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Distance Education during COVID-19 pandemic:
an exploratory study into Remote Learning in an Italian high school.

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Introduction

Remote learning has fast become a key instrument in education in the last year due to the closure of schools caused by the pandemic of Covid-19. Distance education has a long history; it emerged in the 19th century and developed progressively over the years, becoming a high functioning educational instrument. Its main characteristic is the physical distance between the teacher and the learner.

Previous studies on this topic focussed on outlining a set of principles to carry out an efficient distance course and the potential problems related to that. These studies did not deal with the coexistence of traditional learning and distance learning, in particular, remote learning and its use as a tool of support for students. So, this thesis sought to investigate how remote learning has been performed in an Italian high school during the pandemic. The investigation has been carried out taking into account the opinions and the digital skills of students and teachers, as well as the economic and the psychological aspects.

The central question of this explorative study seeks to point out whether the change caused by the COVID-19 pandemic has left something positive in the Italian educational system.

This investigation is composed of five chapters. Chapter one deals with the historical background of distance education, the five generations and the multitude of terms related to this topic. Chapter two focussed on how technology has developed with the field of learning theories. Chapter three focussed on the challenges and perspectives of remote learning, setting the stage for the fourth chapter. The fourth chapter introduces the exploitive study, with the presentation of the questionnaire, participants and the results obtained from the data analysis. Finally, the fifth chapter included discussion and conclusions and aimed at answering the research questions with reference to the data obtained in the previous chapter. The evidence from this study suggested that frontal learning and traditional learning can coexist and showed students' and

teachers' positive attitudes towards the integration of remote learning as a tool of support.

Chapter I: The origins of distance education

1.1. Three generations of distance education

In the last century, the development of Information and Communication Technology (ICT) triggered an irreversible process of evolution which led to important changes in all of the areas of human production, including distance education.

Distance education is still a difficult concept to define for two main reasons. On one hand, there is a great diversity between systems, projects and institutions and the development of the distance education models occurred under different situations and influences, this leads to various forms of this type of education; on the other hand, there are scarce resources on distance education (Kaye, 1988).

Distance education has a long history, in fact, according to Trentin (2001) and Keegan (1996), it emerged in the 19th century with the development of new printing techniques, railway transportations and communications which allow the production and the distribution of teaching material to students who were far away from the teachers. That is the reason why distance education was thought to span the distance between teacher and student, Keegan (1983) pointed out that the separation of teacher and student is one of the six essential characteristics of distance education, together with the role of the institution, the use of technical media, provision of two-way communication, the separation of the learner and the learning group and finally, an industrialized form of education.

Furthermore, it is a shared thought (Keegan, D. 1996; Trentin, G. 2001; Anderson, T. & Dron, J. 2001; Garrison, D. 1985) that it is possible to identify three generations of distance education:

1) First generation: Correspondence model.
2) Second generation: Multi-media model.
3) Third generation: Tele-learning model.

The three generations represented a hierarchical structure, with a fundamental differentiation across them, namely the increased technological capacity. Taylor (2001) suggested the existence of the Fourth generation (Flexible learning model) and the Fifth generation (Intelligent Flexible learning model).
These generations will be explained in detail in the next paragraphs.

1.1.1. First generation: Correspondence model

As mentioned before, the development of new printing techniques and railway transportations made possible the production and distribution of teaching material over large geographical areas, giving rise to the first significant application of distance education in the 19th. This first generation goes under the name of "correspondence generation", it is characterized by printed material, as manuscripts or letters, delivered through postal services, which were very cost-effective and efficient. Correspondence education began in England in 1844 with the "father of the distance learning" (Archibald, D., Worsley, S. 2019) and particularly the correspondence education, Sir Isaac Pitman. Sir Isaac Pitman, a British school teacher, is remembered for his shorthand correspondence course, which expanded across the whole country and resulted in the "Correspondence Society". These methods of teaching were adopted by the University of London in many degree programs. That means that students could follow their studies and make their examinations without necessarily being in London. Thanks to this move, the University of London was named "Open University". Dieuzeide (1985) stated that in 1856 in Germany, analogue signs of progress took place with the foundation of the Toussaint and Langenscheidt Institute to teach languages.
In this stage, the interaction between students and teachers was quite inexistent. Bates (1990) supported this view and said that the correspondence generation is characterized by a little production of material, moreover, students were given a reading list with questions that had to be corrected by the tutors. The problem was that

the correction, sometimes, did not arrive before the students sat at the examination. That is why in this first generation, the interaction between students and teachers was limited and the process of teaching/learning was very rigorous and slowly, so the students were alone in the learning process. Moreover, it is possible to affirm that the correspondence education was especially used in a period of crisis to ensure the proper functioning of the educational system, or with marginal subjects of the society, such as women[1] Unfortunately, some private organizations took advantages of this situation, offering correspondence courses intending to make a quick profit and not to improve education.

