the self, centred in a settled world that owns and sponsors it, and which in turn it owns and enjoys, is finished, closed. Surrender of what is possessed, disowning of what supports one in secure ease, is involved in all inquiry and discovery; the latter implicate an individual still to make, with all the risks implied therein. Arriving at new truth and vision is to alter. The old self is put out and the new self is only forming, and the form it fi-

nally takes will depend upon the unforeseeable result of an adventure (Dewey, 1958, p. 183).

Starting from these considerations, the formative intervention cannot subordinate oneself to an external norm, but rather, it has to help oneself achieve one's potentialities, even in the awareness of the limits posed by the environment.

This perspective undermines many of the criteria that have governed the formative relationship, first of all its "optimization", understood in terms of anticipated planning, according to the canons of an adaptation theory, tending to the a priori selection of the significant inputs for learning, or a radically constructivist theory that focuses on the diagnosis of the organizational needs of the learning structure, developed by each individual.

However, it becomes a priority the attention given to the phenomenological datum meant as a space of "formative possibility", where paradoxically, it is the act of maladjustment that can lead to an evolution of the relational context.

A pedagogy that speaks in first person and that uses as internal regulatory devices those same instances of which it is a spokesperson – tolerance, sharing, dialogue, the legitimacy of the plurality of points of view – is concretized in paths that enable future trainers to make conscious and critical choices through the understanding, control and management of as many alternatives as possible, since only this makes man truly free: increasing the spectrum of possible choices, transforming individual and contextual constraints in resources for self-orientation.

It seems to be a concrete way to spread an idea of pedagogy that is not unilaterally resolved in a "pedagogy of the subject" or in a "pedagogy of the environment", becoming instead, a "pedagogy of the relationship". If it is true that all knowledge emerges from a specific context of relationships, then it is necessary that the trainers are aware of their relationship with knowledge, recognizing their limitations and temporariness. They have to open themselves to the *umbildung*, without ever losing that multiplicity of points of reference related to the political and cultural context in which their experience goes on and will be developed.

Regarding the role of intentionality in the processes of modelling the formative action, the emphasis on the three dimensions, which are the constructive, implicit and intersubjective dimensions peculiar to the human being, underlines how each individual model of formation is influenced by intuitive and scientific theories disseminated in a specific historical period.

Trainers, while becoming aware of that "knowledge" which is peculiar to one's belonging culture, confront themselves with interpretation models deriving from different theoretical matrixes of the formative process. They also com-

pare themselves with models that present some conflicting operational repercussions, depending on the perspective assumed when those were formulated. Said models integrating themselves with the implicit pedagogy will constitute the future trainer references', whom one has to look in a specular way while building strategies for action.

Regardless, in a "closed" cultural environment, the action models refer to a single theoretical matrix. In contrast, in an environment characterized by "complexity" (meant as the coexistence and legitimacy of a plurality of perspectives, corresponding to multiple assumptions), the first need is to distinguish between models of different matrixes, to avoid a synthesis of conflicting positions, according to a cumulative view of knowledge, giving rise to disorganized and inconsistent strategies.

A few words must be spent about the awareness of the action model's implicit nature. This thesis has introduced in the last decade's pedagogical landscape a multiplicity of practical and operational paths aimed at forming the trainers, attributable to the narrative and autobiographical branches. These are strategies that recognize the role of the personal experience in the development of models for educational action.

However, the autobiographical dimension does not exempt from the formal dimension's recovery of pedagogical trainers' formation. This recovery seems to occur through a rethinking of the planning and persuasive function, and hence of the formative/formal one, as well as the heuristic, of pedagogical knowledge.

A conflict between theory and praxis is then outlined: pedagogy seems to have unanimously assumed, concerning the research, a disciplinary status conscious of its plurality and non-univocity. On the other hand, the initial and ongoing formation of trainers seems to translate this plurality into unidirectional paths, unsuspecting of "possible alternatives", sometimes risking denying, "in the name of complexity", the complexity itself.

Opening to the analysis of contemporary training models (according to a synchronic-comparative perspective and not only a historical-comparative one) provides the opportunity to consciously choose both the reference model and more adequate operational tools. Therefore, it will be possible to carefully review these tools through the activation of self-reflection devices.

Finally, the comparative approach to the models of formation, while admitting its political and cultural "non-neutrality", seems to allow the trainers to become active builders of the theoretical assumptions useful to explaining their formative experience, rather than providing an external interpretation framework that would limit the possibility of critical choices and therefore the "freedom" of the trainer.

The trainer is essentially required for reflection and self-reflection. One needs to be continually challenged to bring out and criticize the tacit understandings arising from the experiences of a practice mostly marked by repetition. If it is true that previous experiences condition the individual biographies and determine the subsequent decisions of one's action, however, it is necessary to plan one's actions also depending on the specificities of the context (Jarvis, 2004, p. 61 sgg.). Concerning this segment, educators' initial formation collides with a representation of the psychological, pedagogical and didactic disciplines that give rise to system of expectations. Sometimes, we focus more on the acquisition of techniques and practical strategies that can be generalized rather than on the enrichment of theoretical reflection and on the acquisition of a self-reflexive competence concerning one's professional action.

Therefore, it is not considered that educational practices, in order to be "scientifically" managed, controlled and evaluated, require a theoretical awareness regarding the educational process from which to choose the most suitable tools for their achievement.

We often expect traditional scientific strategies, which can be generalized in every educational context, thus allowing for the achievement of formative objectives. These objectives are identified through the traditional measure of attention and the quantitative acquisition of contents or through an uncritical assumption of behavioural attitudes, sometimes with a clear nostalgia for the "good old days", in which education was regulated by norms shared by trainers and subjects in formation or to which the subject in formation was passively adaptable.

In fact, the reasons for the gap between the educational agencies' formative provision and the response to the latter by the new generations are primarily socio-political and cultural before they are technical. Let us take the school as an example: the distance between what happens inside and outside the school becomes more and more consistent, without the school being able to open itself to the economic, political and cultural changes of the processes underlying the modification of society structures' (such as immigration, family, role of women, political manipulation of sources of information, etc.).

In front of these changes, schools' educational proposals remain largely unaltered if compared to the past. Thus, the spectrum of the cultural downfall, feared because of the mass education process, has become an irrefutable reality today. That happens because the schooling process was not followed by a crisis of schools' elitist conceptions in terms of content and methodologies.

In evolving societies, the school can no longer be understood as a place of transmission as in static societies but rather as a ground of effort and meeting

for the analysis and re-elaboration of cultural contents, so that a “critical” formation of the learners should take place. For example, there might be people who are open to change and who are capable of adapting to new situations – which are unpredictable in a civilization in continuous rapid and accelerated change and development – in the sense of being themselves in continuous innovative growth in harmony with the progress of which they are operating subjects.

On the other hand, the school continues to be the place where a rigidly disciplined culture is transmitted. Even those who are unrelated to it disregard the contents of the experience in most of the students. This is a legitimate model too, but not the only possible one.

Currently, in the pedagogical discourse, we are faced with a plurality of models that define different and often conflicting goals – consider the debate on the history texts or that concerning the possibility of excluding the Darwinian theory from the scholastic programmes – but all them are, at the same time, legitimate. In fact, they are the expression of different cultural and political points of view, and it is necessary for the teacher to take a position on those point of view. One has to know the historical, political and cultural origins, the precedents that contributed to their genesis and physiognomy, before worrying to acquire the most suitable technique for achieving the objectives identified by the models themselves.

One of the pedagogy tasks of is to train the educators, including teachers, to identify the links between the reflection on the different pedagogical models and the practical and operational consequences that derive from them, analysed in depth and not superficially through common sense. It is a matter of teaching trainers to continually reckon with their beliefs and personal reasons and to take responsibility for them in terms of defining the objectives and the identified training strategies. Definitively, it is about making up the conditions so that constant feedback can be created between the individual, his or her profession and society.

This exchange can be greatly amplified by conscious self-reflection. The process of learning – of the growth of subjective knowledge – is always fundamentally the same. It is *imaginative criticism*. This is how we transcend our local and temporal environment: by trying to think of circumstances beyond our experience; by trying to find, construct, invent and anticipate new situations (that is, test situations and critical situations); and by trying to locate, detect, and challenge our prejudices and habitual assumptions (Popper, 1972).

From what has been described, a need has emerged to provide the trainers with systematic tools to revise their “spontaneous educational action” so that they become autonomous and active constructors of the theoretical assump-

tions that can be interpreted by their formative experience, rather than providing theoretical and practical frameworks.

Schön argues that when someone reflects in action, he becomes a researcher in the practice context. He is not dependent on the categories of established theory and technique but rather constructs a new theory of the unique case. His inquiry is not limited to a deliberation about means that depends on a prior agreement about ends. He does not keep means and ends separate but rather defines them interactively as he frames a problematic situation. He does not separate thinking from doing, ratiocinating his way to a decision he must later convert to action. Because his experimenting is a kind of action, implementation is built into his inquiry. Thus, reflection-in-action can proceed, even in situations of uncertainty or uniqueness (Schön, 1983, p. 88 sgg.).

If intentionality associated with values consists in the possibility of exercising free and responsible choices among a plurality of possibilities “deemed useful”, it will be necessary to educate the mind-brain system in the following areas:

- to build a plurality of choice routes;
- to identify and explain the reasons from which a choice emerges on the others.

In fact, intentionality assuming voluntary action models cannot be considered intrinsic to the human being or the result of a simple interaction with the environment. Rather, it is the outcome of relational processes that enable or inhibit the emancipation from imprinting’s dual imprisonment. On the hand, we have the “natural” one, which is connected to the construction of the neuronal structure based on the experiences. On the other hand, we have the cultural imprinting, given by cultural impositions, those that Richard Dawkins (1976) call memes, cultural replicators analogous to genes. Thus, our “dispositional knowledge” results from the transmission of some behaviours from one generation to another. Starting from this transmission, the so-called “common sense” is generated, that is, the set of what everyone considers obvious, within a certain community, and at a given moment in history, a practical knowledge that manifests itself in the unreflected actions of daily life and in the immediate interpretation of reality and of the people around us.

Its contents are defined by the tradition existing within the confines of a given community transmitted from one generation to another. The assumptions are taken for granted, as common sense coincides with “what everyone thinks that the others think”. The common sense generated by memes is, therefore, a sort of cognitive routine, a socially shared habit, an automatism deriving from an agreement about the relevant aspects in a given situation, and it helps one in “understanding the meaning that is appropriate to a context”.

The world of knowledge, expectations and theories about what surrounds us is a universe created by man, but at the same time, it is largely autonomous: despite being a human product, knowledge in turn creates its own area of autonomy (Popper, 1972). Precisely because of this reason, no one who wants to actively interact with the environment in which one is inserted, can forget the cultural heritage of the context in which one operates. Anyway, one can't limit oneself without developing one's own specific self-understanding conjectures, referring to one's location in physical and social space". The problematic condition that "constructs/reconstructs" the knowledge resulting from contemporary epistemology requires developing the ability to hunt any form of reductionism and dogmatism (even that which, as is always possible, is relative to the complexity itself) as well as to enhance "glances from far away" on the event-knowledge and to read it *en structure* and in evolution, according, in particular, with a progressive principle (here and now) of complication, of growth of optics and levels, of points of view and of interferences and mutual relations, and then of recontextualization and interrogations of meaning.

In this context, it seems necessary to recover the pedagogical formation of the trainers meant as a vehicle to transmit memes. This recovery does not seem to happen except through a rethinking of the design, persuasive and therefore formative/formal, as well as the heuristic function of pedagogical knowledge. This knowledge, when researching, seems to have unanimously assumed a disciplinary status aware of its plurality and not univocity. It also seems to translate this plurality into one-way paths and not proposing them in terms of a "possible alternative", both on the side of trainers' initial and *in itinere* formation. In his book *Freedom Evolves*, Daniel C. Dennett warns against the danger that the educational processes might be converted into an "engineering of values" that circumvents people's ability to control their mental activities. Self-control of our mental activities is limited and problematic in any case, so we should not be surprised at our difficulty in distinguishing between an engineering that bypasses our capabilities and an engineering that exploits them in a tolerable and desirable way. As long as you tell people the truth – or what passes for the truth at the time you tell it – and eschew efforts to mislead them, and as long as you leave them in a state from which they can make at least as good of an independent assessment of their predicament as before you intervened, then you are educating them, not brainwashing them. (Dennett, 2003).

Colicchi (2004, p. 171) also claims that once having accepted that educational practices and the reasons for education are rooted in the biological and sociobiological reality of human beings, it is necessary to re-evaluate the spontaneous intelligence – made up of ways of being and acting, of dispositions, attitudes and know-how, and of volitions and memories (that are al-

ways) of real subjects in flesh and blood – that governs immediate educational behaviours.

The educational actions are modelled starting from *meaning perspectives*, that is, the series of assumptions from which previous experience is assimilated, transforming a new experience.

Jack Mezirow (1991) distinguishes three different perspectives of meaning, namely, epistemological, sociolinguistic and psychological, identifying a series of factors that condition, limit or distort this perspective. Among the factors that influence the epistemological perspectives are *the importance of awareness and reflexivity*, which contribute to the definition of the schemes of meaning, i.e., that set of knowledge, beliefs, judgements of value and feelings that guide our actions, needing a continuous critical examination, from which it is possible to make a transformation of the perspective that generates new modes of action.

The reflection and criticism make it possible to become aware of the specific assumptions on which a distorted or incomplete perspective meaning is based, transforming it through a reorganization of meaning. The process of explicating/reviewing the modalities of action begins with a doubtful or problematic scheme of meaning and proceeds through the exploration, analysis, memory, intuition, imagination, straight to the construction of a new interpretation that generates a reflexive change in the original scheme of meaning, enriching it, integrating it and transforming it: when the new interpretation effectively puts into question an entire perspective of meaning, it can lead to a transformation of perspective. Starting from this process, *emancipatory learning* consists of freedom from instinctive, linguistic, epistemological, institutional and environmental issues that limit our options and control over our lives. We reach this emancipation by critically examining our assumptions.

The purpose is to first explore potential hybrid theories and methodologies that will help to explicate specific and immediate moments of learning, such as *situated learning* as well as *embodied* and *enactive* and *transformative learning*, and second, to advocate for the use of a pedagogical portfolio assessment and praxis that is appropriate for adult learners and that values these ways of learning. Accordingly, we will synthesize specific ways of learning (situated, embodied, enactive) with a neurophenomenologically inspired pedagogy and praxis for the purpose of liberating these ways of learning from educational subjugation. Following a neurophenomenological perspective, we should talk about *situated learning*, which means that from a situated perspective, learning is the gradual appropriation, through guided participation, of the ability to participate in culturally defined, socially situated activities and practices (see also Lave & Wenger, 1991). For Lave and Wenger (1991), “learning is not merely

situated in practice – as if it were some independently reifiable process that just happened to be located somewhere; learning is an integral part of a generative social practice in the lived-in world” (p. 35).

