

From Anthropocentrism to Post-humanism in the Educational Debate¹

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ABSTRACT

This paper explores the impact post-human stance has on the study of the learning process. It shows how this new paradigm which focuses upon the relationship between human and non-human modifies our understanding of education. First, we argue that the educational debate is largely inspired by an anthropocentric perspective. It is grounded in the notion of human self-determination and it neglects the role of non-human factors in the learner's development. Furthermore, non-humans (both animals and machines) are usually considered as something to be used: in other words, they are instruments. This fact notwithstanding, there is a small minority of contemporary learning theories that investigate the relationship between human and non-human from a non-anthropocentric point of view. An overview of these theories is offered in the second part of the paper. Finally the use of Latour's Actor-Network Theory (ANT) in educational research will be explored to show one of the possible non-anthropocentric methods of conceiving and investigating the learning process. According to ANT, learning can be interpreted as the effect of a network made up of heterogeneous elements, both human and non-human.

Keywords: post-human pedagogy, post-human education, philosophy of education, learning theories, Actor-Network Theory, post-humanism, anthropocentrism, Bruno Latour, Tara Fenwick, humanism, non-human animals.

¹ Paragraphs from 1 to 4 are written by Alessandro Ferrante. Paragraphs 5 and 6 are written by Daniele Sartori.

1. INTRODUCTION

This article originates from the hypothesis that the conscious use of the post-humanist paradigm in the field of education theories would enable us to develop new visions of educational phenomena and to interpret them in a non-anthropocentric way.

This article intends to problematize the anthropocentric premises of pedagogy, to examine the impact of post-humanism on pedagogical knowledge, and to study the Actor-Network Theory in depth, as it represents one of the most interesting, innovative, and non-anthropocentric proposals in the educational debate. The fundamental questions that orient our speculation are the following ones: In which terms is post-humanism contributing to redefine the pedagogical discourse moving beyond the main schemes of anthropocentric humanism? How can it promote a new understanding of both the educational processes and the learning dynamics?

Before going deeply into pedagogical issues, it is worth clarifying what we mean by “anthropocentrism” and “post-humanism” in this article.

2. ANTHROPOCENTRISM AND POST-HUMANISM: DEFINITIONS

Anthropocentrism could be considered as the main paradigm of thought in western society (Badmington 2003; Marchesini 2009; Andreozzi 2014). In general terms, we could interpret it as a large cultural frame that generates in human beings a feeling of supremacy over the non-human (non-human animals, plants, ecosystems, machines). The anthropocentric perspective is based on a three-fold thesis, according to which humans are special and privileged entities compared to other living beings (ontology), they are the only sources of knowledge (epistemology) and the sole holders of moral values (ethics) (Andreozzi 2014, 49). Thus, anthropocentrism involves ontological, epistemological, and ethical dimensions that collectively justify the attitude of human dominion over nature (Marchesini 2009; Andreozzi 2014; Ferrante 2014b). The use of anthropocentric premises leads us to consider the human as clearly separated from and opposed to the non-human, as well as superior to it. The non-human is viewed as having only instrumental value in order to satisfy human needs; the only needs that are regarded highly by anthropocentrism. Moreover, a human-centred vision obstructs the decentralization from humankind – however partial it may be – in both philosophy and human sciences, bearing serious consequences in relation to the kind of knowledge that is produced and to the effects this very knowledge has on social and natural environments (Braidotti [2013] 2014).

On the contrary, post-humanism aims at criticising and overcoming the ontological, epistemological, and ethical coordinates of anthropocentrism (Hayles 1999; Marchesini 2002; Badmington 2003; Pepperell [1997] 2003; Marchesini 2009; Wolfe 2010; Braidotti [2013] 2014). In order to do so, post-humanism focuses upon the relationship between human and non-human as the distinctive object of its investigation, interpreting it from a non-anthropocentric perspective, thus detaching itself from a hierarchical idea of reality. A similar perspective favours the decentralisation from humankind and shifts the focus towards the multiple connections between the human and the non-human (Pickering 2005; Braidotti [2013] 2014). This enables us to study the interconnection between nature and culture, as well as the relations that involve the human being and biological and technological alterities at the same time, from new perspectives. Post-humanist theorists conceive human identity as an impure product derived from an ongoing miscegenation and contamination with the non-human. In other words, human beings become such only through a process of hybridization with the environment, as well as with those forms of otherness that inhabit it, which can be considered as co-evolutionary partners (Marchesini 2002, 2009; Farisco 2011).