1.1.2. Second generation: Multi-media model

The correspondence generation was integrated with mass media of television, radio, audio-recordings and in some cases also courseware. With all these new elements, it is possible to say that the first generation had been overcome by the second generation, named Multi-media generation. It had been argued (Trentin, G. 2001; Garrison, D. 1985; Garcìa Aretio, L. 1999) that the Multi-media model may be placed in the 1960s and it had been seen as the "industrial model" of the distance education. Also, Peters (1983) defined the Open University as the industrial model of distance education. Furthermore, thanks to the large number of people that radio and television could reach, many open universities could achieve in a better way their main purpose, namely, the expansion of educational opportunities. The first generation and the second generation shared many features, one of them is the interaction between students and teachers, which is still limited and left at the periphery of the distance

1 Anna Eliot Ticknor (1823-1896) founded the "Society to Encourage Studies at Home" which was also known as "The Silent University" because the way of in 1873 with the purpose of "inducing young ladies to form the habit of devoting some part of every day to study of a systematic and through kind (Bergmann, H. 2001). She opened the door to higher education for more than 7000 women. In 1900, Martha Van Rensselaer (1864-1932), who was a teacher and a suffragette organized a remote education program which reached out to women in rural areas in the state of New York.

education, even though, the second generation includes telephonic support. In this stage, there is a combination between the use of “one-way” communication media (print, broadcasting, cassettes) with the use of “two-way” communication, still provided by the correspondence tutors, so the interaction continued to be restricted. Besides, for what concerns the interaction among students, it is possible to say that it is almost absent, this leads to the shared belief that distance education is not a social process (as it happens in class) but an individual one.

These two generations showed a lack of a socio-cognitive process of learning (Trentin, 2001), that problem will be remedied through the use of technology in the third generation, analyzed in the next paragraph.

1.1.3. Third generation: Tele-learning model

As previously said, the third generation will remedy the limits which were present in the first two generations of distance education, making possible social learning even at distance, thanks to the telematic networks.

The technological development encouraged the beginning of the third generation in 1985, introducing interactive technologies, such as audio, text, video and then Web and immersive conferencing. These elements made possible to teach simultaneously at distance and “face to face”.

The main difference in this third generation was that the use of “two-way” communication overcame the use of “one-way” communication. So, the “one-to-many” disappeared, giving space to greater interaction between teacher and student and also among students.

Besides, while the second generation was characterized by high fixed costs for courses, the third generation was characterized by low fixed costs, indeed the costs of teachers and materials increased in proportion to the number of students enrolled. Bates (1990) pointed out that in the third generation even a relatively small number of students could benefit from courses which fit their needs.

Kaufman (1989), in his study, underlined the three major characteristics of the third generation course design, which are, the control by the learner, the dialogue and finally the development of thinking skills.

Firstly, the control by the learner is defined as the ability to make decisions and choices related to the learning process. This topic is further divided into three components (Garrison and Baynton, 1987):

- The independence, which is the ability to make choice, set goals and the strategies to reach them.
- The power, with the interpretation of involvement and responsibility in the learning process.
- The support, which is identified as availability and accessibility of courses, learning materials, and teachers/facilitators, to conduct the learning process.

The balance between these three components allow the control by the learner in the education process and leads to the second important characteristic of the course design, the dialogue since this balance is the basis of "two-way" communication.

Secondly, for what concerns the dialogue, it is possible to underline the strict relation of this term, with the concept of interaction between teacher and students, namely the communication during the educational process, which, as we said before, was almost totally absent in the first and second generation. According to Garrison and Baynton (1987), dialogue between teacher and student is composed of three stages, depending on the changes of emphasis which happen during a particular phase of the communication process. In the initial phase, communication is defined as negotiation, in order to guide the development and set the structure of the course, afterwards in the learning phase, communication is defined as instruction, where the teacher has to answer to specific questions and support student's intellectual, physical and emotional needs for learning and eventually, in the final phase the student learns self-assessment, that is why communication is defined as evaluation.

Finally, the development of thinking skills is a very important characteristic, in particular for the development of independence and empowerment of the student. Related to this concept, Seif (1981, p. 74) wrote: “Thinking enables students to continually confront issues and problems with skills that will aid them in developing new ideas, making sound choices, making better decisions, and understanding the world around them”.