Embodied cognition is a prereflective perception, thinking, and learning that emerges from the lived body in action (Gallagher, 2005). As Merleau-Ponty (1945) states, our body has its world, or understands its world, without having to make use of my ‘symbolic’ or ‘objectifying’ function (pp. 140-141). When thoughts, choices, and attitudes are considered at one with the proprioceptive, sensorimotor, and perceptual body, this helps us understand a diversity of ways in which humans learn. Enactive cognition and learning suggest that perceiving, thinking, and learning are actively inseparable from our meaningful engagement with the environment (Varela, Thompson & Rosch, 1991). Francisco Varela (1999) tells us that enaction includes “coupling of the cognitive agent, a permanent coping that is fundamentally mediated by sensorimotor activities” as well as “the autonomous activities of the agent whose identity is based on emerging, endogenous configurations (or self-organizing patterns) of neural activity” (ivi, p. 272). Interpretively, enaction implies that learning occurs by “... having a body with various sensorimotor capacities [and ...] these individual sensorimotor capacities are themselves embedded in a more encompassing biological, psychological, and cultural context” (Varela, Thompson, & Rosch, 1991, p. 173). It is important to note that these couplings are not determining or causal of the active (learning) agent. The same neurophenomenology began as a theory that emerged from the melding of neuroscience with phenomenology, which in turn shaped enaction, weaving together the phenomenological and neurobiological, in order to bridge the gap between subjective experience and biology, which defines the aim of neurophenomenology as an offshoot of the “enactive approach”. As a theory, neurophenomenology considers the interrelationship between neuroscience and phenomenology as potentially enlightening. It provides a plausible account of the need for naturalizing phenomenology as well as grounding neuroscience in the lived experiences of people.

A pedagogical praxis is meant to liberate previously unrecognized styles of learning (e.g., situated, embodied, enactive), thus informing new ways of teaching (Cranton, 1996). The term praxis is used for research that puts into action a method for practical and laboratory results (Depraz, 1999; Kincheloe, 2005). Praxis also denotes a movement “beyond objectivism and relativism” towards an ongoing critical engagement with knowledge claims. A practice as described herein will be phenomenological in its approach as it seeks to qualitatively understand *transformative learning* (Mezirow, 1991). Transformative learning highlights what the adult learning agent interpretively brings to any given learning situation to transform previous knowledge paradigms. A phenomeno-

logical practice may emphasize the prereflective lived experiences of learning by gathering first-person, reflexive narratives of the ‘how’ of situated, enactive, and embodied learning experiences to better understand the transformative dimensions related to the learning agent as intimately interrelated with the learning situation (see Vittoria, Stollo, Romano & Brock, 2014).

Theorists have combined brain-based learning (i.e., insights from brain research) with education focused primarily on the child’s development to enhance teaching and learning (Blackemore & Frith, 2005); however, studies have not utilized neurophenomenology and research concerning the adult learner.

Learning, by its very nature, is a complex and fascinating phenomenon due to its associations with sociocultural norms, formal and informal educational methods, and psychology and neuroscience. These diverse disciplines all have something to contribute to our knowledge of learning precisely because learning is an all-encompassing aspect of living. Consequently, there has been, and ought to be, many ways of studying the experience of learning using varying perspectives or techniques. Commonly understood, learning (to learn) means gaining knowledge of and being informed (informed connotes inward change and formation). Learning can be understood as the collection of facts, instigating of change, and storing of information. Learning may not have a fully formed beginning and end, and it may not be so easily separated from other cognitive activities – nor does learning seem to be, as we will see, a passive process of containment (Gardner, 1983; Maturana & Varela, 1987). Learning might best be described as diffuse (belonging to multiple contexts), whereby any learning experience can be understood as an embedded and emergent social phenomenon (Lave & Wenger, 1991).

Second Part

**From intentionality to awareness:
a matter of practices.**

Introduction

Trainers' pedagogical formation constitutes a problem for the pedagogist. In fact, no researcher has yet found a valid solution for how this formation should take place, and scholars are constantly looking for new solutions.

The link between professional epistemological awareness and, more generally, trainers and educators' formation involves pedagogical thinking on a double level. The first one is related to the educational and didactic action of the educator while forming other professional educators. The second concerns the goals of this action aimed at enabling effective educational and didactic actions. Therefore, we do not only have to think about what pedagogical models are the most suitable for future educators' actions. We also have to bear in mind which pedagogical models are the most suitable for their own formation.

These two levels seem to be inseparable: *only a reflective professional can form a reflective professional*.

Thus, a pedagogist should include himself in his object of investigation, practising it in first person. Otherwise, he would deny what he says with what he does.

One educator's education assumes as a priority objective that of becoming a reflective professional, so that one would be able to build knowledge in a situation. Nevertheless, the basis of this construction should be the link between formal knowledge and experience from which plot, it emerges the representation of the situation in which this knowledge is going to build itself. It comes out the need to build formative strategies allowing formal knowledge to "experience" as a preliminary step to the construction of strategic competences of a reflexive, proactive and epistemological nature.

Restricting oneself to a "transmission" of the notion that learning is based on experience, i.e., through a formal lesson, may look like a denial, through the didactic action, of what one aims to teach. Perhaps the goal should be that the one leading the trainers in formation to act and learn through action should become aware of what it means to learn through practice.

This necessity involves the educator's professional epistemology, since the link between knowledge and practice is a problem that cannot concern the initial formation with regard to the acquisition of strategic skills. In particular, Bruner's lesson about the genesis and function of popular pedagogy teaches us that the meaning that the educator gives to his own experiences has a deep impact on his professional practice.

Therefore, how much does the pedagogist's academic experience affect his way of organizing an educational intervention?

It might have a significant impact and might lead to the structuring of formation in terms of reflection. Sometimes, this formation might be followed by a workshop to confirm what has been learned from a theoretical point of view. Therefore, would the pedagogist's academic experience not deny this model of action, having as its didactic objective the emphasis on the experience's value while building one's knowledge?

In other words, reflecting on the value of experience in the field of formal formation might constitute an ability to manage experiential processes. Is it unnecessary to prove the value of experience?

Hence, the pedagogist focuses on formation in terms of implementation of strategies rather than content. He has to address a double problem concerning what and how strategies can be learned through the experience in a context of initial pedagogical formation. Furthermore, he has to understand what this learning involves from the perspective of pedagogy's didactics.

The first problem is of a more strictly methodological-didactic nature: we can illustrate the theme of the link between formal knowledge and experience or we can induce it to experiencing it by involving, in the learning process, the embodied experience, personal knowledge, which becomes the starting point to interpret formal knowledge. It is an "upside down" didactic approach in which experience comes before theoretical and formal systematization.

The second problem involves an epistemological change that means pedagogy not such a place of a given knowledge transmission but as a place where one learns the ability to autonomously manage the process of interpretation and construction of the knowledge of the formative process in an educational way. It is not a matter of renouncing a personal point of view about the educational process. It is about making the freedom of choice critical to the purpose of pedagogical formation.

We are far from assuming that it is not possible, at all, to form without taking into account the need for autonomy of the subject in formation. It seems that in the current cultural context, this objective is truly, and fortunately, difficult to reach. Resuming Dennett's (2003) fitting expression, an "engineering of values" can be realized in a closed cultural climate in which the dialectic of the

opposing opinions is not in force and a sort of continuity is achieved between the educational models experienced in a pre-reflexive way during one's own educational story and explicit models enjoyed during formal formation.

Sometimes, it seems that the second problems deny the first problems while building, on the one hand, the premises for freedom, which consists of the knowledge of innumerable possibilities of choice between models of action. On the other hand, even the presuppositions for actions that are not that coherent as a result of synthesis operations between models unconsciously acted.

Thus, freedom of choice is, now more than ever, the necessary condition to manage learning in action and the conscious construction of knowledge capable of coping with problems encountered in practice. There is no possibility, underlying the freedom of choice, of knowing the authoritative ways in which it is possible to act at a given moment, using *a priori* valid clues or in general indicating what behaviours have to be adopted to address certain problematic situations. Instead, it is possible to develop the capacity to autonomously read the context and to compare various ways of acting. One can autonomously act even at the cost of making mistakes, that mistake on which we will reflect and that will produce embodied knowledge, becoming a guide for the future.

Therefore, the assumption of a highly empirical attitude becomes a priority, accompanied by attention to the phenomenological datum understood as a space of "formative possibility", whose critical and flexible management satisfies some of the ever emerging anthropological and existential instances, which are perceived as priorities: sharing, tolerance, difference, openness to dialogue.

Here, we aim to analyse the operational effects related to educational intentionality from a neurophenomenological perspective. Taking up what was reconstructed in the first part of the volume, the three characteristics of intentionality, its being enactive, implicit and intersubjective, need to be metacognitively learned by those who approach the educational professions.

Starting from these premises, the Laboratory of Epistemology and educational practices of the University of Naples Federico II has built strategies to support the awareness of the processes of construction of the educational action through various paths. Those paths include the following: the Mindfulness Laboratory, which specifically complies with the enactive feature; the Laboratory of Musical Autobiography, which relates to the characteristic of the implicit; the Laboratory of Education to Listening, which concerns the intersubjective dimension; and the multimedia Laboratory of Epistemology of Education, which concerns all three characteristics of intentionality.

As we anticipated, these are "upside down" strategies allowing the student to first confront these issues with practice, constructing a theory through a log-book and then comparing it with the formal knowledge of the printed text. In

addition, what amazement and joy catches him when he finds written what he had independently built passing through “action”. The comparison with formal knowledge becomes the tool to systematize Bruner’s “popular pedagogy” that emerged during the experience and while writing a logbook.

In all three strategies, writing plays an important role as a metacognitive tool and consequently a self-reflexive and knowledge-building tool.

In this regard, the logbook is a discursive, descriptive and qualitative tool that highlights the participants’ experiences.

It is a tool for self-reflection and meaningful learning through the re-elaboration of the links between theory-practice-theory. The logbook is a timely narrative of the events experienced by the group and the single participants. It privileges a concrete language, and the description must not leave anything out. It is the story of an educational journey to be narrated in its complexity of process, whether related to emotional, cognitive, social and political aspects. The tool proves to be precious to monitoring the activities, reflecting on the dynamics carried out, self-evaluating, recording the level of participation, some encompassing “unexpected contingencies” (such as conflicts or discussions) and the difficulties encountered.

Compared to a narrative or semi-structured interview, the logbook is configured as an extemporaneous and expressive narrative; the subject does not have to respond to inductive inputs. This difference acquires value compared to the researcher’s interest in exploring the intra-individual and interpersonal perceptive and subjective processes with which an experience can be crossed, in this case, an educational experience.

The logbook serves both as a lens and a mirror of observation and self-observation, as a report of what happened during and after the experience, and as metacognitive writing to rethink, relocate, and reorganize sensations and descriptions, as well as to raise questions to answer while writing.

The logbook highlights the weight of critical and significant events both individual and of the whole group of participants involved, emphasizing the self-emerging aspects in the narratives that may be common to the students or that can be perceived in a divergent way by one student to the other. The reflection that we carried out requires an “epistemological break” (Stollo 2014) to analyse the concrete acts but also the presuppositions, the meanings, the contexts and the educational framework, bringing to light the implicit and the unsaid that subtly seep in the *complexus* of the lived experience.

Starting from the literature on metacognition and self-efficacy, during the aforementioned Laboratory of epistemology and educational practices, a grid was built so that students could make a first reflection on the processes involved in the laboratory experience.

Report of the experience

*While building the hypertext, I have followed these steps: first, I have...
Because...
The thread that holds all my knowledge together (i.e., how I connected my knowledge) ...
During the realization of the task, it happened that...
The construction of ... for me was an experience...
The most emotional moments were...
I believe that this is a type of task...
It requires the ability to...
If I had to redo this experience, I would change...
To a colleague of mine, I would recommend...
A metaphor for my path is... because...
As a student, the course taught me that...
Thus, I would use the strategy that I experienced in my professional activity...*

The first point concerns the awareness of the cognitive moves that the student has used to carry out the new task. In addition, it has to do with procedural metacognition and the planning phase addressing the self-efficacy cycle.

The second point addresses the reconstruction of one's knowledge map and the aspects that best characterize one's own experience. It is connected to one's becoming aware and to the considerations of performance.

The third point concerns the awareness of the launched actions and of the opportunities offered by the tool, connecting to one's reflections and becoming aware of the performance.

The fourth point makes it possible to give meaning to the experience still referring to one's becoming aware and the phase of reflections on the performance.

The fifth point allows a meta-emotional reflection, and it is connected to the awareness and to the phase of reflections on performance from an emotional perspective.

The sixth point implies an interpretative activity of the performed task and presents links with the declarative metacognition and monitoring phase.

The seventh point concerns the cognitive position used during the task and still, the declarative metacognition and the monitoring phase.

The eighth point implies a reflection on the weak points connected to the declarative metacognition and the monitoring phase

I would recommend to a colleague of mine to... involves the identification of the correct procedures by the recall of all the phases of the metacognition and self-efficacy cycle.

The last item concerns the ability to connect the acquisition of educational objectives.

However, most of the all, it is a spontaneous and creative way of writing, that is, with this last term, the ability to newly define and structure one's own experiences and knowledge. It is a tool to remember, explain, and bring out the difficulty in asking oneself, distancing oneself, analysing the bodily response, and creating connections between present, past and future. "I tried to take into consideration everything that came out; I wrote down the memories even in a fragmented way so as not to lose anything" (from the diary of a student).

In the inner dialogue, we are supported with writing so that "we distance ourselves from what we hear, observe, experience", as well as from what we listen to, observe, and live in the *hic et nunc*: "by separating ourselves by writing, we look better at the object that we want to know, ourselves in first place" (Demetrio, 2003, p. 173).

Self-analytical writing realizes an original setting that allows, at the same time, authenticity emerge, "favoured and nourished from the highlighted processes of a healthy splitting that writing generates: I write (as a non-patient writer) to someone who reads me (to me, a non-patient reader) and, in this way, I establish an internal dialectic that changes me and the other, where protection for both [...] here is controlled by writing" (ivi, p. 176). In conclusion, the attempt of contemporary pedagogy is to seek new ways for the formation of trainers and teachers through which the value of action emerges as a vehicle of meaningful learning and, as such, of transformation.

1. Tools of the enactive teaching: metacognitive writing

Conventionally, the metacognitive approach is often used in the scholastic environment, but in the last decade, various approaches have been developed, promoting metacognitive skills in the formation of professional educators. In this context, the research and the interventions that start from the assumption that the teachers, having to address extremely variable situations, need to benefit from a “transactive” metacognitive competence that allows them to adapt their behaviour to the context and, at the same time, to change the context. The goal is to help professional educators recognize that many situations that are apparently routine actually require an adjustment that allows them to communicate and properly negotiate values within the relational context (Lin, Schwartz & Hatano, 2005). General knowledge broadly includes applicable strategies for problem solving, creative thinking, decision-making processes, learning and good mental organization (Perkins & Salomon, 1989, p. 17). General cognitive skills do not work as if something took the place of domain-specific knowledge, nor even if they operated exactly the same way from domain to domain. Rather, cognitive skills are general tools, similar to the human hand. General cognitive skills can be thought of as general devices to recover and grasp specific domain knowledge to handle and configure it. Compared to academic programmes, it is no longer a matter of educating memories or teaching content and knowledge but rather of educating minds (Perkins & Salomon, 1989, p. 24), which is what education should address.

