

Article

# Identification of Levels of Sustainable Consciousness of Teachers in Training Through an E-Portfolio

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**Abstract:** The contents of Education for Sustainable Development (ESD) should be included in teachers' initial and advanced training programs. In order to determine the key competences for sustainability, creating a Sustainable Consciousness is one of the main foundations. However, there are not many empirical studies that deal with consciousness from education. In this context, e-portfolio appears as a tool that promotes reflection and critical thinking, key competences for consciousness development. This work intends to propose a categorization system to extract types of consciousness and identify levels of consciousness of teachers in training. For this research work, of an eminently qualitative nature, we have selected twenty-five portfolios of students in the last year of the School of Education at the University of Macerata (Italy). The qualitative methodological procedure followed allowed to deduce three bases that shape consciousness of teachers in training: thinking, representation of reality and type of consciousness. We concluded that the attainment of a Sustainable Consciousness in teachers requires activating and developing higher levels of thinking, as well as a projective and macrostructural representation of reality.

**Keywords:** sustainability; consciousness; education; e-portfolios; ICT

## 1. Introduction

Today's dominant approach on Education for Sustainable Development has been carved in the last two decades under the UNESCO's leadership. Specifically, its Global Action Programme (GAP) for Sustainable Development, regarding Education (SDG 4), intends to develop two clear objectives: 1) Reorienting education and learning so that everyone has the opportunity to acquire knowledge, skills, values and attitudes to empower them to contribute to a sustainable future; and 2) Strengthening education and learning in all agendas, programmes and activities in order to promote Sustainable Development [1] (p.18).

In addition, the declaration of the Decade of Education for Sustainable Development (ESD) (2004-2015) reveals that the progress towards Sustainable Development requires establishing action frameworks to encourage civic participation, awareness, education and qualification [2, 3]. Education has been regarded to play an essential role in this process, as it is the foundation to build more sustainable and equitable future scenarios. In this regard, teacher training institutions are key agents and, for these reasons, the UNESCO [4, 5, 6] has recommended nations to include such institutions in their plans for national sustainability.

Therefore, we need to integrate ESD in teachers' initial and advanced training programmes; but also, to do research on suitable pedagogical practices in order to help teachers to formulate ESD strategies applicable to teaching and evaluation of ESD learning processes [7].

On the other hand, there is a long and extensive research line on the use of ICT in schools and its effects on learning. Some of the results point out that ICT tools promote both students' learning and motivation and have a great value and potential to encourage inclusion [8, 9, 10, 11, 12, 13, 14, 15, 16]. That is why integrating ICT in teaching methodologies is so relevant for teachers' training to achieve sustainability goals.

However, still there are unanswered questions subject to research, such as: What teaching competences for sustainability should be developed during teachers' initial training? What didactic methodologies are more suitable for this purpose? What role should ICT play in the development of sustainability competences? Etc.

In short, if sustainability is one of these essential challenges of today's society for the years to come, we need to provide educational agents, mainly teachers, with competences that encourage Education for Sustainability (ES) at different educational levels and contexts. In this line, our purpose is to explore the e-portfolio in sustainability awareness' learning and assessment in teachers' initial training.

## **2. Pedagogical models and competences for Sustainable Development in teachers' initial training**

On an educational context, international institutions (UN, UNESCO, UNECE) have proposed pedagogical models and competences for sustainability [17, 18, 19, 20, 21, 22].

In the last years, the UNESCO [23, 22] has proposed four approaches to deal with ESD; they call them: integrated, contextual, critical and transformative. The first one, the integrative, insists in a holistic perspective and places the focal point in the different factors linked to sustainability. This perspective gives priority to the development of the ability to link and interconnect knowledge and information. The second, contextual, gives precedence to local culture as a source of inspiration for sustainability change. It requires to be able to analyse different problems, look for solutions, improve possibilities to the fullest and choose a path, this is, take decisions. This approach gives priority to the ability to analyse and take decisions. The third perspective, the so-called critical, requires competences for awareness: intellectual competences and ethical competences. Basically, it requires to develop a critical thinking. The transformative approach, closely linked to the previous one, involves a step further: after awareness, we need actions to foster change and transformation. In this case, active and committed participation competences are required.

