

Assuming Identity Roles in Becoming a Scientist

Mery Hamui

Universidad Autónoma Metropolitana
Azcapotzalco. Departamento de Sociología
Av. San Pablo 180. Colonia Reynosa
Delegación Azcapotzalco
Edif. H, 3er piso Departamento de Sociología
México

Alejandro Canales

Universidad Nacional Autónoma de México
Instituto de Investigaciones sobre la Universidad y la Educación
Circuito Cultural Universitario
Coyoacán, México

Abstract

This article discusses the importance of the concept of identity roles in the socialization process that occurs during the emergence of a scientist. It seeks to explore the factors involved in the socialization of scientists, in other words, how they shift from being a doctoral student to a scientist during the early phases of their careers as researchers, when the transition from dependence to independence is possible. It also attempts to explain the mechanisms involved in the transition of roles, and to address the importance of the configuration of elements that permit the identity roles of doctoral students, and what is involved in the process of becoming a scientist. It proposes spaces for observation and analytical dimensions to determine what identifies scientists, and what they assume during their cognitive and educational pathways.

Keywords: doctors, becoming a scientist, identity roles, socialization

This article discusses the importance of the concept of identity role in the socialization process that occurs during the emergence of a scientist. It seeks to explore the factors involved in the socialization of scientists, in other words, how they evolve from being doctoral students to scientists during the early phase of their career as researchers, when the transition from dependence to independence is possible. We also wish to explain the mechanisms involved in the transition of roles (Bazely 2003; Laudel & Gläser 2008).

The literature on the subject has highlighted some of the elements involved in the socialization process observed in the training of doctoral students (Parry 2007; Campbell 2003; Delamont, Atkinson, Parry 2005; Turner & McAlpine 2011; Jazvac-Martek 2009), but it is useful to clarify which elements these are and how they intervene in the process. This is even more important if one accepts the fact that, as statistics clearly show, not all students who begin high-level training manage to complete their doctorates, while not all those who manage to do so become scientists.

Our unit of analysis is the experience of the doctoral student during the last phase of the cognitive and educational route of the doctorate, and the first years after completing it. During this stage, greater involvement by the fledgling scientist can be observed in analytical activities, in his active participation in interpreting the data collected, in his promotion of state-of-the-art research and in the production of knowledge in the respective scientific communities.

Moreover, importantly, the type of programs used as a reference are those involving "international competence", regarded as being at the highest level in the ranking of the CONACYT's¹ National Quality Postgraduate Program (PNPC).² These programs, like all those in the Register, offer benefits for their students, such as scholarships and the possibility of improving the program thanks to the investment made through the funding given to them. The programs considered internationally competent have agreements with overseas institutions, enabling mobility among professors and students, joint supervision of dissertations and even participation in joint research projects. In these circumstances, one can assume that these programs and their doctoral students offer more possibilities of meeting the high requirements for knowledge production, and ensuring that their graduates emerge as scientists. However, the question remains on whether these circumstances facilitate the transition from doctor to scientist.

This article seeks to explain the importance given to the configuration of elements that enable the identity roles of the doctoral student, and what is involved in the process of becoming a scientist. To this end, we propose spaces for observation and analytical dimensions to determine what identifies a scientist and what he assumes in his cognitive and educational pathways. We begin with the assumption that doctors do not become researchers because, among other factors at stake, they fail to perform the identity role corresponding to each phase of the researcher's pathway. Identifying the salient characteristics of this identity would provide us with a better tool to explain the transition from students to scientists.

1. The Phase and Key Space for the Emergence of the Scientist

According to various authors, researchers emerge when doctoral students join the scientific community, during the last phase of the doctoral program and the early years after completing it (Bazely 2003, Delamont, Atkinson and Parry 2005; Parry 2007; Laudel and Gläser 2008; Campbell 2003). This tends to happen when their attention focuses on producing knowledge and they participate and advance by collaborating in this knowledge production and it is therefore assumed that they are up to date.