So, we can finally claim that from this generation on, the students can choose why, when, what, how and where to study, so the conditions to put the student in a central position are created together with the perspective of the concept of “lifelong learning”, Harasim (2000) wrote:

“Lifelong education must enshrine the principle of access so people may be linked together. As we became aware that we could reinvent many aspects of education by using the potential access networking provides, we also realized that access is a multifaceted term. Online education could transcend traditional geographic obstacles to where one could learn (and where one might teach), but place-based institutions also presented physical barriers to learners with disabilities”.

1.1.4. Fourth and Fifth generation

As previously said, besides the well-known three generations of distance education, Taylor (2001) identified the existence of the fourth and the fifth generation. Because of the scarcity of resources, it is less clear what features define the fourth and the fifth generation of distance education. In this paragraph, there will be some hints of what characterize these two generations.

The fourth generation of distance education is known as “Flexible learning model”, Taylor (2001) pointed out that this stage is based on the delivery via the Internet. The connection to the Internet has improved the accessibility and the interactivity of a wide range of teaching/learning resources since the people who were more interested in distance education were especially students in full-time employment. These

students need to attend flexible lessons, where they can choose when, what and where to study, and all of this is provided by the Internet, which facilitates interactivity and flexible access simultaneously. Furthermore, in doing so, a learner can advance in the learning progress following their own pace.

For what concerns the fifth generation of distance education[2], which goes under the name of "Intelligent Flexible Learning Model", it is possible to say that it is a derivation of the fourth generation and it regards, especially, the features of the Internet and the Web. The fifth generation introduces an automated response system and intelligent object databases in the context of Internet-delivery system.

The "intelligent object databases" are searchable using pre-specified key-words: students can electronically ask a question to the search engine and find an appropriate match. If the student succeeds in the research, he will have a personalized response to the query. The validity of the correspondence has to be verified by a tutor. If the student can't find a match between the question and the answers generated, the question has to be directed to the tutor, to have a proper response, which is then added to the database. Based on these practices, Taylor (2001, p. 12) says: "The fifth generation (Intelligent Flexible Learning) model of distance education […] has the potential to provide students with a valuable, personalized pedagogical experience at a noticeably lower cost than traditional approaches to distance education and conventional face-to-face education".

A further element which has been introduced is a campus portal. This customizable e-Interface will assure an efficient service to the students, all of whom together with staff and stakeholder could engage with universities in an actively interactive way. All

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[2] The fifth generation of distance education is not just a set of abstract principles, indeed, these principles nowadays are at early phases of implementation at the University of Southern Queensland (USQ) as a result of the development of the e-University Project. The e-university Project has been designed taking into consideration three key-points: the e-Information repositories; a variety of e-Applications; and the e-Interface respectively

Smith (2005) affirm that: "The quality and standing of USQ's teaching and learning activities have been widely recognized both nationally and internationally".

of this will result in effective and enduring relationships among students, approaching even closer to the concept of lifelong learning.

In this section, the five generations have been outlined, the following section will discuss the problems related with the terminology in the area of distance education.

1.2. Problems in defining distance education

As seen in the previous paragraphs, distance education has a long history it has its roots at the end of the 19th century, but, even though its long history, a general definition of distance education, how it differs from distance learning, online learning and e-learning, and also, which are the differences among these terms are lacking. In this paragraph, we will try to get out of the maze of the terminology regarding the field of distance education.

In 1977, Moore investigated on more than 2000 educational programs in which the students were not “face-to-face” with the teachers, he identifies two families of activity, which are very similar between them, but one aspect is different, so a theory which can explain one family cannot explain adequately the other.

Moore (1977, p.6) provides these definitions of these two families:

- “The first of these families, the older, better understood, more fully researched, includes all educational situations where the teacher is physically contiguous with his students so that the primary means of communication is his voice, and in which (to use the economist’s terms) teaching is a "service" that is "consumed" simultaneously with its "production". The physical proximity of the learners with the teacher permits each to stimulate the other, consequently teaching of this kind is conceived as a process of social interaction “.

- “The second family of teaching methods, and the subject of our concern, includes educational situations distinguished by the separation of the teacher from his

> learners so that communication. has to be facilitated by a mechanical or electronic medium. Teaching in this environment is "consumed" at a time or place different from that at which it is "produced", and to reach the learner it must be contained, transported, stored and delivered. There may be interaction, between learner and teacher, but if so, it is so affected by the delay resulting from the necessity to communicate across distance or time, that it cannot be an assured component of teaching strategy, as it may in classroom or group teaching. We refer to this as DISTANCE TEACHING, to distinguish it from "contiguous teaching" where teacher and student are in physical proximity".

The first family corresponds to a “traditional or conventional education”, which is the form of education that everybody considers “normal”, namely, a formal education held at school or at university, where students and teachers are physically present in the same place at the same time.