These methodological proposals have an eminently intellectual orientation, as they are focused on developing competences that shape thought architecture and management, essential to achieve sustainability. This is, they are aimed at shaping a mind-set that allows citizens to take an active part in actions for a sustainable future. It involves activating different intellectual and personal competences; analysis ability, critical thinking, awareness, etc. But there is room to wonder, how can we recognize and shape citizens' awareness for a sustainable future?

In the last years, there have been outstanding efforts to identify and define operatively the necessary competences for Sustainable Development [24, 25, 26, 27, 28, 17, 29, 30, 19, 31, 32, 21]. The existence of several key competence classifications shows, according to Brundiers & Wiek [33], that there is not a unanimous agreement. However, the UNESCO has pointed out that the most important are: critical analysis, systemic thinking, collaborative decision-taking and sense of responsibility towards present and future generations, among others [34] (p.12).

Martínez-Huertas [35] defines Education for Sustainability (ES) as a qualification for conscious actions aimed at learning to change. This definition includes important aspects to be considered in teachers' training for sustainability, such as conscious action, combining two elements: action and consciousness, which is precedent. In addition, the inherent educational goal is to learn from action in order to transform praxis. The axes to articulate teachers' training for sustainability, consciousness, practice, reflection and transformation have been extracted from this conceptualisation [36, 37].

This is, Education for a Sustainable Development involves the development of competences related to consciousness and critical thinking [38].

## **3. Consciousness as a key competence for sustainable development**

Until now, there has not been a systematized knowledge that can be used as a reference to train teachers regarding Sustainable Consciousness. This article intends to advance in the identification of the elements that shape consciousness development in teachers' training and in the identification of consciousness types, as well as their development through training [37].

The educational approach towards the raising of consciousness is difficult due to, among other reasons, the diversity of its conceptualization and operational barriers. As this is a highly complex construct and has barely been used in educational empirical research, we have a limited background of the scientific proposal hereby submitted. Therefore, we think we need to describe the theoretical keys that substantiate our research work.

Consciousness has been studied from different branches of knowledge. From psychology, Piaget and Vygotsky provided different approaches [39]. According to Piaget, consciousness is related to cognitive and thinking levels, suggesting a correspondence between consciousness levels and intellectual development [40, 41, 42]. According to Vygotsky [43], consciousness is the product of the internalization of external activity. It is shaped in a developmental manner through higher psychological processes, including processes for the internalization and appropriation of rules, codes and concepts of the social group (interpsychic) and the individual's internal cognitive activity (intrapsychic) [44, 43, 45, 46, 47, 48].

One of the most representative authors from an educational approach who has resorted to the concept of consciousness raising as a key axe of education is Freire [49, 50]. According to him, education consists in conscientization, this is, the cultivation of a critical conscience, which takes place starting from the analysis and interpretation of reality. This author differentiates three types of consciousness, applicable both to personal development analysis and social group study: magical awareness, ingenuous awareness and critical awareness. Each of them involves different cognitive attitudes and ways of thinking. This author conceives education as a conscientization process involving three phases: awareness, critical consciousness and transformative action. This is a continuous process that involves reflecting on praxis. It leads to deeper interpretations of reality that, in turn, result in new levels of understanding.

Besides this theoretical classification of consciousness levels, taxonomies of conscience levels have recently been developed, applied to professional decision-taking [51]. Along these lines, it is worth noting Endsley & Garland [52]'s contribution on Situation Awareness (SA) which, due to its general and global nature, can be applied to the study of educational teaching praxis. According to Endsley [53], SA is the individual's level of conscience of a situation and the dynamic comprehension of "what is happening". This model identifies three levels of conscience: 1) Subjective perception level, 2) Meaning comprehension level; and 3) Reintegration level for future projection. The integration of these three levels shape the concept of Situation Awareness the perception of the elements in the environment within a volume of time and space, comprehension of their meaning and the projection of their status in the near future [53] (p. 36).