Nowadays, post-humanism is a controversial and debated interdisciplinary perspective, but also an original and promising one. As Badmington observed, such a frame of thought facilitates the connection of different research areas (2004). In fact, post-humanism recurs in many research fields: in literature, arts, philosophy, theology, human sciences, architecture, computer science, media studies, gender studies, animal studies and in disability studies (Badmington 2004; Gane 2006; Braidotti [2013] 2014).

3. THE INFLUENCE OF ANTHROPOCENTRISM ON THE PEDAGOGICAL DISCOURSE

Over the last decade, pedagogy has started to examine the motif of post-humanism (Stables and Scott 2001; Gough 2004; Pinto Minerva and Gallelli 2004; Pedersen 2010; Barone 2014; Ferrante 2014a, 2014b; Pinto Minerva 2014). Nevertheless, post-humanism is struggling to affirm its importance in this field, as ideological and cultural resistance persists. In fact, pedagogy is a form of knowledge so much rooted in the humanistic and anthropocentric tradition that has been recently defined as the “most human among human sciences” (Mariani 2006, 31). The intimate connection between humanism and pedagogy is widely acknowledged in both the scientific and the philosophical debate concerning education (Marrou

[1964] 1971; Luhmann and Schorr [1979] 1999; Cambi 2003; Colicchi 2009; Pedersen 2010; Acone, Vitale, and De Maio 2013). Pedagogical knowledge – from the Greek *paideia* to the German *building*, until the most recent neo-humanistic education theories – is permeated with ontological, epistemological, and ethical presuppositions that are reconnected to the diverse anthropocentric models that alternated with one another in the history of western culture.

Despite this, we believe that the connection between pedagogy and post-humanism could be prolific and profitable. In fact, post-humanism questions different anthropocentric assumptions that recur in the traditional pedagogical discourse and that still recur in many education theories. In this article, we will discuss the two most common anthropocentric assumptions that can be clearly detected in some of the most popular education theories, in order to demonstrate how post-humanism could overcome them.

3.1. *Education as a human proprium*

The first assumption is that human beings alone could educate and be educated in turn. Many contemporary educational researchers and philosophers of education support this assumption in different ways, notwithstanding the fact that they adopt theoretical perspectives that differ from one another (Hessen [1946] 1958; Mounier [1949] 1964; Bertolini 1988; Iori 2000; Mariani 2006; Acone, Vitale, and De Maio 2013; Cambi 2014; Martino 2014)². When this assumption does not directly derive from religious and metaphysical discourses, as it happens for personalism

² Bertolini and Iori resort to phenomenology, Hessen to spiritualism, Mounier, Acone and Martino to personalism, Mariani to deconstructionism, Cambi to both hermeneutics and critical pedagogy. Therefore, they represent some of the most widespread education theories that characterise the pedagogical debate. To put these authors together does not mean to declare the theoretical and social context in which each of them operate as uninfluential. For example, it is evident that a new personalist such as Acone elaborates an educational model that is completely different from that formulated by phenomenologists such as Bertolini. On the contrary, our point is that in the formulation and enunciation of their ideas of education there are assumptions that transversally recur in their works however distant from a theoretical point of view they may be. Though means differ, all of these authors share the idea that education is a peculiar phenomenon in the human world, and that *anthropos* is the only creature that could actually educate and be educated, despite the different evidences supporting the formulation of the various thesis. To explore anthropocentric perspectives in pedagogy and their respective differences in greater depth, see Ferrante (2014b, 55-75).