It is difficult to pinpoint the moment of emergence, as it occurs in what During (2013) refers to as "floating time" and Deleuze as "floating space". It is in this floating time and space that the possibilities of connection and separation, extension or simplification of circumstances, simultaneous conditions, experiences in the present and past, as well as different ways of understanding and projecting them coexist. This emergence can be seen as a decisive act, in which perceptions may change, and ideas, emotions and circumstances float, coexist and connect simultaneously in space and time, which can suddenly be perceived as ineffectiveness, discontinuity or negativity. However, when they are linked to expectations, objectives and other events that are connected and float in space and time, they can turn into a decisive act. When this happens, awareness of the past and present are linked, without clarity regarding the future, and beyond the control of whoever is experiencing it. At this point, another perspective and behavior appear.

In the broader framework of the research project our hypothesis is that if elements constituting the identity of the scientist coincide in time and space, then doctoral students can emerge as such.

¹ The term CONACYT means National Council for Science and Technology

² Within the broader framework of the research project discussed in the text reported here, we will compare between the careers of doctoral students and recent graduates from three doctoral programs at three public universities in three disciplines, rated by Conacyt as being at the highest level, "international competence". The selected doctoral programs are Social Sciences at UAM-I; Biochemistry at UNAM, and Sciences in the Physics specialty at CINVESTAV. These were selected because: a) current data show that only 8.3% of all the programs included in Conacyt's National Quality Postgraduate Program (PNPC) are ranked in the category of "international competence", indicating a high level of screening of the programs and doctoral students enrolled in them; b) being ranked in this PNP category implies that they are explicitly and formally designed to produce knowledge, and are recognized because they offer optimal conditions for socialization in the discipline, while their results are expected to be of a high standard; c) in these programs, doctoral students must publish or receive acceptance of at least one article in an international or indexed journal and/or have written a book chapter, and/or have participated in a patent, all of which must be related to the subject of their dissertation; d) as these are programs in various disciplines, the tasks, organizational frameworks and methods of publishing results vary. Moreover, doctoral students from previous classes must have complied with the academic requirements; and e) they are a socialization space for doctoral students advancing through cognitive and educational processes, in which they play roles and design their pathways to become researchers (Laudel and Gläser, 2008).

In other words, young doctors can become scientists if the doctoral student's personal attributes, expectations, meanings and emotions are related to the research task, if they become part of academic culture during the training process and in their first years, if they assume the sequence of roles to become scientists, and if they capitalize on the resources available to them, assuming identity roles in the educational and cognitive pathways that lead to the scientific field through the production of knowledge.

To develop how students acquire identity roles conceptually, the article will refer first to the agent, the young researcher and his inner world, then to academic culture, and subsequently describe how he assumes identity roles in his process of socialization until he becomes a scientist. When a person who has obtained a doctorate expects to become a researcher, there are significant implications for his emotions, the construction of meaning related to research and his incorporation into academic culture during the educational process. During this process, these two factors influence the roles being played, and entail a change of perspective in those wishing to become researchers.

A doctoral student's personal attributes are of great importance to his career as a researcher, his approach to research, and his methods and willingness to collaborate with others in research projects. It is therefore essential to determine whether the doctoral student is able to join the program's projects during the moment of socialization, and those he could become part of through his advisor's networks or those of researchers in the program once he graduates.

The literature on the subject suggests that those who decide to become scientists expected to follow their vocation. Since they were successful they assumed they would have a promising future within their careers and that meeting both these expectations would give them satisfaction. In the emotional sphere, they considered it essential to have confidence in themselves, to believe that they could undertake and succeed in various research tasks, that the effort was worthwhile and that success in this would yield satisfactory results. (Hemmings, Hill, and Sharp, 2013).

The scaffolding offered by doctoral programs intervenes significantly in the pathways that lead to the emergence of a researcher (Hasrati 2005; Hamui and Jiménez, 2012), since they create a structure that supports the doctoral student, so that, as he advances, he is able to produce research increasing independently. When supervisors and professors properly monitor their students' socialization, giving them the self-confidence and theoretical and empirical tools that allow to become involved in research, thereby enabling them to develop projects autonomously, it is easier for them to develop as researchers (Dever, Lafan, Boreham, Behrens, Haynes and Western, Kubler 2008; Lauder and Gläser 2008 quoted by Hemmings, Hill and Sharp, 2013).

One necessary condition to become a scientist is to be immersed in the systems of scientific knowledge, which are socially constructed in different socio-cultural and organizational environments from those of HEIs (Higher Education Institutions) or Research Centers. Doctoral students are incorporated into the scientific community when they publish articles in peer-reviewed journals, book chapters, peer-reviewed books, present papers and talks at congresses, discussions and forums, and review the scientific production of their peers. All this takes place under the rules imposed by the community of this field of knowledge to which they can belong, and regard themselves and are being regarded by their peers as researchers.