Nevertheless, there would seem to be a need for a general clarification of the word “instruction”, which had created ambiguity and confusion over the years, since it had been the only one used to refer to activities which took place mainly at school and set in the classroom. Indeed, distance education was not considered as instruction and as Van den Brande (1993) stated, it was only seen as a best second option to conventional education, besides, many researchers agreed on the fact that “non-traditional” education had never been defined satisfying and accurately.

But, recently this view has been overcome, and it has been demonstrated by many scholars that Open University has succeeded and that students that have graduated at distance are as good as the ones who graduated in the traditionally. There is still a feud on the acceptance of distance education as a real form of instruction, so Perry (1986, p.15) in Keegan, (1996, p.27) observed:

“Central to overcoming these barriers to acceptance are the solid grounding of the foundations of distance education and the formulation of guides to good practice”.

1.2.1. The multitude of concepts related with distance education

A further definition of distance education is given by Bates (2005) who describes it as a general term that identifies a type of education, in which students and teacher are not physically present in the same place and at the same time. There is a degree of uncertainty around the terminology in distance education, many terms are used as synonymous, with the same meaning, but there are considerable differences that have to be taken into account.

The first one is Open Learning: the word “open” created some confusion because it was an imprecise term to which had been given many aims and ideas. But, over the years it had been identified as the primary goal in education. Education must be open and accessible for all the students, it is essential to remove all the barriers to learning and the use of technology seems to be a mean for doing that. Not all distance education programs are open to all students, some University, as the case of the University of British Columbia, sets very high admission requirements. A very significant point to consider is that there are not totally open teaching systems, each one these obviously requires, a minimum level of literacy, so it is possible to say that there are degrees of “openness”.

The second concept is Flexible Learning which has not the same meaning of distance education, but it may include distance education. With this term, we can describe how learning is provided, namely, without the geographical, time and social constraints. Bates (2005) claim that flexible learning, like distance education is a method.

Concerning distance education, it is fundamental to say that this term has obtained strength and acceptance in the early 1980s, before this, the term which had been mostly used, for over ten years, was “Distance Teaching” described by Moore (1973) as the set of teaching methods characterized by print, mechanical or electronic

devices, due to the physical separation of teachers and learners. However, several studies have revealed the inadequacy of this term, since it is more focused on the role of the teacher and the institution. The same situation happened with the term "Distance Learning" which is considered an inadequate term either because it puts too much emphasis on the student. That is the reason why, it has been adopted "Distance education" as the main term, in which Distance Teaching, namely the development of a course carried out by teachers at distance, and Distance Learning, the process of learning seen by the point of view of students, are the two essential elements (teaching and learning) in this field of education.

Having defined the various concepts related to distance education and sometimes used incorrectly, now it is possible to shed light on the definition of distance education. Thanks to Keegan, who reviewed early works and definitions dating back to 1967 by Dohmen, Peters, Moore and Holmberg and also recent works and definition dating back to 1987 by Garrison and Shale, Baker, Moore, Portway and Lane, he proposed six fundamental elements that compose the definition of distance education, following a study of Keegan (1996).

The first element is, obviously, the physical separation of teacher and learner, which is significative in the distinction with face-to-face education. In this case, the separation is not complete, but there are some degrees which depend on the course design and on the choice of the student. The interaction between teacher and learner could be non-existent, intentional or mandatory. Aretio (1999) explained that in this type of education, the information is transmitted through electronic devices and spread it out over time. The student has to process the information by himself, that is why distance education is based on the independent study of the learner, as previously said.

The second element is the use of technical media, especially print, teleconference, phones, videos, computers which have developed over the years and reduced the geographical, time, social and also economic barriers.

The third element is the influence of an educational organization, indeed, distance education is not a private study, it is provided by public or private institutions. Private study and distance education have in common the individual learning, however in distance education, the institution is a significant presence, since, it organizes the learning activities, it provides the learning materials, it oversees and supports the process of learning and intervenes if the students found himself in difficulty.

The fourth element is the provision of "two-way communication", which is a relevant element in distance education that has finally allowed the interaction between teacher and student. At first, the student was only the addressee of the messages, but from the third generation on, as previously said, the "one-way communication" was overcome by the "two-way communication" and this allowed greater interaction between student and teacher, with the possibility of mutual feedback, and also intentions among students filling the social aspect of education.

The fifth element is the separation of the learner and the learning group, it becomes relevant the intention to use an approach which focuses more on the student and his learning situation, trying to respond to the different educational needs of the learners. The distance education is different because the student is seen as an individual and not as a part of a group.