Recent studies have led to reflection on the nature, origins and development of the ways in which students regulate their learning processes (Zimmermann, 2002, p. 46). Although these studies have clearly shown how self-regulation processes lead students to academic success, few teachers currently prepare students to learn on their own.

During the early eighties of the twentieth century, a new perspective on students’ individual differences began to emerge from research on metacognition

and social cognition. In this context, “metacognition” is defined as the awareness of knowledge of one’s own thought. Student deficits in learning were attributed to a lack of metacognitive awareness of personal limitations and an inability to provide for this lack.

“Social cognition” researchers have been interested in social influences concerning children’s development of self-regulation. They have also studied issues such as the effects of teacher modelling and education on students’ goal-setting and self-monitoring skills (ivi, p. 65). The results led the researchers to attribute individual differences in learning to students’ lack of self-regulation.

This perspective focused on what the students needed to know about themselves to control their limits during learning attempts. The educators’ goal should be that of making students strong enough to become aware of these differences. The most important aspect of this work is the development of a capacity for self-regulation, a self-directed process through which those who learn transform their mental skills into learning skills. The latter is considered an activity that the students perform for themselves in a proactive way, rather than in response to the stimulation of the teacher, which has important repercussions in the field of pedagogy.

Metacognition is about promoting a meta-reflective professional competence and critical thinking with a referral to one’s own modalities of action. It involves the gaze that a person places on one’s learning process and the metacognitive knowledge (of people, of the task and strategies), the management of one’s mental activity (planning, control and regulation) and the awareness of the elements of these two first components.

Despite sometimes leading to other names, the management of the mental activity generally has similar aspects as referents: the actions implemented when a task is being carried out, the ongoing evaluation and the adjustments chosen according to the evaluation. If metacognition is developed, critical thinking is encouraged because the student self-evaluates (self-correction), reacts according to the situation (sensitive to the context), or checks one’s solutions (expresses judgements). Without reflecting on oneself, the individual maintains his own tendencies, distortions and prejudices, especially if he is intellectually skilled at rationalizing and arguing to give acceptable appearances to his preconceived opinions (ivi, pp. 55-56).

We can define metacognitive didactics as a transformative learning device that acts on the *perspective of meaning* that concerns the structure of psychological and cultural assumptions from which our previous experience assimilates and transforms the new experience. It is a framework of reference composed of our dispositional knowledge, that is, the set of correlated expectations that control cause-effect relationships, roles, social action, our way of being,

values, and the connections between feelings and actions. It guides the way we live, feel, understand, judge and practically manage our situation.

Dispositional knowledge constitutes a personal paradigm involving the cognitive, conative (volitive) and affective dimensions. It prepares us to action. By defining our expectations, it selects what we learn and the way we learn it (Mezirow, 1991, p. 12).

Because of the critical and metacognitive capacity, “However, random, limited or unreliable may be the patterns and perspectives of meanings that we acquire during childhood and youth, adulthood gives us the opportunity to make a critical assessment, undertaking corrective actions. With maturity, adults can acquire a new capacity for critical reflection and a new way of interpreting reality through a greater awareness of the relevance of the context” (ivi, p. 13).

Through metacognitive competence, it is possible, therefore, to promote a process that makes one critically aware of how and why the structure of our psychocultural assumptions came to condition the way we perceive the world. This competence is useful in rebuilding that structure to be more inclusive and more discriminating while integrating an experience and acting with anew awareness. Transforming a perspective is a process that helps adults recognize the introjected roles and relationships of dependence, understand what determined them, and take action to overcome them (*ibidem*).

In this context, self-monitoring is decisive, concerning the awareness of thought and “the ability to reflect on it (that is, planning and modifying the thoughts, according to the activity or the learning goal)”. Therefore, self-monitoring is a process that makes us assume our responsibility in constructing a personal meaning through critical reflection. Self-monitoring of the learning process means ensuring that the knowledge structures – both new and pre-existing – are integrated effectively for the achievement of learning purposes (Garrison, 2004, p. 113).

An indispensable tool for metacognitive didactics is undoubtedly writing, which presents a reflective relationship with thought by activating processes of “outsourcing, mediation, translation and distribution of thought, giving to it the opportunity to play between proximity and distance, between the internal and external, between subjective and objective”.

In these terms, writing is for thinking that indispensable artefact that sustains it helps it to formalize concepts, constructs, processes, to express itself, to settle in culturally connoted intersubjective contexts (which are functional not only and not so much to express and document the processes and products of thought but also to activate forms of reflection and self-reflection on them).

Writing feeds *awareness and reflexivity* within social and educational contexts and is considered a fundamental device to develop reflective processes in a context of practice, referring to its courses of action.

Then, we can focus on the need to identify forms of writing that allow us to feed and record the heuristic and hermeneutical processes in which the complex transaction between the dimensions of subjectivity and (individual and social) objectivity is played out. Somehow, the diaristic and narrative writing would seem to be the best way to document and trace reflexive paths on the individual and interindividual level. It is also useful to objectify interpretative hypotheses, epistemic positions, investigation paths, as documented by a consolidated tradition of practices and research in international the field.

As Laura Formenti indicates, metacognitive writing has three dimensions. The first one (declarative) expresses the representations (of oneself as a student, of the studied tasks and subjects, of knowledge); the second one (procedural) consists of actions and procedures acted by working, studying and conducting self-assessment. Finally, the third dimension, which is the most important but, at the same time, which is almost absent in classical studies on metacognition, is awareness. It creates links between the first two dimensions (Formenti, 2010, p. 81). Writing a metacognitive report concerning the processes involved in a given learning process, keeping track of the flowing thoughts, ideas, emotional resonances, personal values emerging during the exercise and the discussion in classroom (*ibidem*), implies the exercise of a reflexivity on the functioning of one's own mind, a practice that can be encouraged even in future users.

However, taking into account the link between critical thinking/writing, metacognition provides an incomplete picture of the processes involved in self-regulation. It foresees that perception and motivation are integral parts of the learning process: the sense of self-efficacy plays a decisive role in learning processes (Schunk, 1995; Zimmerman, 2000). Moreover, comparing one's own relationships and the intuitions contained by them with the literature and the productions made by previous years students shows a useful tool to reinforce what has been acquired during the experience, with an impact on the internal locus of control.

Learning involves the integration of new information within the existing knowledge. Providing explanations to oneself (self-explaining ability) facilitates that process of integration. Until now, it has been shown that self-explanation improves the acquisition of problem-solving skills when studying through elaborate examples. Some studies show that self-explanation can also be facilitative when it is explicitly promoted, in the context of learning a declarative knowledge, from an expository text (Micheline, De Leeuw, Mei-Hung & LaVancher, 1994, p. 439).

Learning processes are often considered in terms of both understanding and acquisition of skills. Concerning comprehension, the declarative information to be understood (like a story) creates a map of knowledge that is already stored and organized in memory; comprehension updates the existing knowledge.

While learning a procedural competence, two classes of mechanisms are proposed: the acquisition of knowledge and the compilation. In the acquisition of knowledge, an initial version of a competence (such as the set of instructions on how to send an email) is directly encoded by the source of the instruction. In compiling knowledge, codified competence is slowly transformed so that it becomes more efficient.

In any case, new instructions of both declarative and procedural knowledge cannot always be present or directly codified; they often require the integration of new information with the existing knowledge. This process of integration can be facilitated by asking students to actively build what they are learning (Micheline, DeLeeuw, Mei-Hung & LaVancher, 1994, p. 440).

Self-explaining (*ibidem*) is a special form of construction activity that has been shown to be effective in improving the acquisition of problem-solving skills. Apparently, self-explanations that arise spontaneously, as well as when studying examples elaborated by a text, are processes that promote the acquisition of competences, although they do not require direct coding of the instruction or the compilation of a codified competence.

Research has shown that this is not the case. There is a general movement in scientific literature on education through speaking, reflecting, explicating and explaining as learning strategies, especially for contextualizing scientific domains. The main idea of the new “scientific dialogic approach” is that students should learn to be able to talk about the elaborated knowledge (understanding how the field’s speech is organized, how the topics are presented, and what counts as argumentation and as a support for these arguments), so that they can participate in scientific discussions rather than simply listen to science-related information (*ivi*, p. 441).

The dialogic approach is part of the general capacity for self-explanation, the effects of which extend from the acquisition of skills to the learning of a new coherent knowledge.

The ability to self-explain promotes a deeper understanding of the expressed materials, as shown by the capacity of explaining to answer more complex issues. The more that students are able to provide explanations of their own mental processes, the deeper their understanding will be. Learning is the use of pre-existing knowledge combined with new information to create new knowledge. In some ways, self-explanation is “the thought of what one knows” (*ivi*, p. 470). Learning the ability to self-explain can be mediated through the follow-

ing three processing characteristics, each of which can shed light on why it is a particularly effective learning activity.

First, self-explaining implies that new declarative or procedural knowledge has to be constructed. In fact, self-explaining is a form of constructive activity that leads to questioning whether other forms of non-verbal constructive activity are equally effective in promoting learning. To assess this issue, studies have been carried out to understand self-observation activity through diagrams drawing. Somehow, we have seen that the learning processes were facilitated.

The self-explaining process contains a second important feature: it encourages the integration of recently learned materials with existing knowledge.

Finally, strictly connected to the previous characteristic, the third processing characteristic has direct implications for a constructive activity that can be sort of effective in promoting learning, which involves the integration of new with old knowledge. It is better to carry out this integration in a continuous way.

A potential way to create a moment to share stems from theories of perceptual learning that emphasize cross-domain differentiation (Schwartz & Bransford, 1998, p. 479). Within the framework of constructivist theories, it has been hypothesized that learning through action implies some form of manipulation or external activity. Furthermore, another idea has also been developed that the best learning occurs when individuals put their efforts and attention together to approach their ideas with meaningful connections.

This “assembly of knowledge” perspective (ivi, p. 492) is reflected in the theories of elaboration that describe learning as a process of connecting ideas. In terms of elaboration, the comparison of one’s own experience with that of the others has encouraged students to assemble relationships that connected information with previous knowledge. This processing has increased the number of possible multiple links and connections to the target concepts by implementing the ability to recover relevant concepts and powering predictive capabilities.

In brief, there is an emerging significance of learning: learning as a discovery, according to which individuals effectively learn when they have generatively focused on figures and structures that differentiate relevant aspects of experience.

Deep understanding requires both a structure of differentiated knowledge, which develops when evaluating alternatives between different cases, and a structure of explanatory knowledge, such as that often deriving from a story and narration. These ideas can be useful to think about structuring generative learning activities that can include the elaboration aimed at assembling knowledge and open production aimed at learning through praxic action.

The results of a similar kind of experience are more formative, since its evaluation is “enactive”. It is based on experience and personal judgement and

not on the evaluation of an external observer (Zimmerman, 2000, p. 88). Additionally, in this case, the function that the student attributes to his writing skills plays an important role.

As for metacognition, for self-efficacy, it is possible to identify three distinct phases: *foresight and planning*, during which students analyse the learning task and set specific goals; *performance monitoring*, in which strategies are used to facilitate progress and monitor task effectiveness; and *reflections on the performance*, or the evaluation of the chosen strategies' efficacy.

Self-regulation involves orienting thoughts, feelings, and self-generated behaviours towards the achievement of goals (Zimmerman, 2002, p. 65). Self-regulation processes are structured in three cyclical phases. The "prevision" phase comprises the processes and beliefs that occur before attempting to learn; the "performance" phase comprises the processes that occur during the improvement in terms of behaviour. In conclusion, self-reflection occurs after each learning attempt. The "prevision" phase includes two categories of main processes: task analysis and self-assessment.

The "performance" phase includes two categories of main processes: self-control and self-observation. Instead, the self-regulation phase includes the capacity for self-judgement and self-evaluation and the ability to implement adaptive/defensive responses, defined as self-reaction skills (ivi, p. 68).

Self-regulation involves personal initiatives, perseverance and acquired skills (ivi, p. 70) instead of socially isolated methods of learning. Self-regulation processes can be taught and lead to improvements in motivation and goals achieved by the students (ivi, p. 69).

Once again, the connection with writing emerges. Zimmerman and Bandura (1994) conducted a study concerning the role of opinions on self-efficacy in academic achievement and writing standards with university freshmen by using comparative analyses. These self-regulating variables were measured at the beginning of the writing course and were related to the degrees of the final course. The verbal school attitudes of the students and the level of education were included in the analysis. The perception of one's writing skills has influenced both the perceived self-efficacy in the academic setting and the personal quality standards that oneself considered satisfying (Zimmerman & Bandura, 1994, p. 845).

The perception of self-efficacy in the academic environment has influenced the achievement of a level of writing both directly and through its impact on the definition of personal goals. These paths of influence are interpreted in terms of a socio-cognitive theory of self-regulation in the academic sphere.

Therefore, it has been shown that writing and verbal self-orientation strategies increase the perceived self-efficacy and improve the schematic structure

and the quality of the compositions (ivi, p. 846). Students are more confident of their ability to structure and communicate ideas and to overcome competing impediments. They also have more reason to believe in their ability to achieve academic success. Moreover, as demonstrated in this and other studies, it is one thing is to have self-regulation skills to learn in the academic field; it is another thing is to be able to adhere to those skills when other activities arouse more interest.

The students register their weakest sense of effectiveness to stick to academic activities, as there are other interesting things to do (ivi, p. 858). Therefore, in promoting self-directive learning, students need not only to be encouraged to build skills and strategies for managing cognitive aspects but also to be motivated by building a bridge between formal and informal training (Stollo, 2008). This aspect of the support of metacognition and self-regulation for individual learning tasks implies the reinforcement of cognitive strategies that can be transferred to other contexts and presents the dual objective of forming university students and making sure that they will learn by using similar characteristics in the future (Zumbrunn, Tadlock & Roberts, 2011, p. 15).

2. The multimedia laboratory of educational epistemology

Epistemology of education laboratories follows a different path from the most commonly used strategies, as they do not start from the analysis of the biographical experience but from a preliminary systematization of knowledge, which one acquired around the educational process through a synchronic-comparative analysis of the formation models. This analysis is preliminary to the choice and explication of a model of action. This explication takes place through the construction of the hypertext.

As we will see from the pilot and the second study analysis, the three dimensions of intentionality in a neurophenomenological key are taken up and metacognitively processed through the construction of the hypertext and the compilation of a metacognitive grid.