(Mounier [1949] 1964; Acone, Vitale, and De Maio 2013; Martino 2014), it is based on the belief that non-human animals could not educate or be educated, as they resort to instinct in order to survive. Animal behaviour, therefore, is widely predetermined by innate schemes. On the contrary, instinct does not, in most cases, enable human beings to face everyday challenges successfully. Human beings have, therefore, to overcome this biological deficit resorting to reason and culture, which directly derive from education. In general terms, education is understood as the ability to create and share knowledge, a rational faculty that human beings develop. Through communication, the human being transmits individual and social knowledge to the next generation, a form of knowledge that has derived from both direct and indirect experiences of reality (Bertolini 1988). To the animal, on the contrary, this opportunity is negated. For example, Hessen explicitly argues that animals do not have traditions, in the sense that a generation does not share the points of view, attitudes, and practices it has elaborated to the following one ([1946] 1958). Of course it is impossible to deny that other species different from ours learn, but the anthropocentric prejudice leads us to consider that this happens thanks to automatisms (Marchesini 2013), that is instinctive and irrational mechanisms that are expressed by the stimulus-response model. Non-human animals' learning is thus described as a sort of environmental conditioning that the animal passively experiences. Non-human animals could be bred and trained, but not educated. The privilege of education is limited to the human being. He is the only entity who is given power of speech, reason, intellect, self-consciousness, freedom, ability to share ideas, practices, and the knowledge he acquired in his lifetime to his children (Bertolini 1988, 150).

Moreover, new human generations do not absorb the teachings of their ancestors in a passive way, but they critically re-elaborate them. The learning subject, as a human being, plays an active role in the processes of knowledge construction (Bertolini 1988; Iori 2000; Cambi 2014). The cultivated man is not a mere reproduction of a predefined model imposed from the outside, but he is an active entity, capable of formulating his own judgment and of supporting it (Hessen [1946] 1958). True knowledge, as underlined by the pedagogical tradition, contains awareness, interiority and freedom in itself (Cambi 2003); education is the high road of humanization (Mounier [1949] 1964; Iori 2000; Acone, Vitale, and De Maio 2013; Cambi 2014; Martino 2014). It elevates the human being above the animal world, and enables him to have access to existential and meta-biological aims and meanings (Hessen [1946] 1958), which at times carry a spiritual or religious message. Education, therefore, is a social practice that uproots

humankind from nature, leading it towards what truly belongs to it, that is culture (Hessen [1946] 1958; Mariani 2006; Cambi 2014).

The anthropocentric “narration” that we have just illustrated creates an idea of human beings that abound in culture, but lack in nature, and an idea of animals abundant in nature but lacking in culture, incapable of going beyond the rigid cage of instinct. The starting point of any anthropocentric pedagogy, therefore, is the clear distinction between human/animal, nature/culture, innate/learned, instinct/reason (Ferrante 2014b). In this ideological framework, education is confined to the human world, it is one of the protected fields that separate humankind from other living forms, it is a “threshold notion” that divides and dissociates human from the non-human, particularly from animals. Education represents a human trademark, the coat of arms of his ontological and anthropological peculiarity.

From these observations derives the fact that the only true educator is the human being and that he could be educated in turn only by other fellow humans. Thanks to education, therefore, the human being becomes a self-made entity; he grows as a self-sufficient creature without any substantial contribution from the non-human. The human educator could at least use the non-human strategically, but simply to make his activity more efficient. The non-human otherness (machines or animals) is reduced to either an object of knowledge or an instrument that could be employed in learning processes. Education remains a practice that simply belongs to human beings (Iori 2001; Acone, Vitale, and De Maio 2013; Martino 2014).

3.2. *The human as a pedagogical unit of analysis*

Since pedagogy deals with education, and since education is a human practice from an anthropocentric point of view, the object of any pedagogical analysis, therefore, could not be anything but humankind. The second assumption, intimately related to the first one, is that pedagogical analysis should be restricted to humankind. The *anthropos*, intended as either individual, subject or person is perceived as the *proprium* of pedagogy, its historical and theoretical *telos* (Cambi 2014, 210). Pedagogy is represented as the form of knowledge that should custody, defend, and protect human beings, thus helping them to develop their humanity (Mariani 2006; Acone, Vitale, and De Maio 2013; Cambi 2014; Martino 2014). It is therefore for the *anthropos* that pedagogy speaks and constructs itself (Cambi 2008, 104).

