The classroom as a research community: an innovative methodological approach for e-learning.

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Abstract

The crisis generated by the pandemic has also affected our education system and challenged traditional teaching/learning models both in school and university. Technology has changed learning and emphasized the collaborative and distributed dimensions of knowledge. Classrooms can be considered as knowledge communities, where active learning, the dimension of research, and comparison with peers represent the values of citizenship that is also digital citizenship. The methodological approach defined as "Bayes' class" fits into this context. Bayes' class is a theoretical-operational approach to learning based on research, experience, and discovery. In this paper we present the results of a teaching activity conducted during the lockdown. We started with these questions: how to use technologies to redesign a digitally enhanced learning environment for university internship activities in the look-down phase? How to redesign indirect internship activities? How to continue to accompany future teachers at a distance in building their knowledge, skills, attitudes, and sensibilities? The focus group, conducted at the end of the experience, confirmed that the "Bayes' Class" teaching setting, promotes a participatory culture based on interaction, peering, and multitasking. In addition, the experience allowed for the enhancement of the indirect internship as a community of practice.

Keywords [1]

Learning by doing, cooperative learning, blended learning, e-learning, university internship

1. Introduction[2]

We're living in a digital ecosystem: smart people are communities that interact, share, exchange data and information, relate and collaborate. In this ecosystem we live together with the technologies that pervade and reshape our virtual and real lives. In this transformation, each of us has a *digital twin*, representing our life on the web as told by data [1]. Education systems are also involved in this transformation and need to renew themselves. Education must take into account the collaborative dimension of learning. From accumulation to sharing, from storage to distribution, the social dimension of knowledge is one of the hallmarks of the third industrial revolution: the aim of teaching is no longer to train a competitive student, but to educate in the social dimension of knowledge. [2].

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Active and collaborative learning, interactions between teachers and learners, and the exchange and sharing of content are facilitated by digital technologies. Students bring to classrooms the ways of approaching knowledge that characterize everyday life: speed of communication, circulation and sharing of audio and video, and continuous access to information characterize our Internet-connected world. Instruction and education must reap the benefits of these innovations and schools can also be considered as knowledge communities where learning is enhanced by the presence, regulated and designed, of new technologies.

1.1. Technology-enhanced collaborative learning

The crisis generated by the pandemic has also affected our education system and challenged traditional teaching/learning models both in school and university. The shift from face-to-face to distance learning has shown how close the link between environment and learning is. Teachers and students said goodbye in the physical classroom and met again the next day in the virtual classroom. This was done without any educational planning. Before the pandemic, there was an awareness that change needed to be made to learning environments, methodologies, and tools, but the innovation process is slow. After the pandemic, the urgency to invest in innovating educational systems became more apparent. A survey conducted by the World Economic Forum [3] and published in November 2020 on the Covid Action Platform explores five key trends related to education: connection, trust, wellbeing, flexibility, and career. The results show some relevant aspects such as educational systems that had invested in digital innovation proved more resilient in overcoming the tests imposed by the emergency.

In most schools, the classroom still has a structure of desk and chair. It represents a model featured by obedience and inflexibility:

1. teacher transmits knowledge to the students;
2. students receive knowledge from teacher;
3. the teacher receives knowledge from the students.

Then, the network structure overlaps with the traditional structure: desks are divided into rows, but each student has a smartphone connected to the Internet. And the structure of the network of connections is horizontal. Access to knowledge is being marked by significant change: it is no longer contained within the confines of the book, but freely accessed by students. Technology enables greater interaction, increases relationships, promotes mutual learning and free knowledge. So, a big and fast transformation has taken place in the availability of access to knowledge. Content is navigable and interactive: when? Always. Where? Everywhere. How? By connecting to the Internet. In this background the school directs the processes of interconnection and exchange within the network. Technologies count for the educational direction of their use. The knowledge conveyed by the new media is widespread and socially situated, produced by a collective and distributed intelligence [4].