A prerequisite is given from knowing the current debate about the formation process theories. When we face the objects of the cultural world “as a theory, our first task is to understand it. However, understanding a theory does not mean accepting it. Nor it means that we must consider said theory as the best among the competing ones. In fact, before being able to form a judgement on the preferability of a certain theory on some others, we must first understand them all” (Popper, 1994).

Therefore, applying the comparative approach to formation models will be considered a preliminary moment to the activation of self-reflection strategies and then to examine the hypertext construction method as a moment of *reconstruction-explication of the cultural path underlying the implicit and individual modelling process. The path is aimed at the acquisition of self-reflection strategies as a preliminary moment to an “autonomous and responsible action” that turns out from conscious and critical future choices, based on the understanding, control and management of the greatest number of possible alternatives.*

In this context, the comparative approach is presented as a “complex path” aimed at acquiring strategies that allow critically review and falsify, if necessary, the theoretical models of reference. If the complexity of real presents itself with the features “of jumble, of the inextricable, of disorder, ambiguity, uncertainty”, the choice of a point of view, of a model requires “to put order in the phenomena by rejecting the disorder, to remove the uncertain”, “to select the elements of order and certainty, to purify from ambiguity, to clarify, distinguish and hierarchize” not by falling into simplifications and reductionism, but by maintaining the characteristics of the *complexus*. The hypothesized path is divided into two phases.

The first phase concerns the main pedagogical models of formation analysis’, highlighting their historical roots and placing them in the contemporary context. The second phase, comprising a laboratory, is characterized by three stages (1. plurality of points of view = plurality of reference models = disorder (subjective); 2. comparison = order (subjective); and 3. choice = ability to manage disorder = subjective knowledge = temporary subjective model) and is aimed at the explicit choice of a model and at the reconstruction of the cultural and experiential path – formal, non-formal and informal – from which the choice emerged, meant, in any case, as a provisional choice and open to new reviews based on future experiences.

In the first phase, through different lectures, the main interpreting models of the formative process are analysed to underline the contrasting characteristics and the common difficult core. The literature contains plenty of models that are analysed during the lessons, starting from the role assumed by the trainer and the subject in formation within the educational relationship. This choice makes possible a greater schematization of the models, which are distinguished in models of autonomy, models of heteronomy and eco-systemic models (Strollo, 2008)

Furthermore, during the taught classes, the main identified models are illustrated, starting from the “implicit pedagogies” that underlie the communication actions undertaken at the “naive” level by individuals.

The second phase of the comparative path foresees a laboratory time during which, once the reference model has been identified after a comparison, the student reconstructs the cultural path from which he made the choice, considering that it was oriented not only by one’s daily life story (first level) but also by the selection of cultural inputs received during the formal formation (second level).

The path of reconstruction, far from being linear, will refer not only to the events of everyday life but also to those texts encountered during the studies that seem to offer, from the operational point of view, suggestions consistent with the chosen model.

Hypertext explains the multiple paths that allow one to reconstruct one's own process of constructing a formation model while maintaining the inevitable links between the contributions offered by formal (institutional formation), non-formal (a formation related to the belonging society) and informal (formation connected to personal experiences) paths.

The construction of the hypertext makes a reticular model emerge. Within the latter, one can identify nodes referring to formal, informal and non-formal formation. The goal is to "objectify the consciousness" as a first moment to emancipate it from the constraints that guide it in action, through the cognitive bilocation that allows one to be oneself and other from oneself in the contemporaneity offered by being able to, at the same time, self define. The unity of consciousness is, in fact, always the result of a recursive ring.

Edgar Morin (2001) claims that consciousness is subjective. However, it splits so that the subject can objectively consider his own thought, actions and person. Consciousness expresses the human being's strong need for objectivity. Furthermore, consciousness is the peak of subjectivity and objectivity. The recursive circle that generates consciousness produces, according to the subject's attention, consciousness of the self, of the objects that one knows, of one's own knowledge, of the thought and, in brief, of having a consciousness.

This recursive circle constitutes a metalevel that allows meta-reflective thought, which is able to act back on the thought itself. That metalevel establishes, at the same time, the bond and the detachment of the self from itself, of the self, compared to the ideas and thoughts. The metalevel establishes a primary condition of the critical examination of every idea and thought. It also exceeds and encompasses cognitive activities while being part of it. Consciousness doubled in consciousness of consciousness and can thus be considered a meta point of view while remaining itself (*ibidem*).

Actually, we are addressing dynamics that underlie the learning processes in formal contexts and how these processes are part of the general learning process that covers a set of multiple and complex, multi-distributed and multi-placed functions. Learning moves multiple levels of mental organization, which must be rigorously included in the organization of practical formative models. If formative processes have to be 'intentioned' on the basis of autonomy as a meta-competence, and if formative intentionality requires to prepare settings by meaning the environment as a complex context, consisting of both natural-biological and artificial-technological factors, then the settings will have to be organized to favour one's awareness of individuality. Hence, there is a need to consider the experiential and learning dimension for an individual as multidimensional, multi-medial and multifactorial. Furthermore, we will have to consider the need to identify the environments and the tools that constitute

the appropriate settings to these assumptions, followed by the multi-medial, synesthetic and multifactorial dimensions.

Hypertext and the links between its three sections allow the student to understand that the origin of his modelling processes is not composed of a linear process, ranging from informal to formal. In contrast, it is made of circular processes that develop a relationship of mutual regulation starting from the formal and informal inputs. Therefore, hypertext escapes from a rigidly linear and sequential logic, which is peculiar to the traditional written narrative text. Hence, it allows us to highlight the network of interconnections that underlie the processes of action modelling.

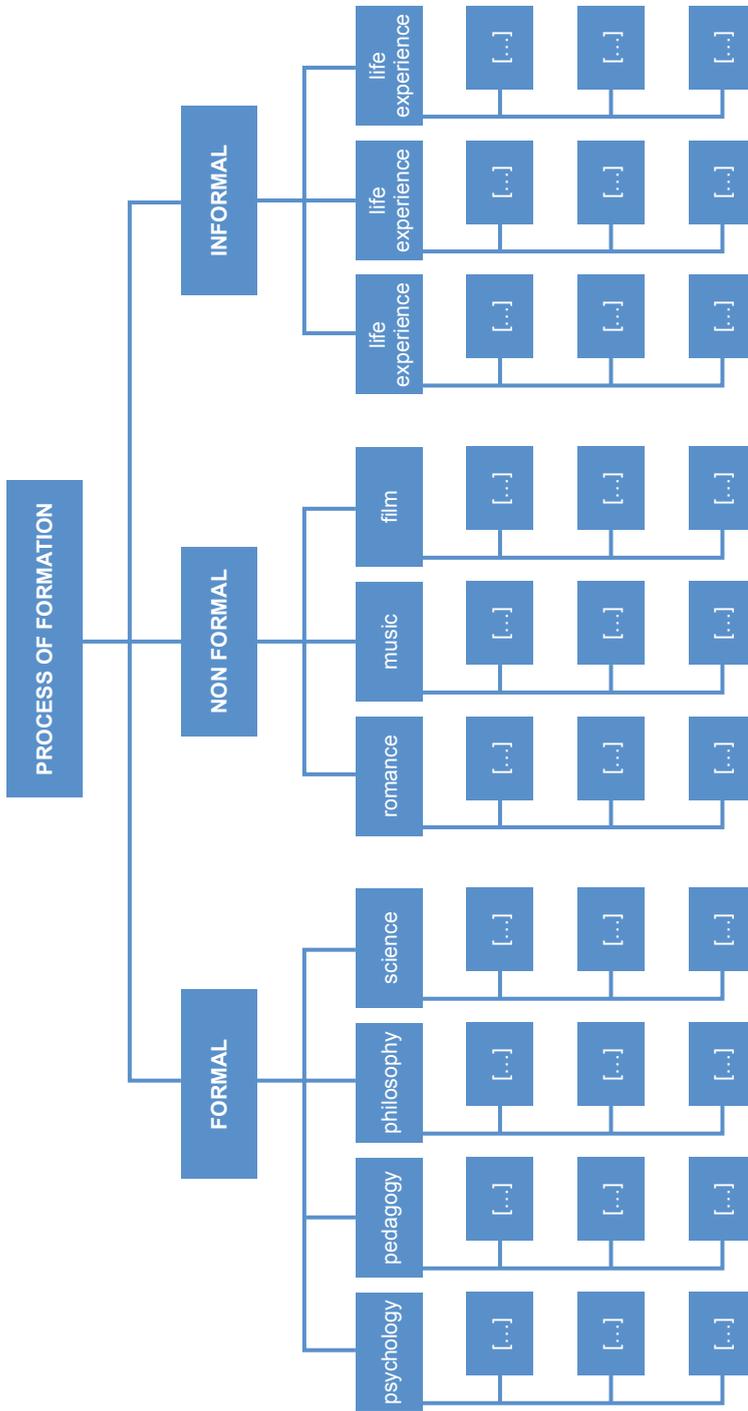
Therefore, a self-formative process is realized, which implies a double appropriation of the power of formation; it means holding this power – becoming subjects – but also applying it to oneself: becoming an object of formation for oneself. This double operation splits the individual into a subject and into a peculiar object that can be called self-referential. This split broadens, oxygenates and increases the capacity for autonomy in that intersection, interval, interface between hetero- and eco-training that is, at the beginning, the individual.

In this model, three levels have been included, which were identified from the neurophenomenological literature: enactment, emergence, intersubjectivity.

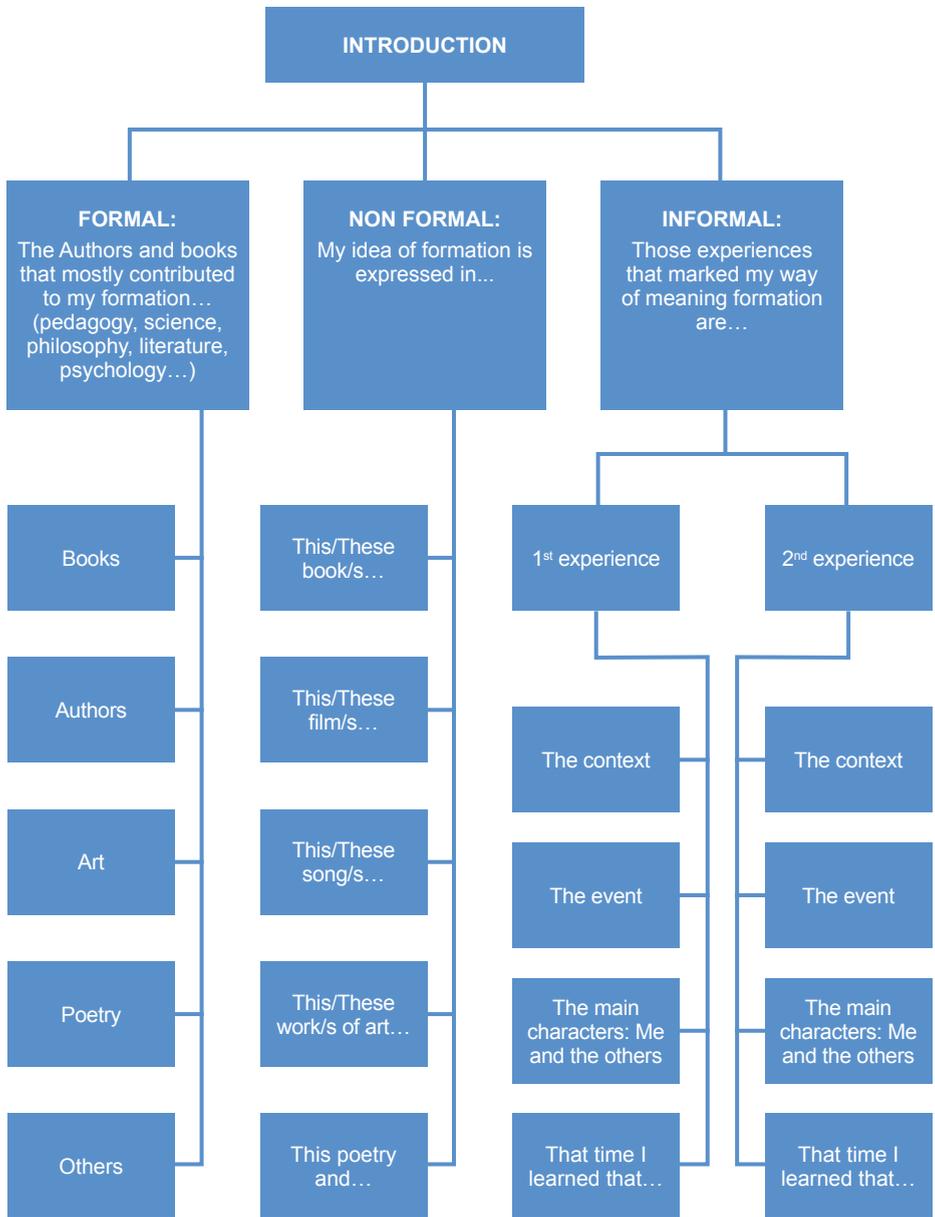
As for the principle of enactment, it was necessary to identify a basic hypertext structure that allowed us to explicit and metacognitively understand the network that underlies the mental processes. Additionally, it had to be visually reproduced, perceptually experienced, simulating its construction through the links between formal, non-formal and informal knowledge that implicitly guide the processes of modelling of educational action.

The visual approach, that is, the retinal message that makes its way into the inner consciousness, is organically included between two structured dimensions: the immediate global perception of the hypertext's structure in its entirety and the detailed analytical perception of the information of the single parts (Pic. 1-2).

We used a program called FrontPage that allows users, during the hypertext construction process, to visualize the basic structure and to monitor the connections between the individual parts generated both by the navigable structure, starting from the “navigation bars”, and from the links intentionally inserted by the students.



Pic. 1 – Example of basic hypertext structure: the first two levels are common to all the students. The subsequent levels are built independently.



Pic. 2 – Example of basic hypertext structure: the first two levels are common to all the students. The subsequent levels are built independently.

Writing guidelines to hypertext's introduction/conclusion*

Myself and the hypertext

While building the hypertext, I have followed these steps, first I have... Because...
The thread that holds together and crosses all my knowledge (how I connected my knowledge) ...
During the realization of the hypertext it happened that...
The construction of hypertext for me was an experience...
The most emotional moments were...
I believe that hypertext is a type of task...
Requires ability to...
If I had to redo this experience, I would change...
I would recommend to a colleague of mine...

2.1. The pilot study

The sample of the pilot study consists of 100 students enrolled in the bachelor's degree in Psychological Sciences and Techniques, selected among those who were attending the Psychology of Learning course (Academic Year 2013 to 2014)

The study allowed us to collect 120 introductions to the hypertext, based on the metacognitive grid.

Both empirical scientists and experimental subjects are be trained in the phenomenological method. Varela, hypothesizes that such training should include the learning of the practice of the epoché and phenomenological reduction, that is, the subject should learn to put aside, or “in parentheses”, opinions and theories about the experience and consciousness that one could possess, to concentrate, instead, on the way things are experienced (Gallagher & Zahavi, 2012).