The sixth and the last element is the participation in an industrialized form of education, this means that there is a similarity between the process of industrial production and the process of learning in distance education. The principal studies on this topic have been carried out by Otto Peters who claimed that the production and distribution of learning materials are industrialized processes and that the distance education would not have existed before the advent of the industrial era, for example, the distance education would not have been possible without a postal service or the introduction of more efficient transportations.

So, in this section it has been shed light on the problems with defining distance education and explained the various concepts and features related with distance

education, furthermore, it has been outlined a set of fundamental elements that compose the definition of distance education.

1.3. Introduction to the new models of distance education: Online Learning and E-Learning

Returning to the third generation of distance education, the Tele-learning model, it is possible to say that its rapid expansion appeared to be related with the evolution of the Internet and in particular, the World Wide Web (WWW or W3). The World Wide Web is a component of the Internet which allows users to interact and collect information and create digital contents. From now on the significant influence of these tools, has led to the introduction of new models of distance education Online learning and E-learning. These news terms are often used as synonymous, but they have different meanings. Researchers have not treated these definitions in much detail: they are used as synonymous, or sometimes it seems that E-learning is part of Online Learning, sometimes not and the paper of Moore et al., (2011) shows these contrasting opinions. So, the line which can make a clear distinction between them is very blurry. Anyway, Bates (2005) distinguishes the two notions in this way:

"The terms e-learning and open learning are often used interchangeably, although e-learning can encompass any form of telecommunication and computer-based learning, while online learning means using specifically the Internet and the Web".

Online learning and e-learning are components of distance education classrooms, but this not means that online learning and e-learning are necessarily at distance, and distance education can be managed either online or offline. So, it is possible to say that these two notions are innovative tools that can be integrated into traditional courses and in courses at distance These means can introduce a broader range of activities thanks to the electronic devices (the "E" of E-learning means "electronic"), Internet and the Web, which are the foundations of both.

Distance Education, E-learning and Online learning enjoy strong support from the private institutions, governments and individual and working students. Bates (2005) explained that this support comes from several reasons, which are outlined below:

- Economic competitiveness: First of all, e-learning can improve the educational system and trigger the production of innovative educational products that can be placed in the international market. Moreover, with Distance education, E-learning or Online learning, the work-force have the possibility to learn and increase their knowledge, especially in the field of new technologies often used in companies, without the high cost of travel and waste of time.
- Lifelong learning: As previously said, lifelong learning is one of the main objectives in distance education and thanks to technologies, it can be reached, creating more possibilities for people to approach to education at all ages, making the education more accessible, since costs and distance have been reduced.
- Social equity and access: Another goal in distance education is open learning. With technology, people can start to complete their education, even if they have work or family responsibilities, or limited economic resources. With distance education all these barriers are being shut down, allowing people at all ages, social or economic situations to have access to education.
- Better education: there are still some problems in accepting students graduated at distance, sometimes a student graduated at distance is seen with less value, but this is not true and this view is being overcome thanks to the success of open universities, which have demonstrated that distance students are good as students who attended traditional courses at University. So, there is no “better education”, a step forward is admitting that education has the same results in both cases.
- Cost-effectiveness: the majority of studies affirm that distance and online courses are more cost-effective than traditional courses. On this topic, Bates (2005) and Cukier (1997) claimed that the costs of distance education depend on the number of

students enrolled to the courses. So, the cost effectiveness of distance education has not been determined yet.

- Geography: distance education is based on the fact that teacher and student are not physically present in the same place, but distance education is said to span the distance between them, so learning takes place at any location at any time.
- Commercialization of education: E-learning is often linked with the term privatization, at first, public institutions and universities invested on distance and online education, nowadays, many companies are investing on e-learning, making it a commercial activity, since it is seen as an opportunity to make money, but in this way, they are privatizing it, moving away from the concept of "openness".

In this paragraph, it has been explained how the Internet and the Web have influenced distance education. The following section will consider what tools teachers have been using in Italy, during the pandemic situation of Covid-19.

1.3.1. DAD and DID in Italy during the emergency of Covid-19

In this last year, teaching and learning in Italy, have been designated with an acronym DAD (didattica a distanza in Italian). DAD has assured the Italian schools to carry on with the education in total safety during the pandemic situation of Covid-19.

There are not many resources regarding DAD, it has not a correspondent term in English yet, but a recurrent expression to define this type of education during this situation is "remote learning".