The school of the knowledge society is confronted with different skills from those required by the industrial society [5]: the factory model has to be replaced. The first step towards innovation in education systems is through the renovation of learning environments: replacing fixed desks with moving desks, equipping classrooms with modular and flexible furniture. All this in order to encourage exchange, collaboration, sharing, socialization of knowledge. Knowledge can be questioned; it is no longer delivered ex cathedra. The transition from the school of *transmitted knowledge* to the school of *distributed knowledge* affects the learning environment, the lesson and the role of the teacher. The student is engaged in doing, the teacher in designing.

There are two areas for achieving change:

- reorganizing school time;
- reorganizing school space.

The reorganization of school-time includes time flexibility projects such as the pilot project conducted by the Istituto Majorana in Brindisi and the Department of Psychology of the University of Rome 'La Sapienza' [6]. Time flexibility was modulated to promote learning: the research hypothesis, in fact, says that «sleeping longer increases attention levels and school performance».

If school time is designed for learning, school spaces are also renewed. School environments cannot be considered as a sum of classrooms: the INDIRE 1+4 model [7] is a model for adapting educational spaces to the evolution of learning contexts. The model consists of

- group space, open to the school and the world;
- 4 spaces: *agorà*, informal space, individual area and exploration area.

Rethinking school space-time means welcoming students into a stimulating environment where they can collaborate and learn by exchanging experiences, opinions and knowledge. Technologies, which have changed access to knowledge, inhabit environments and enhance learning experiences. Let us take the *agorà* of the 1+4 model as an example. *Agorà* is the Greek word for square: it was the political, religious, economic and commercial centre of the city. In the Roman world this space is defined by the word *forum*, a word that has continued to live on in the digital age. Indeed, the *forum* is a virtual place for discussion and is present in every learning platform. The meaning of the words *agorà* and *forum* stand up to technology and continue to be the expression of a community that confronts each other. If school environments are not a sum of classrooms, this is also true for virtual learning environments. A physical environment characterized by the exchange and socialization of knowledge corresponds to a virtual environment: at the time of the lockdown, the *agorà* of the 1+4 model continued to live on the Internet thanks to live events. The community moves from physical space to virtual space almost naturally.

1.2. Active learning methodologies

All these changes were happening in the school when the pandemic crisis forced the school to close. The school did not seem to bother implementing virtual learning environments for teaching. What teaching practices should be adopted? Which methodologies to activate? What tools should be used to guarantee the right to education? The school has not stopped, but many problems have emerged: connectivity, families' computer equipment, teacher training.

INDIRE researchers investigated teaching practices during the lockdown [8]: most of the teachers have transposed typical presence practices to the distance [9]; few teachers have experienced laboratory practices in DaD [10]. Within the sample interviewed, two types of teachers were identified: teachers «laboratoriali» (“lab” i.e. using a workshop approach) and teachers «non-laboratoriali» (“not lab” i.e. which do not use a workshop methodological approach). Teachers «laboratoriali» apply methodologies based on active learning and students were involved in the production of papers, online research, project work and construction of digital artefacts [11]. The problem of teacher training remains the key to the future of learner training: not just training in knowledge and use of technology but rather methodological training.

A recent survey [12] confirms that frontal teaching was retained even at a distance: laboratory methodologies were rarely implemented. Teachers consider *distance teaching an emergency teaching* (73%) and not an opportunity to be seized for the future. A limited proportion of teachers have activated methodologies such as cooperative learning (25%) and flipped classroom (34%). Therefore, despite the indispensable presence of communication technologies, transmissive teaching was the most common practice. On the contrary, the emergency should have encouraged the spread of laboratory methodologies, active and collaborative learning.

2. The classroom as a community of researchers: Bayes' class

In learning environments structured by the presence of technology, laboratory teaching must be activated. This alone can be the answer to the educational challenges we face before and after the pandemic. Laboratory teaching is a methodology that promotes the active role of the student in learning. It makes it necessary to rethink space and time through the design of teaching paths centered on learning and not on teaching. The lab activates constructive leadership, peer-to-peer learning, collaborative learning, and learning by projects and mistakes. The dimension of research and experimentation prevail: the teacher plays the role of facilitator, coach, tutor of the learning process and the student becomes prosumer, that is, he actively participates in the construction of knowledge. In this way, the learner enters into a dimension of long-life learning.