Doctoral programs are bound by the scientific community's guidelines and norms to produce human resources for research, produce knowledge and incorporate students into the field of knowledge, so that they may develop professionally (Scott, Brown, Lunt and Thorne 2004). Future doctors can expect to do two or more of the following: engage in research, and promote the development of their careers or their professionalization.

Those who pursue research adopt the rules of the game of scientific research and those they are obliged to accept. These rules are derived from the *ethos* of science, which, as stated by Merton (1977) as a system organized by norms. The scheme is meritocratic and distributes economic and academic capital. One can therefore study and obtain a doctorate and yet not be suited to the role of researcher. During the publication of results, new production is recorded, analyzed and interpreted, and there is clarity regarding the spheres in which knowledge is created. Researchers who take part identify gaps and find clues for advancing their research and interacting with others, using their knowledge and experience.

The material basis for research (that is, researchers' salaries, funds for undertaking research and the infrastructure supporting the activity) is provided by the research organizations (research institutes, universities, research centers) to which scientists are affiliated (Grediaga, Hamui and Macias 2012).

These spaces represent the field of work doctoral students aspire to, though some of them, studying in professionalizing programs, do not rule out the possibility of working in industry. According to the organizational structures of universities, some reserve a separate structure for research work and others link it to teaching, although in most cases, postgraduate studies combine both structures and constitute the work space for most researchers. This enables them to pursue an academic career based on the merit awarded by the scientific community (Clark 1997).

There are many types of doctoral programs, and there are also differences between countries, universities and disciplines. However, they share certain key features: obtaining a doctorate requires critical, creative thinking (Brodin and Frick 2011). Nonetheless, there is no consensus on how doctors can be trained to be critical and creative.

However, one can determine when a doctoral student is on the way to becoming a doctor, since this becomes obvious during the early years of the doctorate and in his internships. It is linked to the fact that of assuming roles in response to challenges, capitalizing the available resources and showing the required abilities, skills and attitudes. As the doctoral student undergoes the socialization process, he adopts different perspectives that reflect systems of meanings, involving values, demands, and principles, which show his peers he is able to carry out more complex tasks to produce results in the laboratory or publications (Hamui and Jiménez 2012). Each role involves a way of being and acting, corresponding to the identity roles undertaken.

Identity roles comprise a combination of self-esteem and the conviction of having achieved the desired effect, of being self-consistent and of feeling that one can regulate oneself on the spot, in addition to many other features (Stets and Burke 2000 quoted by Jazvac-Martek 2009). When one plays this role and establishes links between subsequent roles, one also negotiates the different ways of being and acting in the various possible identity roles (Hamui 2008; McCall and Simmons 1966).

2. Social and Cultural Factors in the Construction of Identity

The term 'identity' can be interpreted from different angles. From a psychosocial perspective, it is understood as a stable, cognitive construct (Erikson 1968), while others consider that identities are not fixed, and are constantly constructed, co-constructed and reconstructed in time (Egan-Robertson 1998), under the influence of social and cultural factors in the surrounding context (Alsup 2006). Still others perceive it as a changing and extremely relative concept with many labels, interpreting it along social and cultural theoretical lines such as gender, race and status (Erni 2008; Lin 2008; Sarup 1996; Yon 2006; cited in Hall and Burns 2009). This article takes a sociological perspective, which considers the social factors that contribute to the creation of identity, in the belief that doctoral students are agents giving meaning to their expectations and guiding what they wish to be and benefits them most, in their current context.

It also considers the influence of the perception of one's peers. i.e. other doctoral students, and the way in which they see them and place them in specific social contexts. In other words, the present identity and the one they project depend on their conviction of that of what they are, and what they tell others that they are, and why they strive to act in this way in order to appear to be what others say they are (Hall and Burns 2009). Identity is the result of agreements about a social representation with specific characteristics of the context in which they live and work. For example, when a doctoral student considers himself to be a "good student", he strives to appear to be so, to be designated as such, and to avoid diverging from what it means not to be a good student, in order to be identified as such.