In this regard, the laboratory organizes specific mindfulness courses, for an analysis of which please refer to De Simone, Romano & Strollo (2014) and De Simone & Strollo (2014).

From the phenomenological analysis conducted by three judges it emerged that in analogy to what has been described about the *emergence* feature, the hypertextual model also has the characteristic of a transitory configuration, internalized by the student who recognizes the incompleteness of his work and the link between its single elements: the displacement, the insertion or elimination of a single element involves a deep revision of one's work. The retic-

ular dynamics of the hypertextual construction process acts as a model of the analogous dynamics underlying the processes of action modeling: it derives the awareness that an explicit element, arising within the “system” of the explicit knowledge, significantly changes the sense of all the other subsystems giving life to a new configuration (RE1).

Report of the experience 1 (RE1)

The first version of my hypertext was completely different, but now there is no trace of the original work. In fact, this has been a long and tortuous work of meditation, of rethinking that has allowed me to discover ever new things about my inner world.

It was a gruelling job that completely absorbed me, every now and then emerged a thought or a memory that I pursued, connected and often abandoned; but nothing was useless, I discovered in myself thoughts, feelings, motivations that I didn't know I had. I don't know how this experience has changed me because there is still so much activity in my mind, but I can certainly say that I come back to the world a little more conscious. Following several revisions, I realize that I cannot absolutely say that this is the final version, because my path of growth and exploration of my theory of the formative process is not to be considered complete yet. [BDI/00219]

Why Work in Progress? Firstly because, for a very long time, my work seemed like a construction site, with the only difference that besides not knowing when the aforementioned works would come to an end, I also ignored what would have been seen in the end. It seemed to me to place some pieces, brick by brick, but without knowing where the road I was building, would have led; and at the end, ironically, although the product was finished, that Work in Progress continued to seem to me the most fitting title, this time not so much to describe the work itself, but as an indication of the deeper meaning it has for me. Work in progress is well suited to a personality in progress, with a meaning, however, tending to negative as well as positive: or, rather than optimistically focus on the quality of dynamism, progression forward, planning, I highlighted the aspects of complexity and contradiction that necessarily, in my opinion, accompany a “work in progress” state. [BDI/00206]

It is always difficult to find the words for a conclusion, especially in this case, in which I have the impression of having just started. Through the hypertext I was able to retrace my formative path and discover the common thread. I found it quite difficult because I had no idea of the topics to choose, I did not make any mental scheme, I chose the topics that I liked the most without any causal or established link. Then when I made the various connections it was surprising because I was afraid that I would not find them, that I could not find

a common element, but then they came by themselves. It was nice because maybe, I already had my own mental scheme but it was implicit, and I discovered it through this hypertext. [BDI/00216]

At the beginning, I didn't believe this job was necessary, I considered it an overload, but then... day after day I found myself re-gleaning those books that have meant a lot to me, those songs and poems, those paintings that marked my adolescence. Reliving them helped me to grow. And so, the more days went by the more I thought about things that I had before, perhaps, indeed, certainly, I had never thought so deeply. [BDI/00209]

While constructing this hypertext, I had to deal with the need to rethink the directions taken so far from my formative path and, at the same time, to meta-models, theoretical and methodological models that have influenced my thinking, each referring to a precise way of understanding man, life, change. Through the exercise of questioning and systematization necessary for the purposes of structuring the hypertext, I could see the presence of unexpected cross-cutting between the three levels -formal, non-formal, informal- and at the same time a close interdependence between the same elements of every level, of which I wasn't fully aware [BDI/00183].

Moreover, hypertext constitutes a new form of communication with one's own self that, as objectifying thought, allows one to experience the dynamism of one's knowledge graphically represented by the three intertwined dimensions of formal, non-formal and informal.

It becomes a perturbing learning environment able to generate an expansion of perceptive consciousness, an increase in sensitivity that can be defined in terms of autopoiesis (RE2), that is, capable of enhancing the “directional sense of acting”, ie “self-ability of making decisions regardless of expectations, assessments or conditions imposed by society” (Mezirow, 1991).

The connection to the experience and the link to the theory that is in the hypertext section in which the theoretical model is reported, allows us to bring out the circular nexus between experience/theory/action: “Au départ, faire référence à l'action c'était d'abord rendre intelligible une conduite en décrivant les étapes par lequel le sujet était passé pour produire le résultat auquel il avait abouti. Sans la connaissance du déroulement de ces étapes, les activités cognitives étaient incompréhensibles, les analyses d'erreurs ou la mise en évidence de processus vicariants et de la diversité des procédés cognitifs mobilisables impossibles. Mais cette référence à l'action permettait aussi d'éviter d'oublier le rapport que l'on doit toujours pouvoir établir entre le discours et les actes” (Vermersch, 2007).

It is therefore expected that “the stabilization of the phenomenal categories through first-person methods will be associated with specific changes in long-term or short-term brain activity” (*ibidem*). It is therefore a matter of translating the “background knowledge” into knowledge under investigation, which includes everything that is uncritically taken for granted in the analysis of a problem.

Creating links between formal, non-formal and informal knowledge, the subject’s experience is refined in its descriptive quality so that “by increasing his competence, the subject contributes to stabilizing his experience, he acquires this ability by making a firm grip on the different facets and on the sequencing of his experience, as well as establishing greater rigor in his analysis; he pays more attention to the variability of internal, inter- and intra-individual states, which are now no longer considered as a kind of background noise but as a constitutive component of his experience” (Depratz, 2006).

RE2

Until now I have received so many theoretical notions about education, but I have never questioned myself about my formative process and above all I have never realized that there was a meaning behind remembering some authors instead of others. The writing of this hypertext has seen me literally projected in my library. I spent hours leafing through books, those of my personal readings, those of high school and university [...] I selected authors, topics, quotes; then I looked for songs and movies and, in the end, I evaluated everything that I identified. I looked for a hypothetical common thread, and once I found it, I tried to connect it to myself and to my process of change. This elaborate has to be understood as a great discovery of a feeling that has become now deeply aware and the recognition that these same emotions can, sometimes, represent a personal limit [BDI/00155]

The proposal of the hypertextual work, resounds in me with a strong “divergent” charge, moving the memory circuits and inviting me to tell myself, to re-read the experience in a critical key. I felt the double dimension of remaining “inside” the formative path and, nevertheless, to find, in the metacognitive reflection, the interpretative coordinates that give me back a horizon of meaning, which projects me towards the future. [BDI/00152]

A confusing state is the one that characterizes the current state of my education, which hasn’t reached yet the point where the multiple information selected over time is organized by coherent “actions” aimed at adopting different tools for each objective to be achieved, specific for each context. Nevertheless, trends emerge, themes, whose awareness I owe to this experience, whose meaning must

be sought not a priori but now, that everything ends, everything starts! The search for meaning begins, the desire to respond to multiple question marks.

The most extraordinary thing about the work on myself, about my process of self-reflection on what I am now, and what has helped me to be what I am today, is rediscovering myself as part of an immense world of thoughts, emotions, experiences...

There will never simply be an epilogue to this process of knowledge, because there is never an end to oneself knowledge. It is a continuous sailing between living and non-lived worlds...

This hypertext is part of my present, but for sure it will continue to “be there”, with all its significance even in my tomorrow.

Below we have the full version of the introduction of a hypertext built with a double structure. The first, corresponds to the basic structure common to all students, the second, was built by the student after completing the first draft.

Before we face this hypertext topics, I want to underline the processuality of this work and the fact that it is the product of a journey, rather than the realization of a predefined project. The themes, the citations, the works included in this hypertext didn't have an apparent link, nor an explicit meaning until the end; only at the end of the work have they been combined, interrelated, intertwined with each other, finally revealing their sense, their sense of being together. In the three different sections of hypertext I inserted the lines, the notes, the images and the rhymes that, in immediate way, I gathered in my attempt to remember. In doing this, I can say that I have gone through two distinct phases: at first, I experienced a state of confusion regarding the objectives of this work and the modalities required for its realization; I was especially worried about obtaining clear guidelines on WHAT and HOW; in a second moment I realized that my need for clarity, (which was manifested, above all, in the tendency to immediately establish a title and a theme common to the three sections) in reality, was more an attempt to “reassure me”, within the definition of limits and guidelines, compared to a condition of SUSPENSION of the search for meaning.

What emerged from the overall reading of the contents included in the hypertext, is that they can be divided in two groups: those I remember, but which today I feel very far from me, and those in which, instead, I completely find myself.

This division, highlights that in my formative course we can draw a line of demarcation between a before and after and that this line represents an experience that I know very well to be very significant; therefore, the contents that I feel extraneous to my way of being and thinking are those that refer to the period

before the occurrence of the aforementioned experience, while those that I feel closest to me refer to the period following it. Reflecting on these differences I had the impression that what makes these elements so different and what determines their insertion into one group rather than another; lies in the fact that some show obvious attention to form and others to content: they reveal a different way of dealing with concepts, one that is more superficial and the other more reflective. Moreover; among those of the second group, some have clear references to my experience. Reflecting on this contrast between form and content, I understood that, in fact, it is nothing more than the result of a transposition in the theoretical field of what I practically felt, through my experience: a transition from appearing to being. And if now I think back to the difficulties, I initially encountered in approaching this work, it seems clear to me that they should be read in this light, as an evolution from an initial concern for form to a subsequent attention to content. I think that from all this clearly emerges the presence of a circularity between theory and praxis: the possibility that an event can bring about a change that changes the way you relate to a text, and the possibility that reading a book can inducing, accompanying, conditioning the way in which we relate to others, to ourselves and to life. I believe that circularity is the essence of this work: if I had to graphically represent it, I would give it the shape of a sphere in which the beginning and the end meet and almost do not distinguish, a circumference in which the individual points disappear and merge. Ultimately, I am very satisfied with this work, because it has allowed me to get involved, to be in a critical way compared to some fundamental changes that have influenced my training. It was a moment of reflection that made me more aware. It was a formative moment because to reflect on one's own formation, in my opinion it is, in itself, formative.

Among the various situations in which I was formed, I decided to report the experience of this work, as it can be considered an effective example of how change is the product of an autonomous operation that leads us to choose between the various contents of the culture that best suits our way of being and seeing things. In fact, I had the opportunity to freely choose in my training the things that I think most marked me and this led me to reflect on it and acquire an awareness that I did not previously have. It is as if a new conception of change had been created in me, starting from that not very articulated and somewhat vague idea I had before.

During the development of the hypertext, I was surprised by the chosen authors, with a clear mind, I thought I had forgotten, but I realized that many of the knowledge learned in the past is in me in a latent state and silently affects the way of knowing and interpreting reality.

The construction of this kind of hypertext is a highly personalized task. Perhaps who doesn't have the ability for self-analysis, closing in, or who is a bit superficial, who has no capacity for synthesis and a recursive and reconstructive thought will have considered this task trivial or extremely difficult. I had my initial difficulties, because a new task had to be completed. But who wouldn't have had them? Then, it was nice and fun. I don't know what strategies my colleagues

adopted to solve it, but one thing I would recommend doing, if they find my same difficulties, is to take a moment from the hectic everyday life, relax, take a pen and start writing anything runs through their mind, to break the ice with yourself and start talking with your theories. Everything else will come by itself. If they were giving me the opportunity to rewrite this hypertext, now, I would not change anything, but maybe in a few months the things I would insert would be different [BDI/00251]

It emerges from many reports that reflecting critically on the distorted premises, which support the structure of expectations compared to the educational relationship, transforms the perspective of meaning. The task is perceived as a “disorienting dilemma”, a perturbing input, as Varela says, (RE3). Starting from this, a critical evaluation of the epistemological, socio-cultural or psychic assumptions is made together with the consequent implementation of knowledge and skills, useful to construct future action plans.

RE3

First, I think it is necessary to express my initial difficulty in achieving all this. I confess that the meeting with a colleague who showed us his hypertext was decisive. Until then I had only seen so many “special effects” and I used to worry about not being able to use them, not being very good with the computer. I listened to the previous explanations, but only then I understood the sentence of the teacher: “You only have to do what we are talking about”. Until then that “theory-praxis-theory”, “the explication of one’s own implicit model of training”, seemed to me only concepts to be learned to pass the exam, repeated a thousand times in previous pedagogy courses. I wanted at all costs to understand the theme to be performed, but I could not find it and I was wondering: “Do I have to talk about my ideal model of formation?”. And so, only after that fateful meeting, my hypertext has acquired a sense and from the idea of a useless essay from the examination of maturity, it has become the means to reflect. Perhaps this is the reason why I refused, at the beginning, to understand what I was asked to do: I was just afraid to get involved. And so, I wanted to try at all costs a theme to play, a lifeline to cling to, as I always tried to do, but then when I started, everything became simpler, more natural and more interesting than any other thesis to write. I stood in front of my bookstore and took all those books and authors that had been meaningful to me and that had accompanied me in their growth. So, I started to reflect, abandoning any desire for consistency, without a purpose, a well-defined goal to be reached, without books or authors to study. There were so many authors, movies and songs that I wanted to insert, but only some of them were so significant, to leave, even after a long time, an unmistakable sign. In fact, these are the things that made me as I am. I inserted everything in the different sections

starting from the formal and only when I finished writing in the informal section, I found that red string that united those authors. At the beginning, in fact, some seemed opposed and irreconcilable, but later I understood. Through their words I found two recurrent elements: on the one hand the fear of the others, a fear that does not allow you to express yourself, to live, to get involved, which pushes you to seek the perfection and approval of others, who makes you hide behind a mask, which makes your life useless, of an endless boredom, that does not allow you to accept your limits, and on the other the desire to be and to realize yourself without any fear, to fully live, so I won't have to regret anything... and thinking about it my path, until now, it has been nothing but a continuous oscillation between these two shores. [BDI/00208]

2.2. The second study

The sample of the second study consists of 60 students enrolled in the master's degree in Psychology and 140 students enrolled in the bachelor's degree in Psychological Sciences and Techniques. The sample of the master's degree students was selected among the attendants of the Social Pedagogy course (Academic Year 2014 to 2015), while the sample of the three-year Degree students was selected among those who were attending the Psychology of Learning course (Academic Year 2014 to 2015)

It was a transversal study that allowed us to collect over 120 introductions to the hypertext, based on the metacognitive grid, and 80 metacognitive questionnaires.

The goals of the formative intervention are:

- Experimenting the experience of building the hypertext as a device for retrospection, self-reflection and self-formation.
- Catching its elements of self-reflection and meta-cognition through the experience.
- Experimenting the role of the educational intentionality on the cognitive processes and the association between intentionality/formation/experiences in particular.