Bayes' class is a theoretical-operational approach to learning [13] based on research, experience, and discovery: the traditional classroom is transformed into a digitally augmented laboratory and students are organized into working groups while the teacher playing the role of scientific director. Bayes' class aims to reproduce «a teaching methodology based on the logic of scientific discovery (learning by doing and discovering) » [14].

Conventional teaching practices are unable to respond to the educational demands of the 21st century: methodologies and equipment must be redesigned. This approach begins by considering three fundamental issues:

- the physical and virtual environments of education;
- methodologies;
- the role of technologies in the teaching/learning process.

2.1. The Bayes' class setting

The Bayes' digitally augmented classroom setting transforms a traditional classroom into a knowledge generator. Through this methodological approach, students take a practical approach to research work: they learn to submit the results of their research to the class representing the scientific community; they share the steps of the process with the community; they store the materials found on the Internet; they argue about their hypotheses and compare their results with their peers; they are willing to honestly acknowledge errors and review their results. They experience knowledge discovery through interactive and cooperative digital tools: access libraries and digital archives; organize data and information (e.g., with Google Sheets); fill out a timesheet and keep a shared journal of activities; create multimedia presentations to communicate opinions and findings.

The methodological approach is divided into three phases:

- tool box
- cooperative problem solving
- situation room

Regarding the distribution of work time, the first phase occupies little space to the advantage of the second phase (which will occupy most of the time dedicated to the activity) and the third phase.

The *tool box* is the preparatory phase of the activity: the teacher identifies the work context and prepares the delivery, selects the contents and focuses on the relationships between the different fields of knowledge involved in order to help students learn independently. The teacher takes care of the basis on which to start the groups' research work: prepares the toolbox and hands it over to the learners who will continue on their own.

Cooperative problem solving represents the central phase of the methodology. Learners/researchers are organized into working groups and the role of the faculty member is limited to mentoring and scaffolding. Within the groups, the different roles aimed at the topic are organized: this will involve a briefing phase that can be repeated. Each group corresponds to a physical space in the classroom and a space in the virtual classroom, marked by a color or an image (almost all online learning platforms allow the creation of subgroups identifiable by different colors or images). All students have access to personal devices connected to the Internet to do research, consult material prepared by the teacher, filter and organize information. The groups work in blended mode, but this approach also lends itself to being interpreted in e-learning mode as will be explained in the following section. In a cooperative, non-competitive setting, students learn and collaborate in pursuit of a common goal.

Groups perform the following activities:

1. researching and selecting materials;
2. organizing and evaluating content;
3. formulating hypotheses;
4. comparing assumptions;
5. designing the digital artifacts expected from the delivery.

Collaborative learning «fosters the construction of shared common knowledge» [15] that is constantly being tracked through technology. In this way it can be monitored by the teacher and this provides a trail for assessment. Frequency of interactions, materials produced, design around the results represent

the indicators around which it is possible to build the evaluation guidelines from a formative point of view.

The *situation room* is the phase of open and democratic confrontation between the groups: the learners/researchers submit their results to the whole learning community (i.e. the scientific community); they accept the comments that come from the members and agree to question their own results. In the *situation room*, a public confrontation among peers takes place: the heart of Bayes' class is precisely in this exercise of democracy that enhances citizenship skills.

2.2. *Good is water*: an example of Bayes class

How to design a Bayes class? Here is an example of a design that follows the three steps explained in the previous paragraph. The design starts with identifying the final product that the groups need to make: the design of a panel.

Delivery

Design a panel at which scientists, policymakers and intellectuals will speak to discuss issues related to water as our planet's precious resource. The panel is organized by the nonprofit "Good is Water" Association. The panel will take place online and will be streamed. The groups are made up of the association's members responsible for public relations and the board of directors.

Tool box

The teacher sets up a folder in the cloud of the online learning platform marked *Good is Water*: the folder contains links to websites, text documents, videos, images. For example, the water-related goals of the 2030 Agenda [16]: goal 6, clean water and sanitation; goal 14, life under water; goal 15, life on earth. In addition, the teacher provides students with Primo Levi's short story *Ottima è l'acqua (Good is water)*, from the science fiction short story collection "Vizio di forma" *(Formal defect)* [17].