3. Socializing Students as Scientists in Doctoral Programs

The doctor's socialization requires developing multiple skills and abilities, acquired by deploying various kinds of resources, to promote autonomy, be capable of designing strategies for cutting-edge knowledge in the field, to use the tools acquired to solve research problems and to prove this to researchers using validation processes. Learning this involves interiorizing the guidelines, values and practices of the disciplinary and organizational communities of reference. Through the socialization process, the student and the supervisor play different and asymmetric roles: the doctoral student shifts "from apprentice to master" and after, to the condition of being a colleague (Laudel and Gläser 2008; Campbell 2003); meanwhile, academic researchers as supervisors create and recreate meanings, interpret their activity and promote the necessary experiences to create an autonomous professional identity in the student, thus enabling him to become a peer.

The condition of a doctoral student involves being available for work in the field of knowledge to which he belongs, and also requires that he conduct his own research in order to become a colleague. Among the challenges he faces is the change in values, the awareness of his progress within the doctoral program and an inclination to contribute to the discipline, of which he has interiorized the meritocratic principles. Moreover, doctoral students must develop their identity in successive stages and meet the objectives of the programs, in order to gradually construct an academic career. Insofar as they evolve and transform, they establish a balance and overcome the relationship of dependence in order to join the scientific community on equal terms.

The educational processes of doctoral students are heterogeneous, and socialization is a function of the communities to which they belong. Variation in mechanisms and methods relates to the processes of selection, teaching-learning, monitoring of advances, availability of support, mechanisms for explaining results to communities of reference and the characteristics or requirements associated with presenting partial research results to obtain a doctorate and join the scientific community.

In other words, the models used in the socialization contexts in doctoral programs, observations, interaction, the behavior guidelines of supervisors, professors and more advanced students and participation in the production of knowledge, gradually incorporate students into the academic community (Austin 2002; Delamont, Atkinson and Parry 2005; Weidman and Stein 2003).

However, this does not suffice to enter the community, since the student also has to feel and be recognized by his peers, in a gradual process in which he assumes different identity roles throughout the doctorate. In the community, students acquire the tools and knowledge for constructing a cognitive career, as well as organizational skills relating to positions in the work structure, whether in a laboratory or field work, where they interact with researchers who know them and recognize them in their subject community. This is the background against which we will examine students in their context, as regards their motivation, experiences and interactions, which influence the emergence of the identity of the doctor on a postgraduate course, and eventually of the researcher.

4. Identities in the Pathway of the Scientist

Each role comprises identities that characterize the person playing it. Although identities sometimes overlap, they tend to have the same structure. Identities are developed dynamically, producing configurations of elements relating to the internal development of the doctoral student and to the social and subject space (Jazvac-Martek 2009).

From the analysis of the roles played by a young researcher who has recently obtained a doctorate and is immersed in his scientific community, whom we regard as an agent who makes decisions and acts accordingly, we can infer the identity he assumes and observe his relationships with others, the contexts of interaction he moves in, and reconstruct how he shifted into the role he is playing and the identity he has assumed. Developing the skills and abilities in order to be able to research and the beliefs and values required to do so are linked to the phases of the doctoral programs' structure, and the expectations and roles played by the student in the socialization process.

Expectations are the elements that put the future into the present (Schutz 1962). On this base, the student can imagine and organize his life. Even though it appears to be distant, abstract and unreal, it is perceived as desirable and possible. However, when expectations are actually experienced, conditions and situations are different from how they were imagined. Expectations are not fulfilled in the way we thought they would be but we as we have the experience, we learn and this "worthwhile" experience becomes the basis for new expectations (Hamui and Jiménez 2012).

As individuals, we structure our lives by moving towards the objects of our acts. We live in the present by focusing our attention on the immediate future, through expectations linked to the situation. The emergence of each role in the socialization of the doctorate involves floating times and spaces in time horizons, including an awareness of the past, present and future. The past provides meaningful experiences, which seem orderly and comfortable, but when these are incorporated into the present, new or forgotten elements appear that are linked to our conditions and expectations. We then project multiple possibilities for the future, which guide our actions.

During the socialization process, expectations are reformulated, desires are negotiated and activities are organized around them. This is used to define differentiated roles, which enable expectations to be fulfilled.

This adjustment of expectations incorporates the definition and redefinition of identity at different times, and involves the negotiation of roles in response to new situations.