The making of the hypertext is part of the activities that take place in the Laboratory of Epistemology and Practices of Education (www.lepe.unina.it). During said activities, through specific and graduated exercises, the students had experienced and analyzed the construction of experiential paths for a listening education. The Laboratory's goal was to achieve learning through listening to oneself (via the hypertext and a work focused on Mindfulness), the others (through Music Therapy) and the social context (through a workshop based on

the techniques of the Theatre of the Oppressed). The planning of the educational activities was discussed and re-thought in order to promote a complex, integrated and multifunctional course of Listening Education. Every kind of educational activity aims to promote a critical, dialogic and reflective thinking in the participants, who are the active protagonists of the educational proposals. From time to time, the developed educational practices combine in a moment of shared and co-constructed dialogic reflection and questioning in which practice rejoins theory in their interdependence and interconnection.

2.3. Results of the metacognitive grids

The research on the intentionality from an educative perspective went together with the production of introductory reports developed from the metacognitive grids accomplished after the first phase of this research. These reports are narrative and meta-narrative tools. The textual content of the reports written by the participants has been analyzed by T-Lab, a software for data management and text analysis. We have proceeded on a first phase that included the coding and the “cleaning” of the collected textual material: the 120 introductions had been drawn up with the help of the metacognitive grid in order to ease the decoding and the analysis of such content. We have proceeded then with an analysis of the textual occurrences in order to identify the terms and the “dense” words by calculating their frequency and repetition in the text. The analysis of the occurrences works as a first filter for the information within the text: it allows to recognize the most used meaningful, common and shared words. This kind of textual analysis is the result of a lemmatization process that led to a vocabulary of key-words, used during the analysis of associations and co-occurrences. The vocabulary has then been further screened and verified by the research group in order to filter only the most relevant words for the analysis. The research group adopted a comparative and linking methodology for the recursive selection of the words composing the analysis’ vocabulary, the subsequent analyses and the interpretation of the results. In particular, it was decided to adopt a panel of three independent judges who independently discussed and elaborated the analysis of textual data. Then, the results were compared to each other and checked. Referring to the scientific literature, they were discussed and reviewed with the entire multidisciplinary research group. It was then decided to adopt a panel of three independent judges who had discussed and elaborated the analysis of the textual data independently. The results were then compared to each other, re-checked in view of the referential scientific literature and discussed within the entire multidisciplinary research group.

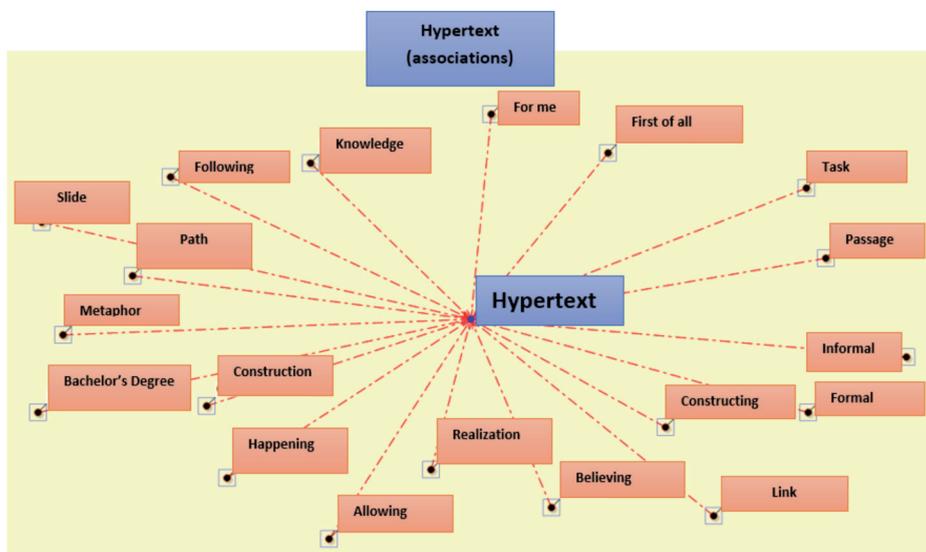
2.4. Lemmatization and analyzed vocabulary

<i>Key-words</i>	<i>n.</i>	book	27	research	19
hypertext	180	emotions	27	reality	19
experience	116	contents	26	level	19
formal	101	to ask	26	to teach	19
path	70	shape	26	to talk	19
knowledges	63	Film	26	passage	19
own	61	concept	26	time	19
to think	56	to choose	26	capability	18
to listen	56	own	26	lived	18
formation	50	oppression	25	hypertextual	18
different	50	sentence	25	to listen	18
allow	49	To find	25	awareness	18
song	49	personal	25	process	18
moment	44	idea	24	simple	18
create	42	dimension	24	student	18
informal	42	learning	23	oppressed	18
riflection	41	realization	23	metaphor	18
to build	40	to happen	23	to re-do	18
life	39	sense	22	professor	18
change	38	listening	22	to select	18
work	37	insert	22	meaningful	17
construction	37	author	22	material	17
group	36	formative	22	to start	17
link	33	to keep	21	to connect	17
to represent	32	to leave	21	to remember	17
knowledge	32	to identify	21	to follow	17
new	32	possibility	21	tied	16
laboratory	31	to see	21	to write	16
to link	31	to understand	21	emotional	16
to reflect	31	task	21	to recover	16
to rend	29	to suggest	21	to assimilate	16
thinking	29	to emerge	21	relation	16
first	29	elements	20	difficulty	16
choice	29	to believe	20	conflict	15
to put	28	colleague	20	to reclaim	15
to succeed	28	words	20	different	15
to try	27	memories	20		
to change	27	connection	20		

The textual analysis is a recursive process in which a reference and a return to the original text subsist in a theory-praxis-theory circularity: this allows the

selection of lemma originating from the text, although it's not a truly exhaustive process. Even when a first selection of the textual units and the key-lemmas to work on has to be made, it's necessary to look again at the text to check the links between the emerging words and the already identified thematic clusters, whose meanings refer to the already produced introductions. The text has been then fragmented in significant textual units in order to evaluate all the co-occurrences taking place among them. It goes without saying that the text has been further refined at every stage of the analysis in order to improve the key-words vocabulary by removing, in a continued *labor limae*, the pleonastic expressions, conjunctions, adverbs and all those grammatical elements that were not significant to the textual analysis. These discarded elements are called “*token*” units, while the ones that have to be considered are called “*types*” units

Concerning the analysis of the co-occurrences, *Hypertext* stands out as a central lemma not only for its frequency and repetition, but mostly for its “thematic weight” in the introductions. The diagram of the co-occurrences for the *Hypertext* lemma is represented below:

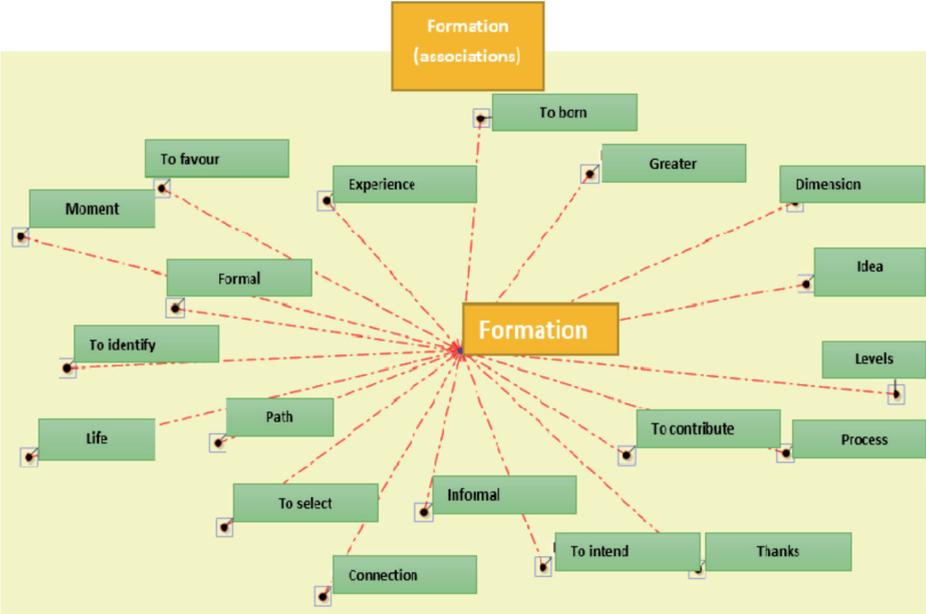


Radial diagram of the co-occurrences for the lemma “*Hypertext*”.

As can be seen in the graph, the *Hypertext* lemma is closely associated with the lemmas *realization* and *to construct* referring to the act of constructing the hypertext's path. The hypertext, being a metacognitive task, requires the ability of thinking in action. It also requires links between knowledge and formal, informal and non-formal settings. In the introductions, there are frequent

co-occurrences of the word *hypertext*: these are linked to the indication of the used methods and the path that has been constructed and followed to obtain the final product

Being it the story of one’s own educational path, it’s an invitation to a narration through first-person connections, *for me*. The application of all the links between knowledge and the dimensions of *here and now* and *there and then* of one’s own educational path can give access to an emotionality and a feeling that is renewed in light of the required task. The hypertext is a synchronic-comparative analysis of the knowledge built up during the course of one’s own formative path, which is often modelled with a slide presentation in order to develop the network of the hypertext’s links.



Radial diagram of the co-occurrences for the lemma “Formation”.

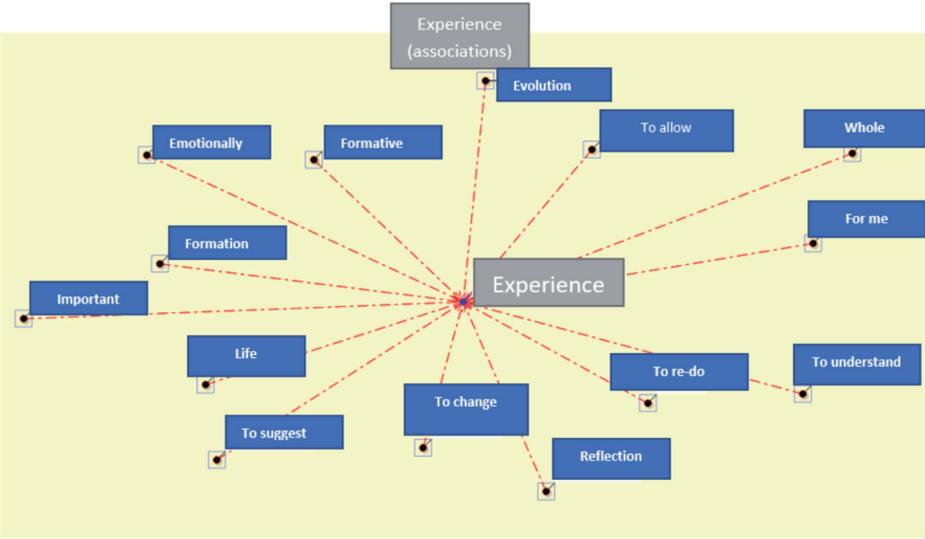
This is the co-occurrences graph for the significant lemma *formation*. This time, along with the evident and maybe predictable links with the three educational contexts/settings and the three sections of the hypertext (formal, informal and non-formal), the category of intentionality stands out thanks to the presence of the strong association with the word *to intend*.

This category is the pillar where didactics rise, under the architrave of the neurophenomenological perspective: in the educational relationship it acts both as an action intentionally oriented towards the individual and a formative goal,

and as a willful intentionality that the student shows in learning, something that the educator had already explored and implemented during his/her studies.

Moreover, the hypertext with its *process* by *levels*, just like formation in a broader way, elicits and represents a path of explicitness, a *moment* to *identify* and make one's own educational intentionality object of reflection and self-reflection. The hypertextual experience supports the selection and connection between all the formative moments experienced by oneself, it often moves on multiple, synchronic and diachronic, comparative and analogical levels.

The hypertext, then, with its *process* per *stages* (like formation, in a broader way), elicits and represents a path of clarification, a moment to identify one's own educational intentionality and make it an object of reflection and self-reflection. The hypertextual experience foster the selection of all the formative moments experienced by the individual and it often moves on multiple synchronic and diachronic, comparative and analogical levels. The reflections emerging from the introductions of the hypertexts are, then, actual first-person metacognitive tales that, encouraged by the metacognitive grid, express the student's meta-reflection.

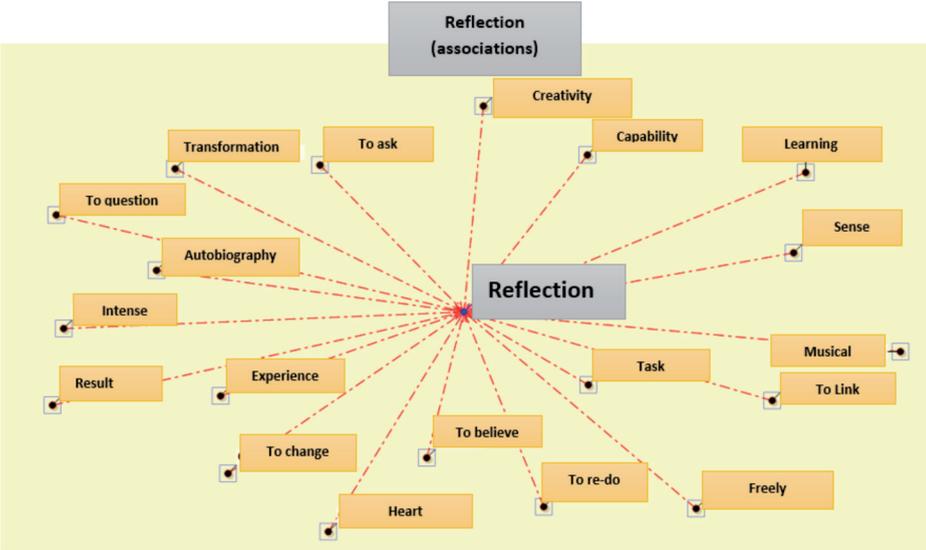


Radial diagram of co-occurrences for the lemma "Experience".

The dense word *experience* here has two meanings. On the one hand, it means to comprehend, through *reflection*, the *whole* educational path of the subject that will speak in first person (*for_me*) about his/her experience of for-

mation. On the other hand, the hypertext itself is also a formative and metacognitive experience constituting, through its different stages, a sort of metaphor of one's own formative story.

The analysis of the co-occurrences with the word experience highlights the emotional dimension inside the reflective task of the hypertext. In fact, the latter encourages to understand one's life evolution in a formative way. Therefore, the meaningful evolutionary moments take place in the informal setting, in which they are reconnected (and re-identified) with the formal and the non-formal settings. The hypertext, then, is also an autobiographical narration that involves emotionality because treats one's own *bildung* as conscious and intentional persons.