Cooperative problem solving

- Briefing to assign roles within groups
- Research, selection and validation of materials
- Organization of materials divided by areas: scientific, socio-economic, political, cultural, anthropological.
- Panel design: speaker lineup, role of moderator, time allocation.
- Design of the environment layout: selection of the streaming platform and directing tests.
- Creation of a multimedia presentation to share the results.
- Briefing to assign roles in the *situation room*.

Situation room

The *situation room* is the dialectic phase: each group submits to the members of the learning community the results and working hypothesis:

1. panel structure
2. space-time organization of the panel
3. topics
4. questions
5. response assumption based on participants' skills
6. event poster

2.3. Digital citizenship skills

Bayes' class is a methodological approach particularly favorable for the development of the skills of the citizen of the 21st century: students live in a place where they learn by working together, helping each other and using shared tools, including digital ones. Digital competences are key competences as recommended by the Council of Europe in May 2018: «raising the level of mastery of basic skills (literacy, numeracy and digital literacy) and supporting the development of the ability to learn how to learn as a constantly improved prerequisite for learning and participate in society in a lifelong learning perspective» [18]. The student is involved in a metacognitive process that leads them to reflect on dimensions that pertain to all educational and occupational pathways. The student is involved in a metacognitive process that leads them to reflect on dimensions that pertain to all educational and occupational pathways. The skills to be enhanced are related to: understanding the context in which one

operates; relating to others and the environment; managing one's role and completing responsibilities. When designing the Bayes class the teacher can take into account some of the competences outlined in the European Framework DigComp 2.1 [19] and connect them with soft skills such as learning to learn, creativity, research skills, time management, reliability.

Table 1

Skills for Bayes class from DigComp 2.1

Area 1 Information and data Literacy	Area 2 Communication and collaboration	Area 3 Digital content creation
1.1 Browsing, searching, filtering data, information and digital content 1.2 Evaluating data, information and digital content 1.3 Managing data, information and digital content	2.1 Interacting through digital technologies 2.2 Sharing through digital technologies 2.3 Engaging in citizenship through digital technologies 2.4 Collaborating through digital technologies	3.1 Developing digital content 3.2 Integrating and re-elaborating digital content

3. Bayes' Class and University Internship: a teaching experience in the degree course "Scienze Formazione Primaria".

How to use technologies to re-design a digitally augmented didactic setting for university internship activities in the lockdown phase? How to redesign the indirect practical traineeship activities? How can we continue to accompany future teachers at a distance in the construction of their knowledge, skills, attitudes and sensitivities?

Starting from the assumption that technologies not only reshape training processes, but also the interactions among those who participate in them, the training experience reported here aims to rewrite spaces and models for university practical traineeship in the new digitally augmented context.

The practical traineeship, in its articulation in direct and indirect, represents that "place of a reflective doing, highly situated and productive of a practical knowledge, seat of learning not related to the formal university learning but crucial for the construction of the student professional self" [20].

The didactic experience took place at the University of Bari, at the Single-Cycle Degree Course in "Scienze Formazione Primaria" (Primary Education Master Class) where the experimentation of a self-study practical traineeship model (borrowed from Anglo-Saxon models) is underway.

This model finds its effectiveness on the figure of the Tutor who represents the innovating agent and the mediating figure in the implementation of the actions of an innovative model of accompaniment of the trainee's experience [21]. The self-study model is based on the reflective crossing of the Tutor's training experience, then offered to the student trainee [22].

3.1. Context of the teaching experience

The experience that we want to describe has involved, in particular, the Indirect Traineeship activities that, as Sicurello and Leoni argue, are configured as «action of accompaniment, development and care of communities of practice, thanks to which experienced teachers and future teachers can reflect and learn together» [23].

The Indirect Apprenticeship activities, collaborative and highly interactive, aim to:

- facilitate the comparison of knowledge and experiences with/of students;
- guide research, reflection and in-depth study actions;

- encourage circularity between individual/micro group reporting positions and active listening to the large group;
- support the resolution of critical issues that have arisen, as active research with/of the students;
- encourage the production of shared materials.