In short, scientific literature seems to agree in two ideas; 1) conscience is linked to cognitive processes and 2) there are different levels of conscience linked to certain types of thinking [54]. These theories are a reference to study sustainable consciousness from an empirical-educational approach, as well as to assess the role of ICT in training.

#### **4. E-portfolio as a tool for consciousness training**

According to Gámiz-Sánchez, Gallego-Arrufat & Crisol-Moya [54], teachers' initial training must back methodologies that involve students' active participation, supported by their personal effort and work. Two decades ago e-portfolios appeared under these premises, which were incorporated to future teachers' training [56, 57, 58, 59, 60]. It has also been started a research line to assess their learning potential [61, 62, 63, 64].

E-Portfolios are a technology validated by the international community to supplement professionalization processes, due to its multiple benefits: it permits to connect an entire network of different multimedia materials, it is user-friendly and exportable and it can be shared and seen from different places [65]. Authors such as Rossi [66], Barrett [67], Hartnell-Young & Morriss [68] and Bahous [69] supported its potential to collect experiences, reflect on them and help students to manage learning. Likewise, they concluded that e-portfolios foster the integration of theory, action, self-reflection and assessment. They are also optimum platforms to foster knowledge construction [70, 71, 72, 73].

In this study, we shall use the Teacher Portfolio (TP), which appeared in 2010 upon the need of a change in initial teachers' training after the introduction of ICT. This e-portfolio was designed and implemented at the University of Macerata, specifically, in the department of Educational Sciences, by professors who have been experimenting and using it for teacher training from 2010 to the present [74]. TP is a tool that allows documenting the development of teachers' professionalization by collecting evidences, reflections and descriptions, displaying the relationship established by individuals between present (how people perceive themselves, and with which abilities) and future (towards professional enhancement). So each student has to build his own e-portfolio using the Mahara platform.

This e-portfolio has been structured around three main axes [75]:

- Curriculum analysis: in this part students must select training activities and reflect on their election.
- Design and application of an educational proposal: involves designing a short didactic proposal, justifying its interest, implementing it and reflecting on its action. We established a feedback among peers.
- Reflecting on a teaching competence profile: in this paragraph, students must reflect on the necessary abilities for teaching function development. They must choose three competences that they consider important to develop it in the future [76]. The team work competence has been regarded as the most important by teachers in training [74].

The e-portfolio learning model has an individualized nature, where students' experiences depend on their knowledge, preferences, needs and interests [75]. On the other hand, students are more involved in the construction of the learning process, which increases their awareness and their ability to identify problems, root causes and potential solutions [62, 55]. Therefore, e-portfolios provide a technological context that fosters the development of conscious, committed and critically active professionals [77, 38, 63]. E-portfolios apply critical judgement and self-reflection to teaching actions and the process of knowledge construction and generation, which in turn promotes consciousness [78]. According to Dewey [79], real learning is the result of reflection on doing.

Our contribution is focused on experimenting and doing research on the application of e-portfolios to the development of sustainable consciousness in teachers' initial training.

## 5. Team work as a methodology to develop consciousness of teachers in training

One of the key teaching methodologies is "team work" [80, 81]. This methodology has had substantive effects in the achievement of educational goals closely related to sustainability, such as social cohesion, civic participation, respect for difference, etc. [82, 83, 84, 85]. According to Brundiers & Wiek [33] it would be important to develop communication and team work skills in a sustainable future (p. 4). Literature on education for sustainability also includes interpersonal competence, this is, the ability to work in a group [33]. However, these abilities are not usually included, explicitly, in sustainability programs.

Learning to work as a team is very important due to present society's need to solve highly complex problems that demand group's collaborative work. Therefore, learning how to use each student's abilities for problem resolution and learning, enhancing innovative and successful proposals, is an important skill for teachers [86, 82, 87]. In this regard, this is a didactic proposal that fosters inclusion, respecting and enhancing diversity [84]. Another educational value of collaborative team work concerns to the variety of social interactions generated, which supports interpersonal links and builds a trusting foundation for social cohesion [83].