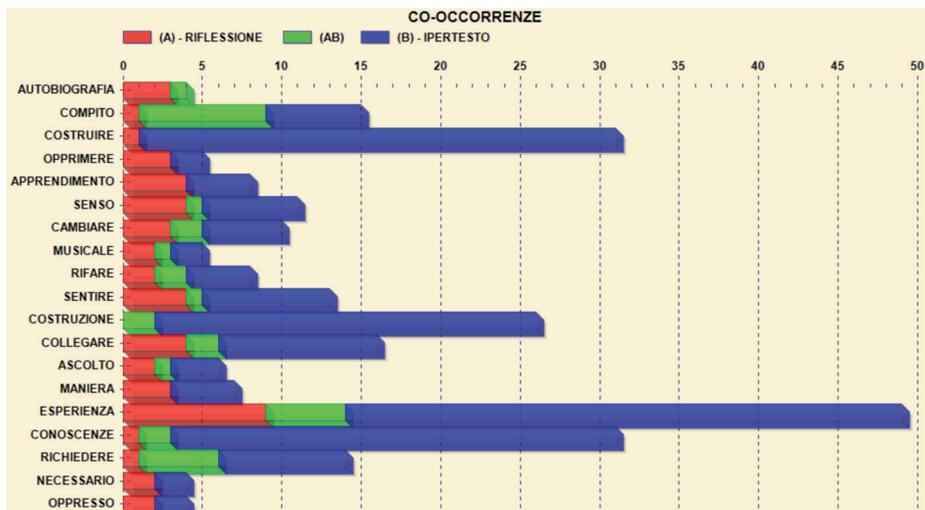
Radial diagram of the co-occurrences for the "Reflection" lemma.

Lastly, an analysis of the co-occurrences for the lemma *reflection*, has been carried out. According to the neurophenomenological interpretation of the intentionality, this is a key word in the hypertextual path: Reflecting, in student's first-person words, is elicited by the task of preparing the hypertext.

Since the hypertext calls into questions its own models of formation, it also promotes, somehow, *transformation* and *change*: it's helps people in becoming aware of their theoretical perspectives and of all the internalized formative models.

This liberating push constitutes a flywheel and a reflective potentiality of the hypertext which requires critical and *creative ability*, in order to link and

question one's own formative assumptions. It is an *intense* work facilitating, we would dare to say, a *transformative learning* (Mezirow, 1991), since it requires the revision of one's meaning and epistemic perspectives and their revision in the dimension of the here and now. In this regard, we introduce an analysis of the intersections between the lemmas (hypertext and reflection), which results appear graphically represented by the bar chart below:*



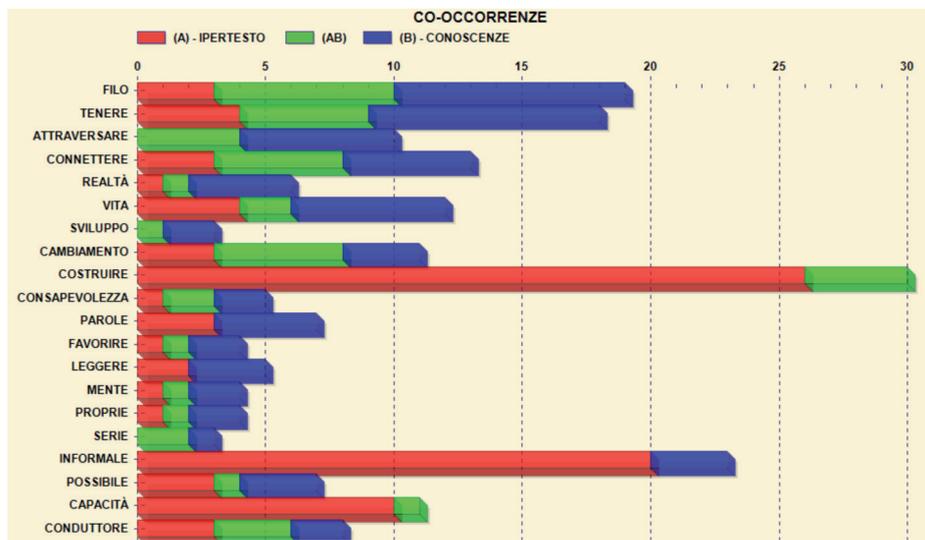
The analysis of intersections between the lemmas has underlined the conjunction between *reflection* and *hypertext* with respect to the task and to the *experience* lemma. This result recursively confirms the interdependence bond between reflecting on the experience and the hypertext, as a lemmatic triangulation that systematically refers to the introductions of the students.

Said interconnection involves the autobiographical sphere, the experiences are re-lived because there is a *space* and a *listening* that allows to re-live *pictures and periods*, formative models. One can also build knowledge, changing the patterns of the educational action. That is why the hypertext is a meta-reflexive tool, very efficient in the formation of the trainers. It stakes the feeling and knowing, in a process of shared construction of the meaning of one's own formative story.

The analysis of the intersections between the lemmas hypertext and knowledge, has highlighted other significant insights to understand the individual and

* Co-occurrences: (A) Reflection, (AB), (B) Hypertext. Autobiography, Task, To build, To oppress, Learning, Sense, To change, Musical, To Re-do, To listen, Construction, To link, Listening, Manner, Experience, Knowledge, To ask, Necessary, Oppressed, First.

shared metacognitive processes which are activated by the hypertext production. The results of this second analysis process are graphically shown below.*



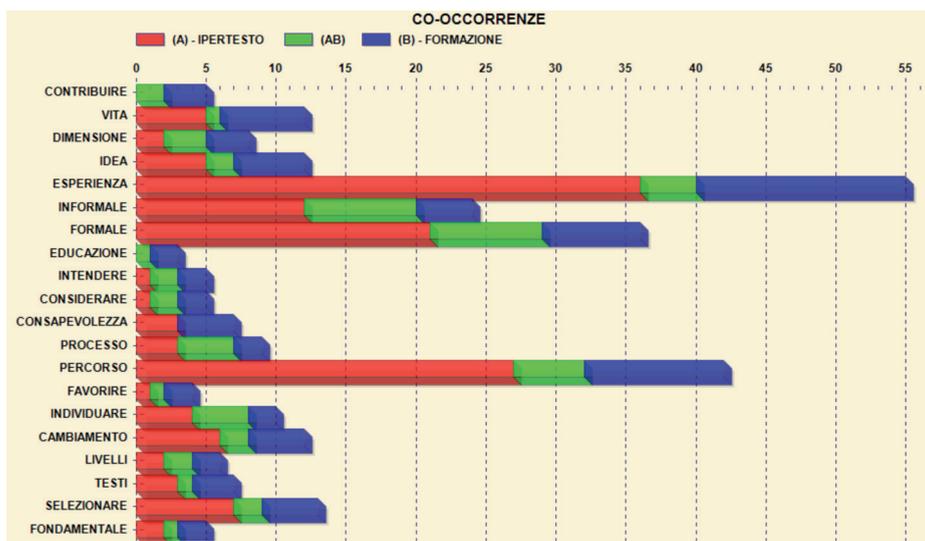
The research group, oriented by the intersections emerging from the analysis of the introduction and from the scientific literature, decided to explore in depth the links both conceptual and expressly linguistic, between the *hypertext and knowledge*.

From the textual analysis of the lemmatic intersections resulted that the hypertext activates a multifaceted construction, an implicit and potential capacity, probably until that moment not explicit and not aware so much that the most relevant core of the intersection is that related to the sphere of change.

This process of individual and shared construction of knowledge is expressed as a search for a common thread that holds together all the knowledge that oneself acquired in the formal, informal and non-formal settings, promoting the acquisition of awareness about one's life and formative experiences. It has to be noticed the presence of a lemmatic intersection between the words *mind* and *connecting* which helps us drawing a parallelism between the connection of knowledge in the hypertextual lattice structure and the modeling of neural networks in which the cognitive development and the and restructuring of previous one's acquisitions would reside.

* Co-occurrences: (A) Hypertext, (AB), (B) Knowledge. Thread, to keep, to cross, to connect, reality, life, development, change, to build, awareness, words, to favour, to read, mind, own, series, informal, possible, capacity, conductor.

Down below there is the analysis of the lemmatical intersections of other two important terms which are frequent in the produced metacognitive grids, *hypertext and formation*.*



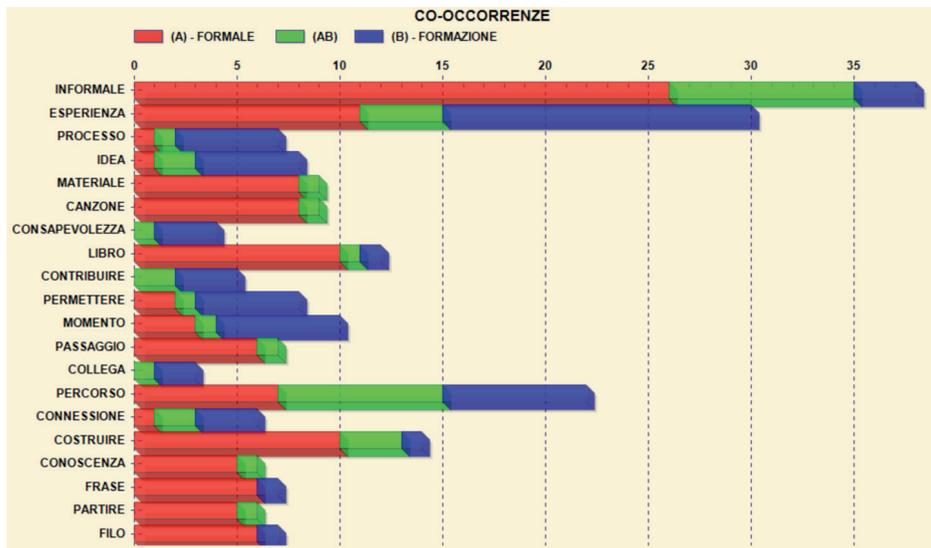
It emerges from the graph how the experience finds its connotation while *selecting the texts* to be inserted in the three sections of the hypertext. The hypertext experience can be considered as a process, one's path of formation moving onto different levels because it promotes awareness of one's fundamental educational models in life. It signifies and re-signifies these models because of their connections in the wider education path. Moreover, the hypertext makes explicit the ideas of education, man and of the processes of change which are promoted starting from the adhesion and the internalization of that model. It is like a disorienting dilemma (Mezirow, 1991), stressing and forcing us to think about our education, and how it has contributed in every phase of our life.

So, the difference between formal, informal and non-formal, appears even clearer to the participants, especially during the reflective and metacognitive phase of filling the metacognitive grid. There is a new chance to re-think about the practice in order to find a link with the theory.

Finally, it was carried out an analysis of the intersections between the lemmas formation and formal in order to see which conceptual and then textual

* Co-occurrences: (A) Hypertext, (AB), (B) Formation. To contribute, life, dimension, idea, experience, informal, formal, education, to understand, consider, awareness, process, path, to favour, to identify, to change, levels, texts, to select, fundamental.

interconnections could be revealed. The analysis of lemmas intersections explores the linguistic and consequently conceptual, nodes which are produced by the narratives. These nodes create interconnections between thoughts and emotional experiences that can be explained starting from their analysis. The purpose is to let the conceptual and emotional twists emerge spontaneously and automatically, non-intentionally from the participants reports. The lemmatic intersections were analyzed only for the lemma *formal* starting from the reasoned methodological choice to take into consideration the setting of the hypertext task which is required in an academic and university setting. It provides for the integrative use of other techniques and methodologies, to support listening to oneself, to others and to the social context.*



The most relevant intersection between the lemmas *formation* and *formal* arises within the two interconnections of *path* and *informal* referring to the whole path of building the hypertext.

Moreover, for the first time we can notice a reference to the group, sharing one's path with the university colleagues. The sharing of the hypertext construction happened both while planning the hypertext, through comparisons, exchange of information, ideas, thoughts, and during the making of the latter. In fact, some students presented part of their hypertextual path to their classmates

* Co-occurrences: (A) Formal, (AB), (B) Formation. Informal, experience, process, idea, material, song, awareness, book, to contribute, to allow, moment, passage, colleague, path, connection, to build, knowledge, phrase, leave, thread,

and to the teacher who coordinates Lepe's activities, in order to have feedback and comments on the progress of their production. In the graphical analysis presented above we outlined the knowledge and the references that have to be involved in the formal section such as the books and the most significant and emblematic phrases of theories or authors that students remind.

So, the hypertext becomes a space where one can *think* about the complexity of the plot given by formation and experience. It is a place to rediscover and find a new meaning compared to one's past formation and to the years spent at school and university.

Psychology students' grids reveal introspection and self-reflection abilities: they are particularly willing to work on themselves and their educational models, without leaving their emotions and affects. Concerning the functions of metacognition described above, it seems from the analysis of the hypertextual introductions that the overdetermined and more developed function is that of monitoring and integration.

Monitoring, which expresses oneself double ability to identify, recognize and define the different components of one's own mental state (emotions and thoughts), and to establish a relationship between these internal components and the environmental or relational events describing causes and motivations of behaviour, is evident while one's developing awareness and understanding of intentions, thoughts and of one's hypertext leitmotiv path.

Students are able to describe their own formative path and to represent it when selecting the material and sharing it into the three sections.

On the one hand, the integration, the ability of reflecting on states and mental contents, integrating them to each other even with other elements, is expressed in students' skill to get an integrated vision of their mental states such as of any of their mental processes compared to the temporal sequences.

We find this last ability in the hypertexts' organization with cohesive and consistent connections between the formal, informal and non-formal fields. Integrating is useful to the following fundamental tasks: establishing hierarchies of relevance in the context of hypertext; clarify the relationship between the components of the three areas of hypertext; clearly express the different roles within the proposed materials. However, these results have to be extended and made more complex by the analysis of the questionnaires administered after the experience that we carried out.