The primary educational concern of any humanist pedagogy, as Luhmann and Schorr among others outlined in their accurate analysis ([1979]

1999), relates to the “form” that should be conferred to both the other and oneself in order to become the humans that we potentially are. Therefore, pedagogy explores the aims, norms and values that are attributed to the educational process and that are its founding aspects. This applies in two cases: when this form is considered as something that is, as it were, naturally present in the individual and that is simply waiting to come into light (the maieutic approach); when it is considered as a form partially modulated by external events (this could be defined a sculptural approach)³. In all these cases, the question is to thematise which model of human being should be created according to political, ethical, metaphysical or religious criteria. Therefore, a sort of epistemological shift takes place in pedagogical theories: to research on the creation of the human being, scholars end by interrogating themselves on the human being itself, attributing to him an absolute priority.

4. POST-HUMANISM AND PEDAGOGY

Post-humanism, as written above, allows us to critically deconstruct the anthropocentric assumptions of the pedagogical discourse and to suggest different ways to interpret educational phenomena.

4.1. *Education and non-human otherness*

The first of the two anthropocentric assumptions – that is to say that education completely detaches the human from the non-human – could be overcome thanks to a speculation that resorts to contributions of different spheres of knowledge, ethology *in primis*.

This discipline has demonstrated that other non-human animals also have a consciousness and a refined cognitive apparatus, a certain degree of subjectivity, and an articulated behavioural, social and emotional repertoire. Besides, they can develop complex learning, as well as transmit such learning to their offspring, thus creating at times truly cultural traditions (Mairardi 2001; Marchesini 2002; Marchesini and Tonutti 2007; Bekoff [2007]

³ About the relationship between the idea that education is an interior process and the idea that it is the result of external influences in the history of pedagogical theories, see Dewey ([1938] 2014). For further details about the educational imaginary evoked by these two approaches in relation to the theme of human nature, see Ferrante (2013).

2010; Marchesini 2013)⁴. Non-human animals are sentient, intelligent, and conscious beings, not at all passive and predetermined by their rigid instincts that aim to satisfy their existential needs. Moreover, as Marchesini affirmed, the human being itself can express his cultural dimension thanks to his complex neuro-biological apparatus, and not because of an assumed biological vacuity (2002; 2009). If this theory is valuable, it is because it asserts that nature and culture, innate and learned, should no longer be opposed in human beings (or in non-human animals): rather, they should be viewed as interdependent relationships, based on mutual integration and interaction. Thanks to this interpretation, the paradigm that separates human-animal and nature-culture starts to crack, thus unveiling the anthropocentric prejudices that inspire it (Marchesini and Tonutti 2007).

Therefore, we can consider education as a widespread phenomenon in nature that crosses the borders between the human world and the world of other animals. The notion of education, therefore, could not be used to erect unsurmountable barriers between our specie and the others. Of course, this does not mean that human education is identical to that of other species. It has more to do with the recognition of the cognitive plurality of the different forms of animal life (Marchesini 2013) and the differences that exist in nature in relation to the learning patterns. In other words, it means to stop using the notions of education and learning, which raise human beings to a superior and privileged position, in a pretentious way.

It is worth considering that, according to post-humanism, the human being does not learn only from the members of his specie. Any individual, as well as any social group, elaborates his identity and his behaviour in relation to non-human partners, animals among them. Marchesini argues that a great amount of cultural expressions – from dance to the planning of many technological devices – is mediated or promoted by animal otherness and that is originated by a direct comparison with it (2002; 2009). According to this hypothesis, human culture has a substantially dialogical and hybrid character, in the sense that it results from many connections between human and non-human. This consideration induces us to accept that not only non-human others learn, but also that we ourselves learn from them. Pedagogy, therefore, tries to recognize the fundamental contribution non-human otherness gives to the definition of human cultural and educational processes (Pinto Minerva and Gallelli 2004; Ferrante 2014b; Pinto Minerva

⁴ The *Cambridge Declaration on Consciousness* represents a significant interpretative turn about the question of non-human animal's consciousness. This document, subscribed in 2012 by renowned scientists, explores how the scientific data available lead to consider that mammals and some other animals are fully conscious beings.

2014). In the light of the previous observations, to adopt a post-humanist perspective from a pedagogical point of view enables us to question not only how we learn *as animals*, but also how and what we learn *from other animals*, as well as in which terms education could be reconsidered in relation to *non-human otherness*.