Team work also involves and implies putting into practice multiple skills such as: task planning, fixing goals and strategies as a group, time management and learning to discuss and come to agreements with others, as well as developing commitment, autonomy and responsibility [88, 89, 90, 91, 92]. All these competences are essential for social sustainability. This methodology also promotes participation, critical thinking, solution anticipation and decision taking in order to foster change [93, 94, 95, 96].

The main educational goal for a sustainable future is founded on changing individuals' and social groups' attitudes (consciousness). This is about transforming practices, attitudes and ideas settled in people's cultural tradition and incompatible with a sustainable future. Sustainable Consciousness (SC) includes an entire system of knowledge, beliefs, values and attitudes that become activated in the practice in the physical, social and cultural environment to preserve a sustainable future [97].

In this regard, it is essential to point teachers' training towards the development of consciousness levels for a sustainable future; but it is also essential, from an educational and scientific approach, to identify such consciousness levels as indicators of training effects.

## 6. Research goals

The scientific goal of this study is to discover and describe the foundations that support consciousness of teachers in training, as well as their level of development regarding team work methodology.

The following specific goals have been suggested:

- Identifying the aspects that shape and express consciousness of teachers in training.
- Bringing to light possible levels of consciousness of teachers in training.
- Creating a substantive theory on consciousness training in teachers for a sustainable future.

## 7. Research methodology

The study applied a qualitative, narrative methodology. Narrative methodology allows to identify qualitatively different forms of the levels of consciousness displayed by teachers in training.

We selected a phenomenographic design, based on the study of multiple cases, applying the constant comparison method, a key procedure in grounded theory. Glaser & Strauss [98] were the authors that proposed Grounded Theory (GT) and defined it as a systematic set of procedures to develop an inductively derived grounded theory about a phenomenon. Its purpose is to bring to light theories on phenomena, rather than confirming an existing theory. Grounded theory demands to identify basic categories derived from data applying a consistent comparative method [98, 99]. This methodology allows to bring to light and display individuals' inner thoughts and different approaches towards reality. Therefore, it is suitable for the discovery of a consciousness theory for future education professionals.

### 7.1. Participants and sampling strategies

In this study, we used a purposive sampling in order to generate a substantive theory linked to the development of typologies and categories typical of specific situations. We selected 25 teachers in training during the internship of the last year of the Education Degree of the School of Education at the University of Macerata (Italy). The sampling size has been adjusted to the recommendations of phenomenological research; according to Creswell [100], it should be 2-25. Our selection has been also adjusted to Smith, Flower & Larkin [101]'s proposal as, despite being a relatively small sample, it is reasonably homogeneous, which makes it possible to detect convergence and divergence to a certain extent (p.3). Therefore, our sample is appropriate to observe both participants' homogeneity and heterogeneity in consciousness manifestations.

### 7.2. Data collection process

E-portfolio, besides being useful to promote professional consciousness, is a valuable tool for data collection. The information subject to analysis has been obtained through an e-portfolio (TP) [74, 75]. We specifically included reflections on the value and importance of team work, which have been documented in the section "Reflection on the role of teaching competences" of e-portfolios. In this section, students reflect on the abilities and skills necessary to develop the teaching function. The narratives and the discourse implied in the reflection shall bring to light multiple expressions of «consciousness», as consciousness gets structured and organized through narratives [39].

Out of a total of 200 reflections, 25 that responded to our research goals were purposely selected (purposive sampling).

### 7.3. Data analysis process

Data analysis follows the procedure established by grounded theory, including: initial and focused coding, axial coding, theoretical coding and theory construction. We briefly describe the steps applied in our study below:

- Initial and focused coding: In the initial stage the researcher deals with data from an open perspective, trying to discover the concepts revealed by data. In this phase, we also take research questions as a reference, trying to identify relevant data to respond to research goals. In this case, this stage of the analysis had an open, focused nature aimed at identifying consciousness-related expressions or categories.
- Axial coding: Axial codes capture and reflect the relationship between the concepts identified in the previous stage [102]. The axial codes generated have a more conceptual nature with a higher abstraction level, which allows to establish connections between more specific categories. In this case, we identified constructs that allow to articulate the aforementioned categories.
- Theory construction: The final stage of data analysis is the development of a data-based theory [102]. In this last phase, we shall propose an initial theory on training-linked consciousness.