Doctoral students act in accordance with situations in which they appreciate, choose, decide and implement strategies at various moments in their journey through the doctorate: when they define their research project, in their tutorials, before the supervisory panels and when they present and defend their dissertations before a jury to obtain their doctorate. Their experience and relationship with their advisor, professors, other researchers and peers alter the way they are in response to their own internal dynamics, their interactions with the outside world; chance also plays a role in this.

Identity can be deduced from the attitude they adopt towards themselves and reflect to the world, as they discover the contradictions and paradoxes arising from their evaluation of the difference between “the way things should be” and the way they are in practice and when they explain its formal, sequential role. In this assessment process, the student models, modifies and acts based on the way he is and internalizes identities, which he then projects onto his everyday life, by adopting various roles.

The doctoral program involves an educational pathway that operates as a scaffold (Hasrati 2005) in which the doctoral student is recognized and sought by the advisor and the academic staff on the program. The relationship between the supervisor and the doctoral student is crucial to the success of the research process, making the student feel secure, and ensuring that he has the possibility of being successful and becoming a scientist, as opposed to feeling discouraged and wanting to drop out of the postgraduate program. These perceptions float in time and influence the student’s decision.

The supervisor guides the doctoral student through the scientific *ethos*, to produce and present his findings in the context of new knowledge. To become part of this, it is necessary to publish, write and be read by peers, demonstrate abilities and independence, and for these achievements to be gradually detached from the advisor’s perspective. It is only then that he can feel he is achieving autonomy. The supervisor plays an important role, not only in terms of knowledge, but also as an example of the figure of scientist and the values and attitudes learned during socialization, such as honesty, patience and justice.

The roles of student and advisor are formalized in the learning process and practice (Hamui, Jiménez 2012). The advisor accompanies and supports the student during the doctoral program, a time of challenges and difficulties. Feedback is a key to obtaining trust, feeling capable of success and continuing to study for the doctorate.

The student is expected to advance through the program, act and demonstrate his certainty in a continuous way of being, with stability and persistence that provide him with an identity role, as a student, colleague or researcher (Laudel and Gläser 2008). In the process of socialization, he acquires knowledge and skills and learns values, patterns and the use of the experience of the disciplinary *ethos*, the ethos of the establishment and the *ethos* of the surroundings that modify and project him according to how well he has incorporated them (Hamui 2008).

In the relationship he establishes with others, he reflects his identity, and during this interaction, others show him theirs, as though it were a game of mirrors. In this context, each one ranks the other according to his internal scheme. For example, the supervisor shows the learner his identity as a successful research fellow, while the learner reflects his identity as an intelligent learner in his supervisor and classmates.

Throughout the scientist’s pathway, identity roles emerge in line with his development: being a learner, colleague or researcher (Laudel and Gläser 2008) and often overlap during the process (Jazvac-Martek 2009). The dynamic change in the configuration of elements incorporates new structures that make it difficult for him to act and fit into the roles we have defined—he may slip between them. In addition, by playing a role imposed by the advisor or group leader, the student may be identified by others in the role that has been imposed on him rather than the one he would like to be identified by.

As mentioned above, the transition to becoming a researcher involves a conflict with reality, a difficulty gradually overcome as the student experiences the process of enculturation, through which he acquires tacit scientific competence through trial and error, until he manages to publish independently (Delamont and Atkinson 2005). Campbell (2003) argues that not all doctoral students become researchers, perhaps because they cannot fulfill the identity role corresponding to each phase of a researcher's pathway. The researcher’s role emerges when he is able to research autonomously and begins to participate in the scientific community.

Bazely (2003) referred to this as “Early Career Researcher” (ECR), while Garbett and Tynan (2010) specified the meaning by delimiting it in time: “an early career (in research) is defined as the first five years after completing the doctorate” (p, 175).

The doctoral student follows all the paths in the *ethos* of the subject community and institution in which he is studying or working. There he obtains the bases and resources to play various roles by undertaking research projects and building up his career to become an independent researcher. The meeting of these paths is not linear nor does it occur at the same time in the various disciplines.

5. Analytical Spaces and Dimensions in Identity Roles

As one can see, the concept of identity role can be useful, since it allows us to analyze the intra- and interpersonal relationships of persons wishing and able to become researchers. Indeed, by contrasting and evaluating idealized role types, their feelings and actions and the way they are seen, they can be located in the identity role of researchers. The concept also shows how close or far they perceive themselves emotionally, cognitively and socially in their practices from the roles that lead them to become researchers.