The relation between humans and non-human animals in the learning process has been examined in great depth particularly in applied zooanthropology (Marchesini 2002; Marchesini and Tonutti 2007). For example, non-human animals become essential reference points that favour people's cognitive, emotional and social development both in didactics and in the pet therapy that follow a zooanthropological approach. Applied zooanthropology's projects are based on the ability to make available and apply the referential content that belongs to the human-animal relationship. In practical activities, this kind of relationship is not randomly developed, but it is planned and oriented to specific dimensions, in order to obtain particular benefits linked to the user's peculiarities. Moreover, these practices focus on the user's conscious recognition of the biological and behavioural characteristics of animal otherness, thus favouring the decentralization of the human subject, as well as a collaborative and respectful attitude towards the animal partner.

Many educational scholars who resorted to post-humanism have discussed the question of rethinking education through a constant reference to non-human otherness. Pedersen, for example, argues that the reference to non-human otherness stimulates the interconnection of disciplinary fields that are usually separated and to question the human subject's supremacy in educational experiences (2010). In the author's opinion, it is important to establish a sort of alliance between animal studies, research and educational practices. This would, in turn, challenge pedagogical anthropocentrism and decentre the human subject through a form of education that would promote the recognition of non-human animal roles thereby raising their status from that of a subaltern and commodified level. This should also allow to problematize the complicity between pedagogy, biopower and biocapital, based on the exploitation of living creatures; a kind of exploitation that education usually does not simply oppose, but also contributes to its perpetration in different ways.

Pinto Minerva, as well as Pedersen, attributes a prominent theoretical role to the non-human in the creation of a new idea of education (Pinto Minerva and Gallelli 2004; Pinto Minerva 2008, 2014). The author conceives a "pedagogy of the mutant subject", according to which the human being has experience of both himself and reality thanks to ongoing *transition* processes – for he undergoes a constant metamorphosis – and to *trans-*

action processes, that is interactive exchanges with different forms of otherness (human and non-human ones), whom he progressively encounters. Since human education takes place in the light of hybridization processes with the non-human, the scholar argues that the development of competences that would lead the subject to learn how to establish a relationship and how to co-evolve with otherness, human and non-human, is of pivotal importance. In fact, they would help him to develop forms of planetary democracy and of solidarity among the species that go beyond anthropocentric schemes. With this object in mind, pedagogy should promote practices of self and world care, as well as all the forms of otherness with which we share processes of co-evolution, being aware of our ontological bias.

To both Pederson and Pinto Minerva, as well as to other scholars who confront education from a post-humanist perspective (Stables and Scott 2001; Bonnett 2004; Gough 2004), we need to overcome anthropocentric, anti-ecologic, and specie specific behaviours thanks to educational activities. That is to say, that education should build relationships between the human and the non-human that do not gravitate around the *anthropos*'s superiority. Nonetheless, in order to accomplish this aim, it is worth redefining education beyond the ideological barriers of anthropocentrism, considering it as a practice that accepts non-human otherness's contributions.

4.2. *The relationship between human and non-human as the subject of education studies*

Post-humanism also allows us to overcome the second anthropocentric assumption that pervades the theories of education, according to which human beings are the *proprium* of pedagogy.

In fact, wherever a post-humanist logic is adopted, the object of study changes. This object is no longer the human being *or* the non-human one, nature *or* culture, but all that is *between* them. Pickering claims that the dualism of nature and culture that characterises modern humanism is fossilised into rigid disciplinary distinctions (2005). This traditional approach separates the "hard" sciences of nature – that exclude what is human and instead study the world of things – from the social sciences, which in turn explore the human world, focusing on meanings and exclude the world of things. Pickering explains in detail that this subdivision is not erroneous in itself, but it is not compulsory. It can, therefore, be overcome, if the unit of analysis changes, thus becoming a hybrid object of study on which to reflect and intervene from a non-anthropocentric perspective. Considered in these terms, post-humanism is an invitation to explore the ways in which

human and non-human worlds combine, without assuming any intrinsic superiority of the human. This means that in order to understand the different assemblages of the human and the non-human, human sciences should reorganize their epistemological traditions (Braidotti [2013] 2014).