We used Software Atlas.Ti v.8.2.33 for technical purposes.

## 8. Results

Initial and focused coding, applied to individuals' discourses, reveals a series of categories that are manifestations and expressions of the conscience of teachers in training on team work. Later we established the axial codes that permit linking and organizing the initial categories in conceptual structures. Three axial codes have been identified:

1. **Thinking:** This first axial code combines categories related to the ability to conceive ideas, lay out arguments and establish intellectual relations regarding team work. The categories included reflect different ways of thinking:
  - Practical-contextualized thinking: The subject starts from the context and/or the daily praxis to discuss his/her position:
 

*"I have chosen to reflect on the "team work" competence, as it has accompanied me a few times during these years of university studies in different pedagogies" (Case 15).*
  - Specific experiential thinking: It takes precise, specific personal experiences as references:
 

*"Before this university experience I did not experiment team work very often... During these five university years, three of them in face-to-face classes (one in Perugia and two in Macerata) and two online, one of the constant foundations was just this: team work" (Case 18).*
  - Abstract thinking: Characterized by establishing relationships and connection between praxis and theory:
 

*"The ability to work in a group is one of the competences that I have developed from my experience as a university student and, upon observing its effectiveness and potential, I tried to include it in the projects and activities proposed at the school where I did my internship" (Case 8).*
  - Internalized/interactive thinking: Expresses construction from a personal conception of team work based on educational experiences internally reformulated:
 

*"The combination of cords tied to form a sole rope is the strength individuals can generate as a whole, giving life to new ideas and projects, creating what cannot be created. This is the idea of team work that I built during 5 university years, in which the concept has adopted different meanings" (Case 11).*
  - Critical towards reality: The individual confronts his/her vision with his/her reality perception and makes a personal assessment:
 

*"Nowadays, there is a generalization at schools about team work being a waste of time... In my opinion, it stems from teachers' lack of knowledge on this subject. I inform with my experience to testify it" (Case 5).*

2. **Representation of Reality:** It accepts categories linked to the time perspective adopted by subjects in order to represent reality:
- Representation of retrospective reality: The value of team work has been elaborated on the basis of a previous experience:  
*"Another lab practice very instructive for me was that of education and learning technologies, in which we carried out a project on the importance of water and the benefits people can obtain from it. This experience has been important during the training activities carried out in X pre-school education, where I developed an activity on primary colours following the cooperative learning method..."* (Case 21).
  - Representation of the evolutionary reality: The basis of reality representation is supported by an evolutionary argumentation:  
*"This is the idea of team work that I built during 5 university years, in which the concept has adopted different meanings. In my post, I had never worked in a group and I thought that it was just an addition of individual contributions, and not a generative boost, as I see it now. On the contrary, I was sceptic about the effectiveness of team work, on the belief that there was a risk that some of them worked more than others. On the contrary, when I experienced it myself, I noticed that team work leads to results unthinkable for an individual"* (Case 11).
  - Representation of projective reality: It suggests spaces for future action where team work can be included:  
*"Finally, teachers must be competent to work with his/her colleagues, in a synergic and interdependent manner, as his/her collaboration does not only concern students' learning, but also school operation"* (Case 24).
3. **Type of conscience:** It binds the ways to appreciate, consider and assess team work together, including the following categories:
- Perceptual consciousness: When team work has been discovered and receives attention:  
*"Before this university experience I did not experiment team work very often; of course, maybe sometimes during the school year... but I had never thought about it or, above all, I had never tried it or developed it from this approach"* (Case 18).
  - Reflective consciousness: It involves a deep recognition of team work, as a result of a reflective personal process:  
*"Team work may involve a competition spirit and it must be avoided in practice, ensuring a pacific confrontation at all times, a moral and civil sensitiveness, experience and intelligence that leads both individuals and groups to integration"* (Case 17).
  - Sustainable consciousness: It involves a deep, transcendent vision of team work that results in a personal involvement and commitment. They project their value on the future professional and social context:  
*"Personally, I believe that the ability to work in a group and collaborate is one of the key competences that everyone must have. According to Michele Corsi, we live in a society that has not defined it as one of its challenges, but still persist in an "associated" nature, this is, a group of persons who work together, cooperate and communicate with each other for a social welfare purpose... The development of this social and relational competence still is a key aspect to educate new generations, but also for the adults of current liquid society"* (Case 2).