Remote learning provides the opportunity for students and teachers, who are not physically present in the same place, to interact with the content through electronic devices, such as computers, tablets and phones. Teachers deliver their lessons to students using video-conference platforms, such as Zoom or Google Meets and assign homework or tests through a school portal. Generally, remote learning can be synchronous or asynchronous: the first expression means that students follow the class in live and there is an interaction between student and teacher and also among

students; the latter term means that students are provided with recorded videos of the class, they decide when to watch them, the interaction is quite inexistent in this modality. Fortunately, the most used modality is synchronous, which includes a higher engagement, than the asynchronous modality, but there is no flexibility in time since students have the same time-table they had at school.

The remote learning has been defined as an experiment in Italy (Sarsini, 2020), but this is not entirely true, because there are many universities which deliver courses at distance, it can be considered as an experiment in the lower grades of school, for example, high school, middle school and elementary school. But, was it a success or not? There are contrasting opinions on this topic but what is certain is that Covid-19 marked a turning point, Roncaglia (2020) said that from now on, Italian school is not going to be the same anymore, because the awareness of new tools and technologies will have a huge impact on teaching methods and also on learning styles and strategies. The functioning of remote learning has been highly contested but I will not expand on this point, since this dissertation aims to explain whether remote learning can replace traditional classes and what could be the best use of it since it has the potential to remodel Italian school. Finally, it is also significant to talk about another acronym DID (Didattica Integrata Digitale, translated as Integrated Digital Learning), which is a newborn term, that is why there are ephemeral resources on this topic. The meaning of this word encompasses both types of classes, in front and at distance classes, thus a classroom is divided into two groups, one group at school and one group at home, switching every three weeks, so a student attends the 75% of the activities at distance and the 25% of activities at school. This method has been introduced to avoid gathering of students in classrooms during the emergency caused by Covid-19.

We will see the Italian situation of education in detail in Chapter 4 together with a research carried out in an Italian high school.

Chapter II: Evolution of technologies in the learning theories

The introduction of technologies, with the advent of the Internet and the Web, have led to many significant changes in people's lives. The personal, professional and social sphere has been influenced and transformed by this technological revolution. During the last years, technology has had an enormous impact also on education: educators started to adopt online tools to improve their traditional teaching methods, as previously seen in the first chapter. This adoption can be considered a double-edged sword if it is used only to make traditional teaching methods easier or more efficient since doing so, there are a lack of opportunities to introduce better and advanced ways of learning.

Learning and teaching have always been linked with learning theories, which can be considered a modus operandi that teachers embrace and through them, they can remodel, shape, improve their work finding better ways to provide education.

Learning theories also explain how a student perceive, process and acquire knowledge, in a few words how a student learns.

The three main learning theories emerged in the 20th century and derived from the field of educational psychology. These theoretical frameworks are seen as a historical continuum that has marked important turning points in the field of education in the past 100 years, are:

- Behaviorist learning theory
- Cognitivist learning theory
- Constructivist learning theory

In the 21st century, the contemporary development associated with the Internet and other online technologies in the education field led to the introduction of two theories of learning: the Connectivist learning theory and the Collaborativist learning theory. Connectivism has been defined by George Siemens and Stephen Downes as the theory of the digital age, while Collaborativism addresses the needs and opportunities of the

current century, for instance, it focuses on students of all ages and online communities, in a formal or informal educational context.

Harasim (2017, p. 3) wrote:

“Educators are challenged to respond to the Internet. There is a need to reflect on our theory of learning (even if it is implicit), and to rethink and reassess our teaching practice and pedagogical approaches in relation to the opportunities afforded by online technologies. Most professions are faced with this challenge; new technologies are transforming the world of work and the nature of the organizations in which we work”.

This chapter will show how technology evolves over the centuries within the field of education, since technology and education have always been interconnected. Understanding the historical background of learning theories and technologies, it will be possible to identify which are the main principles that govern the distance and online education nowadays.

The main features of the five learning theories will be explained in the next paragraphs.

20th century learning theories

2.1. Behaviorist Learning Theory

As previously said in the first section, learning theories emerged within the area of educational psychology, this discipline has played and continues to play a significant role in education.

In the late 19th century, psychologists turned their attention from studying human mental processes to observable processes, as people's behaviors.

Behaviorism is a school of psychology introduced in the 20th century; it has European roots and emerged from experimental studies in German laboratories. Later, it had a significant diffusion throughout the world. It is essential to say that behaviorism focused on human and animal behaviors, how people behaved, how they reacted and how to change or elicite a particular behavior since all of these factors are visible and measurable. The mind was identified as a "black box" because there was not a proper method to study it, so it was considered an unobservable and unmeasurable factor; for that reason, behaviorists excluded it from the research and about this, Tomic (1993, p. 39) wrote:

"For the behaviorists, then, explanations that had no basis on human in human or animal behavior were irrelevant. It is important to note that in behaviorism, the term "behavior" actually refers to observations of the consequences of this behavior".