As far as pedagogy is concerned, to adopt a post-humanist perspective provides opportunity to analyse educational phenomena without exclusively focusing on humankind. The object of a post-humanist pedagogy is to study the ways in which the human and the non-human co-emerge and interact, and to generate new educational experiences. Learning is no longer considered as an individual cognitive process or as a mere social realization. It could be rather considered as the effect of a complex system, composed by both human and non-human (Sørensen 2009; Fenwick and Edwards 2010; Barone 2014; Ferrante 2014a, 2014b; Sartori 2014). Learning, therefore, derives from the collaboration of bodies, spaces, objects, technologies, animals, and natural forces.

A small minority of educational studies has recently shifted its attention from students and teachers to the multiple interconnections between the human and the non-human. Some of these studies aim to describe how learning and knowledge are rooted in action. To this end, they decentralise their attention from the human being in order to explore the materiality of educational processes, that is to say “the mutual entailment of human and non-human energies in local materialisations of education and learning” (Fenwick and Landri 2012, 1). Socio-material studies in education – to which Cultural Historical Activity Theory (CHAT), Actor-Network Theory (ANT), Complexity Theory and New Cultural Geographies belong – open up new research opportunities and inaugurate a new vocabulary to rethink pedagogy, in other words educational practices themselves. Among the socio-material approaches to education and learning, the one that combines themes, categories and methods of the Actor-Network Theory is probably the most popular and radical (Latour 2005; Sørensen 2009; Fenwick and Edwards 2010; Fenwick and Landri 2012; Ferrante 2014b; Sartori 2014). Since the Actor-Network Theory represents one of the most significant non-anthropocentric perspectives, its assumptions appear to be the most promising and warrant further examination.

5. ACTOR-NETWORK THEORY: AN INTRODUCTION

In the first part of this paper, it has been argued that post-humanism openly refuses the ontological, epistemological and ethical coordinates of anthropocentrism. Two of its main traits have been discussed. Firstly, it has been

argued that post-humanism does not grant the human being a superior or privileged position over non-human species. Secondly, that human being is not its main object of analysis: post-humanism focuses on the multiple relationships between the human and the non-human. Once the rigid distinction between nature and culture (or nature and society) is removed, we can explore the interconnectedness between the human being and the biological and technological alterities. In introducing Actor-Network Theory (ANT), we will consider it against the above mentioned traits.

As for the first point, ANT treats human and non-human entities according to the principle of symmetry. Quoting Latour: “[...] to be symmetric simply means not to impose *a priori* some spurious asymmetry among human intentional action and a material world of causal relations” (2005, 76).

Non-human entities have traditionally being considered passive conductors or neutral carriers of actions whose source should be found elsewhere – in an intentional and conscious human actor or in an overarching and distant structure. ANT grants them agency, i.e. the ability to modify a given state of affair. More precisely, each human or non-human entity is deemed capable of generating transformations and triggering unexpected events along the chain that links it to the others. As a result, action is redistributed: the actor is never alone in acting. It is made to act by many others (Latour 2005, 46).

Additionally, ANT rejects the idea that entities have inherent attributes, qualities or properties. Law invites to understand it as a “semiotics of materiality” (1999, 4): ANT extends to all materials the semiotic insight of the relationality of entities. The form entities have is a consequence of the relations they entertain with other entities. They are performed into existence through those relations. Nothing is inherently ahistorical or durable: labour is constantly demanded to stabilise the connections that maintain a certain entity into existence. Given that, ANT investigates how human and non-human entities come together, exert force, hold together or decay (Fenwick and Edwards 2010). This is in line with what we have considered as the second main trait of post-humanism.

When entities come together – associate – they interfere with each other’s course of action by modifying their respective goals or functions or by offering one another new possibilities. ANT names this particular relation “translation” (Latour 2005, 108). Researchers are invited to follow, trace and describe the chain of translations in such a way that it is clear what actors do and make others do. When this happens, when each point of the chain is treated and described as a translation, we end up with something like a network. The notion of network should be considered as a tool

to keep the world flat while we carry out our investigation. ANT bypasses the opposition between individual and structure. There is no individual enclosed in a context and acting in isolation from within it. At the same time, there is no such a thing as distant and pre-existent structure capable of influencing entities' behaviour. All there is are associations among human and non-human entities deploying themselves in different spatial patterns (Latour 1999). It is through these relations that power is enacted, circulate and sediment.