Conclusion

The Contribution of Neurophenomenology to Transformative Learning*

Being able to talk about transformative learning is necessary, in order to investigate from a biological point of view its conditions of possibility. The bio-pedagogy showed over time reading models of the learning processes of autonomous and heteronomous kind (Stollo, 2003). In the first case both the nature of the learning process that the possibility to intervene on it starting from the conditions of the training setting are very limited, because the process of learning is determined by the genetic predispositions of cognitive structures that select between the stimuli coming from the environment those most significant for the structures themselves. In the second case, however, the learning process even in part conditioned by individual predispositions, depends more on socio-cultural environment, paving the way for educational interventions aimed at the transformation. In physical and cultural contexts of belonging, man is never passive receptor of environmental stimuli that hurt him, but is an agent system set in relationships with other agents systems, modifying each other. The socio-cultural environment is the constructor and producer of mental structures, thus the educational process is not simply facilitated by environment products. In line with a heteronomous type model, in the neurophenomenological approach (Varela, 1991; 1996), subjective schemes are not genetically determined, but they are definitely influenced by the types of beliefs and reasoning schemes available in the culture that surrounds the individual (Stollo, 2008). This, on one hand may anticipate the impact of contextual constraints, on the other opens the way for reflection on the transformative possibilities of educational practices, which may be dialogic interaction spaces where to revise mental habits, behaviors, taken for granted assumptions transversally to the multiple application contexts (Gordon, 2013). Varela (1979) defined the unity of autopoietic systems as or-

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ganized networks of the processes of transformation and destruction through which the system continuously regenerated and realized the processes or relations that produced it. Starting from these conceptual premises, neurophenomenology (Varela, 1991; 1996) offers a meaningful contribution to support the conditions of possibility where transformative learning (Mezirow, 2000; 2003) may occur. The core concept of the neurophenomenological reflection is the intentionality, which should be considered as the root of all human action, therefore, of the learning process and of the educational action. The central elements of the reflection on the intentionality find their theoretical roots in the phenomenology by Husserl and Merleau-Ponty (Dreyfus, 1982), and their empirical roots in the neuroscientific studies on brain functioning (Rudrauf, Lutz, Cosmelli, Lachaux & Le Van Quyen, 2003; Lutz & Thompson, 2003). Those latter besides using the traditional functional magnetic imaging resonance, adopting the virtual reality (Froese & Fuchs, 2012; Froese *et al.*, 2014), which even if in experimental conditions, allows to identify with greater approximation the variables that impact on the process of action in contexts of real life. Considering these researches, neurophenomenology identifies the base of action modeling processes that are the principles of enaction, emergence and coevolution, which are rooted in Husserl's theoretical categories of the Constitution, Implicit and Intersubjectivity (Stollo, 2008; 2014). The enaction implies that "the sensory-motor association shapes, but never in a deterministic way, the double endogenous activity representational and constructive in a time that it configures into meaningful world items in an unceasing flow" (Varela, 1999, p. 270). The enaction means that each human action (and each human action is an intentional experience) works only through sensory- motor acts. The enactive approach to perception is not only constrained by the environment, but contributes to its effective activation, so that the body at the same time gives shape to and is formed by the environment. In terms of methodology, it is possible to trace the adoption of a process very close to that proposed by the phenomenological tradition, since the correlation between the subjective act and the objective data to which this act is aimed explains the separation between things and modes of manifestation of the things, the subjective perception of the acts explains the appearance of the independent reality of things, and vice versa. The starting point in the study of perception is not, therefore, a world that is given, independent of the subject of perception, but the sensorimotor structure of the cognitive agent, the way in which the nervous system connects the sensory and motor surfaces. The exterior, the environment, plays a disturbing function that resides at the origin of the activation of perception, but since it takes place in local situations and these are constantly changing, it is the sensory-motor structure that determines how that person can act and how it can be modulated by

environmental events. The emergency introduces the possibility of considering any action as characterized by the co-participation between different regions of the brain, which are functionally distinct and topographically distributed, and their sensorimotor embodiment. Recent surveys conducted in the field of neuroscience allowed to support the transition from a conception of the brain as modular, both from the topological that functional point of view, to one that sees it as active by means of the simultaneous action of fragments of modules communicating with each other for phenomena of ‘resonance’: the occurrence of a resonance between cognitive subsets that act simultaneously, even if dedicated to specific differentiated functions, brings out “the cognitive configuration of the subject at that precise moment” (Varela, 1990). The result is the inability to reconduct a global process, such as the conscious behavior, only to local rules that govern brain function: emergency, the specific cognitive configuration, manifests itself as a construction dependent on a relationship between the organism in a whole and the environment. Consequently, the traditional notion of a cognitive agent, which collects information and makes decisions for subsequent actions is replaced by the concept of transient configuration that emerges “in a moment and disappears in the next moment, and this for every fraction of a second” (*ibidem*). The coevolution, connected to Husserl’s concept of intersubjectivity, concerns the ways of construction of models of actions: a reactive mode, a hedonistic mode and an educative mode, reflecting the cognitive levels that are driving the evolution of the human gender. The difference between the three constructive schemes depends on several cognitive factors that intervene in the processes of construction of actions: the reactive action does not require the use of particular cognitive strategies and allows to adapt to complex environments exclusively for very simple tasks. Sophisticated action carried out in an evolutionary environment require to process the action starting from one’s own experience, making reference to a principle of pleasure/displeasure. This is the hedonist level: by virtue of processes of self-reinforcement, the agent works in advance and is able to build new strategies. But at the hedonistic level these action strategies are stiff and evolve slowly. The only way for an agent to change in real time unsuitable strategies is the education, which refers to the ability to mentally simulate future actions, without one’s own direct experience or imitation, and from patterns of one’s cognitive and symbolic dynamics, functional for the strategies to be implemented. The education means, then, agent’s ability to simulate numerous cognitive trajectories, where it is necessary, and to realize a self-directed learning from these virtual trajectories (Strollo, 2008). The limit for an isolated agent is, however, the possibility to use only models of action built on the basis of his own experience: the only way to build models, based not only on the individual experience, lies

in the possibility of being able to make use of models built from the experience of others. This requires a new skill, the mirroring skill: thinking, modeling, reasoning in a given situation as well as the other would think, would model, would reason in the same situation. This is one of the main aspects of the concept of mirroring, essential concept to analyze the cohesion of human societies. In dealing with a new situation the human being does not build models only in function of what is observed but also considering the way in which the other would build models in the same situation. One of the key points of education in enactive key is thus intersubjectivity, the complementarity of self and other in the processes. One of the distinctive elements of the higher primates would, in fact, be to excel in providing an interpretation of the other's mind. This skill is a particular kind of intelligence, connected to the understanding of mental states, desires, intentions, and beliefs, based on the other's bodily presence. The other is learned, therefore, not as an object but as another similar subjectivity, an alter ego, who shares the same organic structure embodied in the same vital field: this double dimension of the body, organic and lived, is the basis of training and of the human evolution, so understood in terms of co-evolution (Strollo, 2008). The learning process, therefore, in the neurophenomenological approach is always a transformative process: the conditions of possibility of learning reside in the ability to manage metacognitively one's own actions. About this conclusion the neurophenomenology has been working for years to build metacognitive strategies enabling subjects of experiments to report in first person (Diaz, 2013) what happens to them in the laboratory. One of the peculiar elements of neurophenomenology is criticism of the reports in third person and of researchers' reports, as a guide to the definition of what happens during the experiment (Varela, 1991; 1996; 1999). Hence the construction of paths that tend to form self-reflection about internal cognitive processes: these paths could be very interesting about the reflection on the possibility of a transformative learning (Mezirow, 2000) that makes individuals aware of their cognitive processes, acting on the emergent elements that regards the implicit and working as emancipatory element from cultural imprinting. We will discuss about these strategies currently in use as well as being tested in the Laboratory of Educational Epistemology and Practices in the end of our contribution. How Neurophenomenology Supports the Conditions of Necessity for Transformative Learning According to neurophenomenology, learning processes take place implicitly and are strongly influenced by the culture in which they implement, so we should reflect on how individuals are truly free in their choice of action. The condition of possibility of the process of freedom of choice lies in making explicit our own learning processes and in the emancipation from the cultural imprinting (Strollo, 2014). In this regard, neurophenomenology appears to present

numerous connections with the theory of transformative learning: the input that generates the transformation is in fact intended in neurophenomenology as a kind of confused problem (Merleau-Ponty, 1964), as a perturbation (Varela, 1991) and as a disorienting dilemma (Mezirow, 2000). Merleau-Ponty (1964) defines input as a kind of confusing problem: the body and the environment, sentient and sensitive, are not facing each other, sensation is not the irruption of sensitive in sentient, but is the outcome of a coupling, a synchronization between inside and outside, where the outside, the environment poses to the body of the living subject a kind of confused problem, for which the subject is called to find the attitude that will give him way to self-determine under this stimulus. Varela (1991; 1996) talks about inputs such as disturbance, perturbation, which triggers an autopoietic process of defense, which responds to the input renovating the subjectivity in its entirety. The concept of “perturbing input” exceeds the learning vision in mechanistic terms opening up to a more problematic interpretation of the person-environment relationship, according to which the environment, which also triggers strongly the dynamics of change, is “metabolized through a device certainly much more intricate and complex than the adaptive operation” (Stollo, 2006). Mezirow speaks about input as disorienting dilemma (Mezirow, 2000; 2003): the disorienting dilemma is a disturbing input that determines a time of uncertainty, estrangement, an “A-ha!” moment. The disorienting dilemma is something relevant to the mystery of learning, to that jump that when it is produced, requires the need to review our patterns of meaning. The disorienting dilemma is an acute, personal and internal crisis (Taylor, 2000), which refers to some problematic experiences, themed from current insights and reference frames. People feel a disorienting dilemma when they do not undertake an action or a change despite having experienced the transformation through the process of critical thinking and reflective discourse: in this case, they go through a gap between their values and reality. In the ten step precursors of transformative learning, the outcome is the commitment in new action, testing a road thus far never undertaken. Clearly, the growth of self-awareness, the discovery of the values, and the encounter with other people promote the mutual exchange of insights, perspectives and visions that can enhance transformative learning. The disorienting dilemmas are part of the common sense of the people, but they cannot be solved without understanding the ways in which the perception, thought and action distorted the way in which people have defined the problem and themselves in relation to it, in order to increase the probability of transformation. This implies that individuals acquire an awareness of their ability to give shape to their lives and the ways in which they try to cope with the disorienting dilemmas that arise in their experiences. For both approaches, the condition of possibility for a transformative learning

resides into an input aiming at a reconfiguration of the previous cognitive structures, through a cognitive conflict that has resulted in an acquisition of metacognitive knowledge of the ties that imprison people's possibilities for action. In this regard the contribution of neurophenomenology can be further: neurophenomenology and its implications in pedagogy provide as well as a theoretical support for the possibility and the need for a transformative learning, also practical strategies for its achievement. These strategies are currently tested in LEPE (Laboratory of Educational Epistemology and Practices) as well as in a number of contexts in which it is adopted the neurophenomenological approach to the study of learning processes and include:

- Mindfulness as awareness and training strategy for first-person reports (for the clarification of the internal processes) used in both neuroscience research as well as in pedagogy (Lutz, Lachaux, Martinerie & Varela, 2002; Dor-Ziderman *et al.*, 2013; De Simone & Strollo, 2014; De Simone, Strollo & Romano, 2014; Lancaster, 2015; Kass, 2015);
- Metacognitive paths on the topic of the awareness of personal process of cultural formation.

In this regard, since 1999 it is used in LEPE a strategy designed to make users aware of the links between formal, informal and non-formal education, such as the hypertext: formal training means learning paths that take place in educational institutions and educational programs leading to the grant of recognized diplomas and qualifications; informal learning is a corollary of the experiences of everyday life, is not necessarily intentional and therefore can not be recognized even by individuals themselves as contributing to their knowledge and skills; non-formal learning means learning paths that take place outside of mainstream systems of education and training and does not typically lead to formalized certificates. Non-formal learning is dispensed in the workplace or in the framework of activities of organizations or civil society groups (youth associations, trade unions or political parties) (Source Memorandum on lifelong learning, SEC, 2000). The experience outcomes are reported in references sources (Strollo, 2008; 2014). Users through hypertext construction connect the three dimensions as starting point of the metacognitive awareness of the role that culture and environment play in the training process. Such awareness as appears from self-reports written by users generates awe and opens the way for a transformation aimed at achieving better management of the influence that culture plays on individual actions. This finds support in the reflection of the memes by Dawkins (Dawkins, 1976). The meme is an entity consisting of an information recognizable by the intellect (Strollo, 2008) on human culture, and that can be replicated by a mind or a symbolic memory support, for example a book, to another mind or support. In more specific terms, a meme would

be a self-propagating unit of cultural evolution, analogous to what gene is for genetic, then an element of culture or civilization transmitted by non-genetic means, especially by imitation, in transgenerational sense. Memes are responsible for the trans-generational cultural transmission. Hypertext, a kind of presentation of the connection between formal, informal and non-formal education on personal training story, is therefore understood as a disorienting dilemma from which to gain awareness of the role played by cultural imprinting on individuals' educational theory. The Laboratory of Educational Epistemology and Practices follows a different path than the most commonly used strategies as it does not depart from a biographical analysis of experience, but from a preliminary systematization of knowledge around the educational process by a synchronic and comparative analysis of the training models. This analysis is preliminary to the choice and the explication of a pattern of action, explanation that happens through the construction of hypertext, intended as a device of revision of people's educational work through the synchronic-comparative analysis of educational patterns of actions internalized. Between Neurophenomenology and Transformation, Future Perspectives The route presented intended to explore the contribution of neurophenomenology for transformative learning: the theory of autopoiesis (Varela, 1991) and of the embodied mind (*ibidem*) led to a paradigm shift in the approach to the complex relationship mind-body, understood as structuring elements of being in the world, in continuous autopoietic co-determination, which organize all human experience. We can therefore assume that the encounter between neurophenomenology and transformative learning would bring a mutual enrichment, considering neurophenomenology as a foundational element of transformative learning dimension and Mezirow's theory as an important instrument of strategies that enable precise first-person reports to be used in neurophenomenological trials. Neurophenomenology, in conclusion, not only substantiates (rooting it in the body) the questioning of the prospects of meaning on which it focuses the transformative learning theory, but provides the incarnated dimension of the opportunity to experiment new roles, after the review process, and to add in individuals' conscious experience of new pattern of action. Therefore, our future recommendations is for a deepening of the links that connect transformative learning theory and the embodied-enactive conception of the knowledge, which is embodied in our body and embedded in our relations and in lived experience.

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NEUROPHENOMENOLOGY OF EDUCATION

The book aims to present an action-research carried out with teachers and educators at University of Naples "Federico II": through the research and its results, it is possible to analyze the nexus and the connections between phenomenology and cognitive sciences, in the training of the educators, relating to the reflection about the category of intentionality in an educational key. The intentionality, otherwise the deepest motivation pushing the action, is in fact conceived as the "motor" of each educational process both for the trainers and for the subject in training. Specifically, with our contribution, we focus on the three vectors of the phenomenological inquiry on the category of intentionality: the process of construction, the characteristic of being implicit, and the intersubjectivity. These three vectors impact on the interiorization and promotion of ideals like democratic citizenship, global sensivity, and multiculturalism in the process of construction of professional identity, particularly in the field of education and of the formation of the educators. These three vectors are intended in the framework of the neurophenomenological perspective, which aims to put together the philosophical inquiry with the research in cognitive sciences. However, the purpose is to explore the consequences of this conjunction on the pedagogical reflection on the concept of educational intentionality, empirically showing how they influence the metacognitive processes of teachers and educators during their training course. In order to evaluate empirically how teachers and educators would develop metacognitive reflections about their professional identities and about their potential and their opportunities to promote ideals in the children education, we adopt mixed methodologies of research, using a structured questionnaire and the first-person narratives. The data gathered with these two instruments are analyzed in a comparative way to find out indications and directions to follow about the enactive implicit and co-evolutive dimensions of the training of the facilitators and educators.

Maria Rosaria Stollo is Full Professor of General and Social Pedagogy at the University of Naples Federico II. She is Scientific director of the Epistemology and Practices of Education Laboratory. Her research interests focus on training of trainers (teachers, educators, psychologists) and especially on the construction of practical training to reflective thinking transformative learning objective. Her most recent works, based on the connection between phenomenology, cognitive science and pedagogy, present the empirical research conducted in the Laboratory of Epistemology and Practices of Education (LEPE).