Many scientists were associated with the development of behaviorism but, the fundamental contributions to this theory had been made by the Russian psychologist Ivan Pavlov, known for his theory of classical conditioning and the American psychologist Burrhus Frederic Skinner, known for his theory of operant conditioning, proposed as an alternative to Pavlov's theory. The notions of classical and operant conditioning are considered milestones, not only of behaviorism but also of the entire psychology field. The two theories of Pavlov and Skinner showed a relationship between the environment and the learning process. The learning process is considered

a response to an environmental stimulus. That is the reason why, under these circumstances, learning is defined as a situation of stimulus-response.
In the next section, a detailed explanation of these two theories and the experiments will lead to a better understanding of behaviorism.

2.1.1. Ivan Pavlov: Classical conditioning

Ivan Pavlov was the pioneer of classical conditioning: a theory about the relationship between stimuli and responses, which was first applied to animals and then to humans. Pavlov was interested in reflexes, which were automatic behaviors in response to stimuli. He was carrying out a study on dogs digestion when he noticed that the dog started to salivate at the sight of the person who fed him, which means that the person became a stimulus for the dog. Pavlov decided to substitute the person with a neutral stimulus, a bell, and when the dog heard the sound of the bell he started to salivate since the bell became associated with food.
So, salivation is a conditional reflex in response to a conditioned stimulus, the bell. Pavlov, manipulating the stimulus-response situation, showed that classic conditioning succeed.
With this experiment, he demonstrated that the behavior was moldable and that the repetition of a set of operations made a behavior automatic.

2.1.2. Burrhus Frederic Skinner: Operant conditioning

Burrhus Frederic Skinner is considered the father of operant conditioning theory, proposed as an alternative to Pavlov's theory of classical conditioning.
With respect to Pavlov, who focused his attention on how behavior is affected by a neutral stimulus, Skinner drew his attention to how a behavior changed by using positive or negative reinforcements. Skinner supported his theory with an experiment: a laboratory rat learnt how to get out of a maze with the help of positive reinforcement, the cheese. This experiment was carried out through steps: in the first

step, the cheese was placed nearby; in the second steps, the cheese was placed a little further away; in the last step, the cheese was placed at the end of the maze and, the rat was not rewarded until it reached the next step. These positive reinforcements could affect the behavior of the rat. So, Skinner demonstrated how a special stimulus had the power to change or modify a certain behavior and also to reinforce the repetition of this behavior over time.

2.1.3. Behaviorist Instructional Design

Behaviorism aimed to create the autonomy of the learner by introducing during the learning process stimuli, rewards, punishments with the intent to modify, promote or elicit a certain behavior. Learning was a behavior that could be manipulated to become consistent, automated and replicable over time. It is possible to say that, within the field of behaviorism, the learning process is a predetermined path that each student has to follow step by step since each step is propaedeutic to the next one. Moreover, each student's performance would had been compared to standards, which meant that all the students had to reach prefixed standards.

Therefore, following Ertmer and Newby (2008), the instructional design based on the behaviorist learning theory was focused on the following aspects:

- Pre-assessment of students to determine where to begin.
- Establishment of objectives and learners measurable and observable outcomes.
- Establishment of the fundamental knowledge and abilities and the sequencing of more complex levels.
- Provision of constant feedback to the student, which is seen as a reinforcement to influence the student’s performance.

In this theoretical framework, the relationship between the teacher and the learner was asymmetric: the teacher held the knowledge and conveyed education it to the student, whose role was just receiving the information, which meant that he had a passive role in the learning process.

Before proceeding to examine the behaviorist learning technology, we can take stock of the situation outlining the pros and cons of behaviorism. For what concerns the pros, behaviorism provided a clear and precise objective, implicit learning was automatic and lasting, it could be applied with large numbers of students and it was extremely efficient. The behaviorist learning theory had been criticized by many scholars especially because the starting point of instruction was the same for each student, and it did not take into account previous knowledge or personal traits of the students.

2.1.4. Behaviorist Learning Technology

The second industrial revolution had begun in the mid-19th century and it required more and more educated worker who could write, read and follow instructions. Also, the Second World War contributed to that, leading to the mechanization of education through special learning technologies. These learning technologies aimed to instill in workers the ability to perform repeatedly specific tasks, making them reliable.

The most famous behaviorist learning technologies are two:

- Teaching machines and programmed instruction.
- Computer-assisted instruction (CAI).