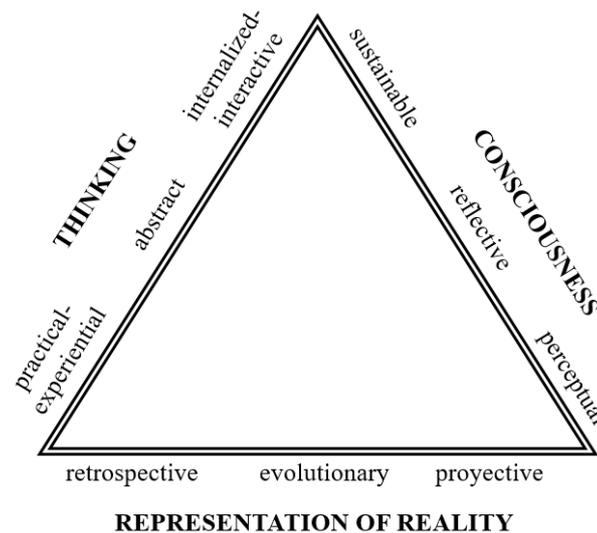
In short, the qualitative methodological procedure allows us to deduce three axial codes present in reflections of teachers in training: thinking, representation of reality and consciousness. Figure 1 deals with the theoretical coding obtained from an inductive analysis.

Thinking	Representation of Reality	Consciousness
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C A T E G O R I E S	Practical-Contextualized	Retrospective	Perceptual
	Specific-Experiential		
	Abstract	Evolutionary	Reflective
	Internalized-Interactive	Projective	Sustainable

**Figure 1.** Theoretical coding

The system of categories obtained shows us that teachers in training have reflected on team work, relying on three axes: thinking, representation of reality and consciousness. We have identified different typologies in each of these axes, as described in Figure 1. Figure 2 sums up the substantive theory generated, based on the empirical data analysed.



**Figure 2.** Foundations that support education for a sustainable future

Individuals' positions about a certain phenomenon is articulated on the basis of a time axis, how to think about it and how to perceive it. Figure 1 registers the different options individuals can take towards a phenomenon. Each of these axes shows different levels of development. The maximum level could be the objective of an education for a sustainable future. On the other hand, the horizontal connection of these three axes could represent development levels towards consciousness for a sustainable future.

To verify this hypothesis, we classified individuals according to their positioning in these categories.

This classification allows us to identify three groups of individuals linked to specific positions in the three theoretical categories, which represent different evolution levels:

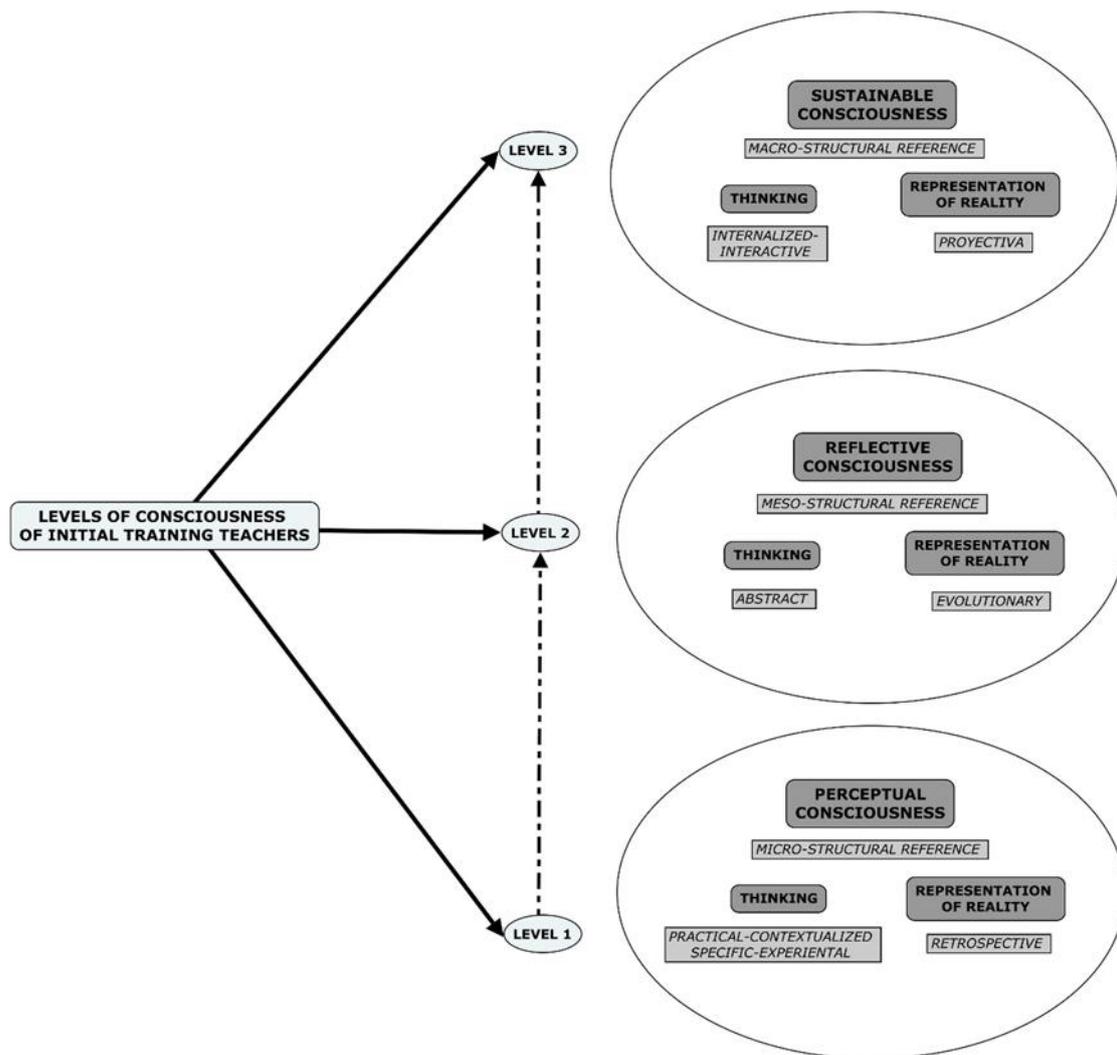
- Level 1: It includes subjects characterized by expressing specific and experiential, practical and contextualized thinking. The representation of reality is retrospective and expresses a type of perceptual consciousness, which involves becoming aware of "team work".
- Level 2: In this level we observe a critical, abstract thinking, establishing connection between praxis and theory. The representation of reality has an evolutionary nature. Individuals

show a reflective consciousness, but they do not express an attitudinal and behavioural aptitude for action.

- Level 3: This group shows an interactive, flowing consciousness. It changes depending on new experiences and knowledge. It also expresses a projective representation of reality. Individuals propose team work projections that involve abstraction and reintegration cognitive processes, as well as creativity and imagination. This stage has been identified with sustainable consciousness, as an affective, behavioural attitude towards change has also been observed.

Each consciousness level has been represented by a certain number of individuals: 5, 15 and 5, respectively. On the one hand, it shows the heterogeneity of the levels of consciousness that coincide in the same training spaces and, on the other hand, the homogeneity of the subgroups that share the same level of consciousness. The coexistence of three groups in the same training space permits to theorize that sustainable consciousness is the fruit of an evolutionary process of individuals' internal transformations. This evolution also involves a change in the discursive references; thus, in level 1, references are microstructural elements, in level 2 they are of a mesostructural type, whereas that, at the level of sustainable consciousness, they are at a macrostructural level. Figure 3 below shows a list of identified levels.