Among the tasks of the Coordinating Tutor, in the specific context of the University of Bari, we find that of planning and conducting Thematic Insights, of a workshop nature, among groups of students of the same year.
These Thematic Insights focus on six macro-areas: school legislation, didactic innovation, national guidelines, teacher professionalism, inclusion, national evaluation system.
The Bayes Class methodology was tested in one of these Thematic Deepening (Inclusion).

3.2. Methodological choices

Referring to constructivist theories, which see in teaching technologies and communities of practice [23] a fertile ground of application, it was decided to use the methodology of Bayes' Class [25] for the following reasons:
- *heuristic nature of experience* [26]: one of the most stimulating activities to be proposed in the new educational setting is, certainly, research. Through research, direct, concrete and experiential experience is promoted.
- *socio-constructivist approach*: formation of working groups based on the notion of communities of practice: «groups of people who share the same theme, similar problems or the same passion for a particular aspect and who deepen their knowledge and experience within this defined space» [27]. Within communities of practice belonging to the same professional context, training means sharing one's experience and building shared solutions to problematic situations [28].
- *principle of epistemological tolerance*: In research work, no learner rejects a priori hypotheses other than their own. This leads to co-constructed learning and active and participatory confrontation.

In addition, some functional elements of the Bayes' Class methodology were found to be appropriate to the mode of delivery of the distance activity [29]:
- *accessibility*: the material to carry out the final task can be found by searching the Internet free of charge;
- *social intelligence*: the use of digital technologies naturally predisposes and facilitates the sharing of knowledge and collaboration in the approach;
- *sharing*: the learning activity leverages on the exchange of digital materials;
- *sustainability*: the activity can be carried out with any device (PC, tablet, smartphone).

Being future teachers, the Tutor explained, in advance, the methodology of Bayes' Class, thus allowing all students to deeply understand the purpose of the proposed activity while it was being implemented.

3.3. Participants and teaching setting

96 fourth-year students took part in the learning experience; they were divided into four virtual groups.
The students, perceiving themselves as belonging to the same community, experienced not only an enunciative co-presence, but also a social identity [30]. This assumption made it possible to use technologies not as a mere passage of information, but as a means for comparison and for the co-construction of new knowledge and skills.
The training course concerned the Thematic Deepening related to the macro area "Inclusion" with the focus on "The inclusion of pupils with specific learning disorder in primary school".
The duration of the course, delivered entirely online in the virtual learning environment "Microsoft Teams", was five hours for each group.
In the planning phase it was necessary, first of all, to define more carefully the profile of competences to be achieved, taking into account the interconnections between the Guidelines for Training adopted in the Degree Course in "Scienze Formazione Primaria" of the University of Bari and the DigComp 2.1 framework (*The Digital Framework for Citizens with eight proficiency levels and examples of use*).

Table 2
Skill Profils

INTERNSHIP GUIDELINES (4th year) AREA: INCLUSION	DIGCOMP 2.1
Focus: "Inclusion of pupils with SPECIFIC LEARNING DISORDERS" (SLD) in primary schools ***Objectives***: - To know the macrocategory of Special Educational Needs (SEN). To deepen the category "SPECIFIC LEARNING DISORDERS" (SLD). - To know the legislative process for the inclusion of pupils with DSA in primary school. - To know the tools for the identification of SLD in primary school (screening, check-lists and observation grids) and for inclusion (Personalised Educational Plan). ***Final product***: co-construction of a Personalised Educational Pla, based on the study and analysis of a case of a primary school pupil with SLD. Focus on the choice of compensatory tools, dispensatory measures and assessment criteria.	***Area 1: Information and data literacy*** 1.1 Navigating, searching and filtering data, information and digital content 1.2 Evaluating data, information and digital content 1.3 Managing data, information and digital content ***Area 2: Communication and collaboration*** 2.1 Interacting via digital technologies 2.2 Sharing through digital technologies 2.3 Developing citizenship skills through digital technologies 2.4 Developing forms of collaboration through digital technologies **Area 3: Creating digital content** 3.1 Developing digital content 3.2 Interacting and reworking digital content 3.3 Copyright and licensing

3.4. Process

1) First phase: *Tool box*

In this phase, implemented in the large group (approximately 30 students), the Tutor presents the tool box.