In the next paragraph, the use of ANT in the educational debate will be discussed. We will focus on the notions of learning process and knowledge, teachers and students' identity, educational reform.

5.1. Actor-Network Theory and the educational debate

If we investigate the learning process using ANT key concepts, we no longer understand it as a singular and well-defined entity. On the contrary, we become interested in the many entities and interconnections underpinning it. We also reject the traditional assumption that learning is an individual cognitive achievement and embrace the idea that non-human entities play a key role in the process of knowledge building. Sørensen (2009) clearly shows that representational knowledge does not simply transit from its source (e.g. a textbook) to the learners' mind. A chain of translations and many artefacts are required to connect people to it. The researcher followed a teacher and a group of pupils studying the metric system. In order to explain it, the teacher asks a pupil to jump; she then measures his performance using a piece of chalk and a ruler. The metric system – the representational knowledge – is used as an external standard to compare the performance of the student to a given value in the textbook. It is made to associate with the network already in place in the class via different artefacts. More generally, the process of knowledge building should be understood as the product of the particular pattern of relations entities design when they associate. In the case of representational knowledge briefly discussed here, two separate regions are made to connect. Different patterns produce different kinds of knowledge. By using ANT to trace patterns of relations, Sørensen identifies two other types of knowledge: communal knowledge and liquid knowledge.

ANT also calls into question the traditional understanding of student and teacher identity as a set of pre-determined and universal attributes. Nespore (1994) understands students' identities as the result of the interactions between architecture and the codified knowledge of the discipline.

The author focuses in particular on the role of the programme. The latter artefact organises people in space and time; moreover, it associates the individual with certain contents and instruments. In so doing, the programme influences the range of networks students can connect to, thus assembling a certain type of student. In the case of the physics course he considers in his study, students are assigned to a secluded building; being obliged to take courses in a given order, they have no opportunity to organise their time schedule; they also have access to highly sophisticated representational technology (e.g. equations) which few people can master. All these factors do not encourage contact with different networks or people other than classmates, thus promoting the adoption of specific ways of interacting (e.g. meeting with peers during the night to study) and representing the world. Quoting Nesper “identity consists of a configuration of ties – a particular way of assembling an actor network – coupled to a public narrative” (2011, 22).

Nesper’s study (1994) clearly shows that ANT does not invoke structure or social institution to explain entities’ behaviour or identity. Agentivity is granted to non-human actors, the world is kept flat and the chain of translations is followed.

ANT has been used to investigate teacher identity too. Fenwick (2011) clarifies the process of enrolment and translations of teachers during the educational reform launched in Alberta (Canada) in 2000. Once teaching software, teaching guidelines, textbooks, student materials, instruments of data collection began to circulate in the classrooms “Lesson plans became experiments. Everyday interactions with students became ‘benchmarking’. Student assignments became research findings. In other words, the translation of teacher to [...] researcher fundamentally changes the pedagogic gaze, identity, and relationships” (Fenwick 2011, 125). Teachers were translated into “knowledge producers and authorities” (Fenwick 2011, 127). Their identity was the result of the relations they entertain with other human and non-human entities: teachers were made to act as knowledge producers and researchers. This calls into question our traditional understanding of professional standards – i.e. that set of knowledge, skills and competence that is used to define professional identity. Far from representing “the reality of what teachers know, believe and are able to do” (Mulchay 2011, 97), standards are constantly enacted through local material practices. As Mulchay (2011) shows, teaching practices require physical work and embodied judgement from the teacher, as well as material objects and the students’ involvement. In the process of developing universal standards all these elements are made to disappear. The scholar followed a teacher panel meeting where geography teachers come together to produce the standards for the

discipline. In this case, video excerpts of local teaching practices were translated into universal professional standards by way of material (notes), literary (arranging elements in lists and items) and social (grouping experts in a panel) technologies. The universality of standards was also reached thanks to final documents and reports being circulated and informing policy design.