These findings resulted in the theory that future professionals' impressions on team work are not homogeneous, as they show different levels; such heterogeneity can also be observed with regard to types of consciousness. Academic training and professional practice may have an incidence in the development of thinking and teachers' conscience. Our contribution in this regard is to identify the multiple forms in which teachers in training think about their professional activities. The identification of consciousness levels of teachers in training is essential both to understand training evolution and development and to substantiate effective pedagogical proposals. Figure 3 synthesizes the substantive theory found regarding the levels of consciousness registered.



**Figure 3.** Levels of consciousness of initial training teachers

The aforementioned discoveries lay the foundation to inspire and guide educational proposals to train teachers for a sustainable future. One of the foundations is the discovery that sustainable consciousness is the last step of an educational and maturation process de that involves a good command of the previous types of consciousness; and that consciousness is supported on thinking which, in turn, presents different intellectual levels. From a pedagogical perspective, consciousness development for a sustainable future requires activating and developing these three foundations.

## 9. Conclusions and discussion

The empirical findings of this study can be summarized as: a) identifying a category system that supports individual's consciousness in training contexts (see Figure 1), b) determining the cognitive axes that explain the registered categories: thinking, representation of reality and type of consciousness (see Figure 2) and c) disclosing three levels of consciousness and their characterization (see Figure 3).

The outcomes obtained on categories referred to thinking show agreement with other studies and theoretical contributions [39]. Thus, the identification of modes of thinking combined in the types of consciousness, converge and feed Piaget's theory on consciousness, as there is a parallelism between levels of thinking and consciousness [40, 41, 42]. Our outcomes allow to explain these levels in great detail, as described in Figure 2. On the other hand, in the characterization of the consciousness levels registered, we have observed through the texts elements of Vygotsky's theory on consciousness, as they express and register internalization processes of external activities [43, 44, 45, 46, 47, 48].

On the other hand, the empirical attainment of three levels of consciousness (perceptual, reflective and sustainable) converges with the types of consciousness proposed by Freire [49, 50]; but they can also be added to the taxonomy of Endsley's levels of consciousness [53]. Therefore, in a scientific context, we can conclude that theoretical approaches find a correspondence in the empirical data obtained in our study in training contexts.

These levels represent gradients in the intellectual evolution of individuals and define spaces that must be addressed from an educational approach. The maximum level of all of them could be the objective of an education for sustainable development. Training may play an important role in the evolution of the levels of consciousness and thinking until reaching levels that allow an active involvement in the creation of a sustainable development.

The quantitative analysis performed confirmed that not all individuals reach the highest values, as certain individuals respond to initial and medium degrees of consciousness. Such knowledge is essential both to understand the evolution and training journey followed by individuals and to support effective pedagogical proposals, adjusted to reference conditions. Therefore, these findings are relevant to direct teachers' training with regard to a sustainable future [97].

We understand that the results showed here, given the complexity of the subject discussed, are limited, due both to sampling particularities (the sample was just made up of teachers in training) and the strength of the data obtained. In this regard, it would be necessary to extend the empirical data to validate the categorization system in other training contexts, applying different training methodologies and technological resources.

Our study is focused on how teachers in training perceive and take a stance on team work. In this case, team work is the element of external reference on which individuals' thinking and consciousness is projected. Other key subjects in sustainability right now could be managed from a consciousness approach, such as gender violence, sexual identity, xenophobia, addictions, etc. But it could also be transferred to other spaces typical of sustainability, such as financial and environmental areas.

If the goal of Education for Sustainable Development (OSD 4) is to redirect education and learning so that all citizens can contribute to sustainable development, it is essential to get to know how to achieve a level of consciousness that allows to participate in the construction of sustainable development. Hence the relevance of a research line focused on the analysis of consciousness in educational contexts.

This research field is not just attractive and respectable, but its disclosure constitutes one of the most relevant and updated research focuses given its theoretical and practical implications [39].

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