This is a preliminary and preparatory phase to enable the students to learn independently and to collaborate.

The activities are outlined below:

- In the "Coursework" section of the platform, the tutor provides students with multimodal digital content (written documents, presentations, videos, podcasts and web casts). Through this type of learning, which Laurillard defines as *appropriation* [31], the essential information and content of the thematic study is acquired;
- reading of diagnostic documents and analysis, guided by the Tutor, of a case of a primary school pupil with SLD:
- acquisition of information and procedures for the shared implementation of the final work (co-design of a Personalized Educational Plan).

2) Second phase: *Cooperative Problem Solving*

This phase constitutes the moment of the actual research.

The students are divided by the tutor into virtual groups of 5-6 elements.

Each group is assigned a "room" within the Microsoft Teams platform.
Each group simulates a Class Council with the aim of co-designing and drawing up the Personalized Educational Plan for the case presented in the first phase.
Specifically, each group member is assigned a subject area (linguistic, logical-mathematical, anthropological) in order to:

a) select and choose the most appropriate dispensatory measures for the case analyzed;
b) identify the most appropriate compensatory tools (traditional and digital) for the subject area in question
c) identify compensatory tools (traditional and digital) according to the subject area;
d) agree on the most suitable assessment methods.

The groups work by entering all the material researched and produced into folders shared with the tutor, who can check the progressive progress of the research.
The tutor's role, in this second phase, is to support and facilitate the work of the groups.

In *Cooperative Problem Solving*, students will be able to search for the most appropriate compensatory tools (maps, diagrams, summary tables, software for reading, writing and calculation,) among the Open Educational Resource [32].

These are educational materials collected in large online repositories made available under licenses that allow reuse, modification and distribution.

In this way, future teachers learn to use the network as a large reservoir of resources for teaching that can support and enhance active and participatory learning [33].

Moreover, in this phase the group reflects and builds hypotheses regarding each dispensatory measure - compensatory tool - evaluation criterion that, collectively, is included in the Personalized Educational Plan in order to socialize, in the next phase, the choices made.

3) Third phase: *Situation Room*

A member of each virtual group will socialize the results of the research work, highlighting and motivating in particular

a) which compensatory tools have been chosen and why;
b) which dispensatory measures were selected and why;
c) which criteria were adopted for assessment and why.

Through the *Situation Room*, which represents the dialectical phase of Bayes' Class, the students make public the products of their cooperative work and authentically practice their research work.

Specifically:

- they learn to submit the results of their collaborative work to the large group that, in our case, represents the scientific community;

- keep a public record of the individual steps of the research path by making contextual reference to materials found on the web;

- argue their hypotheses by comparing their results with their colleagues, thus putting into practice the principle of epistemological tolerance.

3.5. Focus Group and Evaluation

In order to collect general information (strengths and weaknesses) on the students' training experience and to establish what conclusions could be drawn in view of new training actions to be undertaken, it was decided to conduct *a single, non-directive, exploratory focus group* [34].

The sample that took part in the focus group consisted of 6 students regularly enrolled in the fourth year of the course. It was formed on the basis of two criteria: voluntary participation and interest in the subject matter of the focus group.

The participants (5 females and 1 male), aged between 23 and 34, had different educational and experiential backgrounds. Three students, in fact, had already done occasional teaching activities in elementary school; the rest had never taught.

The focus group, which took place the day after the experimentation, at a distance on the same Microsoft Teams platform, lasted one hour.

The tutor, who became both moderator and observer of the focus group, asked the following questions:

1. *What are the strong points of the training experience?*
2. *What are the critical points of the experience?*

Below are the reports constructed through the narrative synthesis of the data collected and the salient points which emerged.

Question 1) What are the strengths of your learning experience? (full transcript of notes in italics)

For the students, the experience is a valid experiential model, as it has "*allowed them to learn about and work concretely on one of the teacher's key competences: inclusion" (student 4).*

The "Tool Box" phase was useful because "*it encouraged me to search independently among the material present what was most interesting to me in order to go deeper into the subject of SLD*" *(student 1*).