Finally, ANT calls into question our understanding of educational reform. As Nespor (2002) points out, the traditional narrative about reform is that of an encounter between two discreet, distinct and well defined entities: a set of core principles and a pre-existent context. The latter either support or challenge the former. The problem with this way of conceptualising reform is that it makes it extremely difficult to think of both reforms and contexts as mutually constituting one another. School should not be considered a self-contained context. Artefacts such as homework, curricula and standards move school practices across space and time, well beyond the school building. Mrs. Tuttle, the main character of Nespor's paper, was attached to the school via a constant flow of papers, homework, grading and reports. Her use of the artefacts she received from school played a crucial role in defining the identity of the school, that of the reform and her identity as a reformer. In the school-based network, papers are intended to be signs of students' individual performances. When Mrs. Tuttle compared a particular paper with a similar one from her other daughter undertaken four years earlier, she noticed the curriculum content had changed. The paper underwent a translation: once Mrs. Tuttle provided it with a new set of associations, it ceased to be the sign of an individual performance and became the marker of curriculum change. What was the marker of curriculum change was then compared with other children's papers, thus becoming a sign of the school's performance. It was also considered the defining example that a school reform was happening. Finally, once hybridised with the national debate on curriculum reform, the homework became part of a wider problem: the national curriculum reform. As Nespor points out, not only was Mrs. Tuttle actively shaping the identity of the school; she was also constructing the curriculum reform in terms she could oppose.

6. CONCLUSIONS

In the first part of this paper the main traits of post-humanism have been briefly described. Post-humanism openly refuses the human-non human dualism. Furthermore, it does not grant humans a unique and superior status. Given that, it focuses on the relations between the human and the non-human. The implications of adopting a post-human perspective in

education have also been debated. Pedagogy has been shown to be traditionally based on the assumption that reason and culture are human trademarks: the education process distances individuals from nature and instinct and lead them towards culture. To counter this presupposition, three arguments have been made. First of all, ethology has demonstrated that non-human animals are able to educate and initiate cultural traditions. Second, it is thanks to his neuro-biological apparatus – which is a biological trait – that the human being can express its cultural dimension. Third, the active role of non-human animals in the learning process have been fully acknowledged by zooanthropology: learning processes based on inter-species relationships have been successfully designed and delivered by scholars in this field.

The second assumption on which pedagogy is traditionally grounded is that of the human being as the *proprium* of pedagogy. The main concerns of pedagogy are which model of human being should be created and which criteria should guide educators in this process. To answers these questions, the notion of human being itself is debated and investigated, leaving no space for non-human entities, animals included. ANT has been presented as a radically different way of understanding and investigating the learning process.

By adopting the principle of symmetry, ANT at the same time refuses to grant the human being a unique status and grant agency to non-human elements. Furthermore, ANT openly refuses essentialism: the form and attributes of entities are considered to be the result of the relationships they entertain with other entities. Once applied to educational research, ANT displaces man and its attributes as the main actors of the learning process. The latter is understood to be underpinned by a swarm of interconnected human and non-human actors. As for the humans participating in the learning process, their identity is acquired, enacted and negotiated thanks to and through the networks they are enrolled in. From this perspective, to think about change and reform is to think about how to rearrange the connections linking actors together.

ANT has proven to be a powerful analytic tool. Can it also offer us any indication about the directions in which to orient future education practices? As we have shown, authors such as Pinto Minerva and Pedersen have already argued the need for education to actively contrast anthropocentrism and promote the co-evolution of the human with non-human alterities. Because of its political neutrality (Braidotti [2013] 2014, 50), ANT would probably not be able to take part in this debate very soon.

The lack of an explicit ethical commitment is not the only issue educational researchers need to examine. The second and perhaps exquisitely

pedagogical question we need to answer is how to translate ANT insights and findings about a given learning process into operational variables that can be used to re-design the process itself. Above all, is it possible to intentionally re-design a network? To what degree is this possible?

Finally, considering educators' training and development: how can we alert educators about the role that the non-human plays in education? Is it possible to mobilise ANT categories during the design and delivery of learning processes? How?

By answering these questions, we could probably offer the education debate a much more viable alternative to the current emphasis on the human and his cognitive faculties.

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