In light of this context and the conceptualization of the identity role, we propose a few ideas, spaces and dimensions that enable us to visualize the identity roles from the doctoral student to the scientist. Firstly, there is McAlpine’s idea (2012) that the doctoral student is an agent making intentional efforts to imagine and build strategies to ask and answer research questions, even though these may not always be the most suitable ones or lead to the best solutions.

5.1 Identity Roles can be observed in the Following Spaces

1. Interactions and forms of relationship reveal a means of relating to others’ actions. Within this framework, they assess and guide their actions using established guidelines and norms (Hamui 2008). The doctoral student seeks to adhere to the idealized conception of his role, and to legitimize his actions in his activities. The progress he achieves places him in sequential roles. Sometimes, he manages to be a colleague while at others he goes back to being a learner (Jazvac-Martek 2009), but when he is building a scientific career, he tries to act and behave according to his idealized image of a researcher.
2. Another sphere is the context, floating space and time, in which identities are confirmed in actions. This happens when actions in the experience of the doctorate are consistent with the social representation of the role dictated by the scientific community. It is borne out when other people’s actions and reactions confirm that the student is fulfilling the idealized image of a role. In this regard, identities are in a process of legitimization and are embodied at the point where identity emerges.
3. Internships are another means of making identity roles observable. They interpret the expression of his activity, which is imbued with meaning, and the attitude that characterizes him in his own eyes and those of others. The student’s way of acting is reflected in his activities, his academic practice, the strategies he uses, and his participation in academic events in keeping with the rules, norms and prestige acquired. One example of this is the confidence and security he demonstrates when speaking on a subject in which he is gaining experience or which he is researching, or when he feels he can clearly express their ideas in writing. The student reveals himself through the way he behaves, and others confirm what he shows.
4. In experience, with its continuous need for legitimization and self-verification, the identity role can be confirmed even though there may be discrepancies between his actions, the feedback received from others and the idealized stereotype (McCall 2003). Playing a role requires being in constant exchange and reciprocity with others’ roles, since roles are confirmed in a context of interaction in which meanings and ways of being are exchanged (Buke and Stets 1999 cited by Jazvac-Martek 2009).

5.2 Situations That Enable Us to Reconstruct Their Experience Include the Following:

1. Context in the configuration of elements structuring the scientist’s socialization process.
2. Experiences at the various stages of cognitive and educational trajectories during socialization, and the influence of experience on the legitimation and self-verification of which he is capable, on the current intentions and on imagined short- and medium-term futures.

3. Opportunity during the socialization process. The opportunities on which the doctoral student capitalizes as he advances through the phases of the cognitive and educational trajectories in the program, his actions that are crystallized into achievements that lead him to sequential identity roles on the postgraduate course, and his insertion into the scientific community.
4. Interactions such as building networks and the reciprocal relations he used as resources to occupy positions and responsibilities in the field of knowledge and in the educational and organizational pathways, to obtain peer recognition, establish an institutional career, obtain funds for research and have responsibilities in the organizations to which he is affiliated.
5. Shifting identity roles, as described by Jazvac-Martek (2008), to observe the legitimization in the role, situating the respondent at a time when he experienced playing an undefined role. For example, when he felt like a learner when he was a colleague, or a colleague when he was a researcher, or when he felt like a colleague when he was a learner or like a researcher when he was a colleague. This involves analyzing the time when he did not fulfill the role he was expected to play yet which he experienced along the way to becoming a researcher.

Lastly, we believe that the doctorate enables students to enter the scientific community, and socializes and guides the future doctor, who plays various roles that identify him in gradual positions and times before he emerges as a scientific researcher. Analyzing the observation spaces and dimensions allow one to go beyond what it means to take a non-linear route, which places doctors and young researchers in roles that identify them with a way of acting. It also enables one to consider what expectations and emotions entail, as the student advances along cognitive and educational pathways in order to manage to feel like a scientist and be recognized as such by his peers.

Examining the constitutive spaces of the scientist's identity and addressing key aspects that enable one to reconstruct experience provides more elements for understanding why repeated efforts to train high-level resources do not always result in the intended goal: training scientists. At the same time, it could provide a better approach to some of the factors at stake during the emergence of the scientist, and help prevent the hurried linear and automatic training processes that are often proposed in various initiatives.

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