For the majority of students, however, reading and analysing the case required new skills they had not yet experienced (students 1-2-4): *"it was the first time I read a detailed diagnostic certification and I understood what it means to learn from clinical data" (student5).*

The construction of the PDP, in the phase of Cooperative Problem Solving, has encouraged students to cooperate, to actively confront and participate: *"through the simulation of the Class Council I was able to experience how fundamental it is to acquire attitudes of cooperation, negotiation and confrontation" (student 3).*

The components believe they have experienced individual responsibility, but also that it is important "to network among teachers to achieve a common goal" (student 6). The value of collegiality as a basic dimension of effective organization was also stressed (student 2).

The dialectic phase of the Situation Room, on the other hand, was useful because "through confrontation with others we understood that some choices made with the group on the choice of dispensatory measures were not in fact appropriate for the case analyzed" (student 1).

On the whole, students evaluate the activity as highly formative because it is able to acquire knowledge, skills and attitudes that can be used within the school context (students 2-3-6)

Question 2) What are the critical points of the learning experience? (full transcript of notes in italics)

From the observations reported by the students the following critical points are identified:

1) Difficulty in finding common teaching solutions in the small group: “sometimes in the cooperative problem solving phase, it was difficult to coordinate and make shared decisions”. (student 3).
   The fact that some students were already in possession of greater skills (resulting from previous teaching experiences) while others did not, has caused a difficulty in finding solutions and share common methodological an didactic choices to be included in the Personalized Learning Plan.

2) Differences in digital skills: one student reports that "*in my group, some people found it difficult to carry out some technical steps on the platform, such as exchanging materials through the chat or uploading the final work" (student 6)*

3) Organization of digital resources: difficulties in selecting, collecting and sharing digital content (student 1 and 5)

Although it is rare that a single *focus group* is sufficient to achieve the proposed objectives, it should be emphasized that in our case the participants were all, by definition, members of the target population.

4. Conclusions

Through Bayes' Class, the indirect practical traineeship experience has been enhanced in terms of community of practice, promoting the importance of practical-professional knowledge as specific knowledge that is created during the virtuous circle theory-practice-theory.

The learning experience, in our view, fits into the *Communities of Inquiry model* [35]:

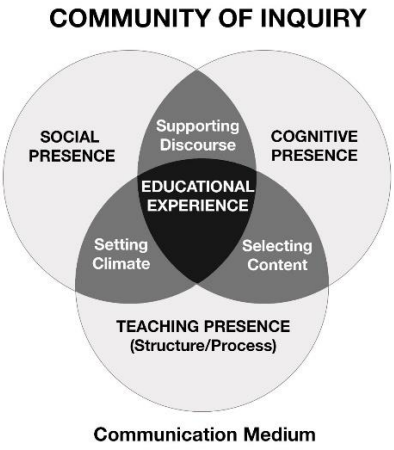

Figure 1- *Communities of Inquiry model*

With regard to *cognitive presence*, we refer to the learning processes that resulted in the production of work, through the sharing and negotiation of information, inputs and experiences.
Social presence, on the other hand, has become the indispensable element for the creation of a cohesive working environment conducive to exchange. Feeling part of a group that shares the same objectives (training to become teachers) has positively influenced this direction.
Finally, the *teaching presence* took place in the tutor's action space. By preparing the materials for the implementation of the activity, helping the members of the community to build knowledge and creating an environment conducive to exchange and a fertile ground for sharing and exchange, the tutor's role was one of facilitation and mediation.
It was important for the students to share ideas, methodologies, objectives as well as to consider the practice as an object of individual and collective investigation and reflection in order to respond adequately to the demands of heterogeneous, complex classes with the presence of pupils with special educational needs.
In the final analysis the experimented didactic setting would make it possible to promote:

- the simulation of experience enabled by digital technologies;
- a participatory culture based on interaction, peering and multitasking;
- processes of distributed knowledge and collective intelligence (shared management and dissemination of knowledge and knowledge) [36];
- transmediality, understood as "additive comprehension" (reading and processing media content to develop skills on multiple levels) [37];
- the "digitally augmented" community of learning and practice [38].

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