Teaching machines were devices of self-scoring testing, inside the machines there was a list of questions and through a mechanism, the student responded. If the answer was correct the student got a reward. A prototype of a teaching machine was designed by a psychology professor, Sidney Pressey in 1927. His machines were simple devices, and through them, the professor presented multiple-choice questions to the student, who had to push the bottom which corresponded to the correct answer. If the answer was correct the machine went on with the next question, otherwise, the student had to choose which was correct. Later, there was an evolution of these teaching machines Skinner designed a new type of teaching machine, called programmed instruction (PI). Concerning teaching machines, the question proposed in PI were not multiple-choice

questions, but a short answer was required. The student wrote the answer and then checked if it was correct, after the feedback he went on with the next question. The programmed instruction led the students to progress through units at their own pace after they had given the correct answer. The answer was not a test, but a part of the learning process since the students' aspiration to give the right answer was considered a reinforcement of their motivation.

About computer-assisted instruction, it is possible to say that it consisted of a drill-and-practice approach to developing students skills and knowledge with the support of a computer. In the 1950s and 1960s, the first examples of CAI were very disadvantageous because of technical problems, lack of quality of applications, complexity and high costs. But in the 1980s, with the increase of personal computers and their introduction in the school system, this drill-and-practice approach finally flourished. Also, the military found this approach very efficient.

Within the field of behaviorism, education technology arose to encourage and reinforce the practice of specific tasks making education more methodical and mechanized.

2.2. Cognitivist Learning Theory

The behaviorist learning theory was highly criticized for his rigid emphasis on what is observable, measurable and replicable and for the restricted link between stimulus-response since other many factors were involved in the learning process. Consequently, with the development of study fields as linguistics, psychology and neurology, many researchers realized that the cognitive processes were not such mysteriousness.

In this context, the cognitivist learning theory emerged as a reaction to behaviorist learning theory, but it did not reject it entirely; it aimed to demonstrate that the mind played a central role in the learning process, so the attention of scientists shifted from the external behavior to the internal mental processes.

Cognitivism was a field of psychology that determined how humans thought and how they acted or reacted; in this framework, the notion of stimulus-response was replaced by the concept of input-output. Cognitivist psychologists believed that humans could think logically, that was why they were interested in what went on between the input and the consequent behavior (output), namely in which were the mental structures that intervened in the processing of the behavior.

Cognitivist learning theory replaced behaviorist learning theory in a short time, becoming the prominent school of thought. This replacement was possible mainly because of the invention of the computer which had a great impact on this theory, that was why cognitivism was related to the concept of "cognitive information processing", also known as "mind as computer". Cognitivism information processing (CIP) was a model developed by Atkinson and Shiffrin in 1986 in which the learner was seen as a processor of information and his mind was associated with a computer in the process. A more accurate definition of this model was given by Andre (1997, p. 245) who stated:

"The learner receives environmental information through senses; such information is organized into meaningful structures by a perceptual process that operates automatically, information attended to is processed in a limited-capacity working memory, and as a result of that processing, changes may be made in long-term episodic or semantic memory structures".

Therefore, the main components in the processing of information are storing, retrieving, transforming and using (Harasim, 2017).

Schema was another concept related to the cognitivist learning theory, which explained that a learner acquired new knowledge more easily if he compared it to existing knowledge.

Winn and Snyder (1996) outlined a set of characteristics connected with the schema theory:

- Schema as a memory structure that contains most of the knowledge of the world.
- Schema as abstraction, which means that memory encodes features of every experience of the learner and it recalls these experiences or features to interpret new objects or events.
- Schema as a dynamic structure since when students learn new information, this will mix with the preexisting information, constantly changing their understanding of the world.
- Schema as a context that influences the learners' interpretations of their new experiences.

2.2.1. Cognitivist Instructional Design

Cognitivism organized the learning process into levels and through them, the learner memorized skills or a set of sub-skills that he could use and reuse in different contexts. There was more emphasis on the structuring, organizing and sequencing of the information.

The instructional design of cognitivism was similar to the instructional design of behaviorist learning theory, but there were some differences. Some learning strategies proposed by behaviorism were presented in cognitivism. A common trait was the use of feedback, which in this case was used to guide and support the process of learning, while in behaviorism it was reinforcement. The cognitivists tried to determine which were the students' predispositions to the learning process and how to design instruction making it easily absorbable. In contrast, the behaviorists ascertained that the starting point of instruction was the same for each student and decide which were the most efficient reinforcements.

The relevant principles of cognitivist learning theory were:

- Emphasis on the active participation of the learner, who makes choices and takes decisions about his learning process.

- Use of hierarchical analysis to identify prerequisites and objectives.
- Emphasis on structuring, organizing and sequencing of information to promote better assimilation of it.
- Development of learning environments that enable students to activate connections with previously learned knowledge and to activate complex cognitive strategies (such as problem-solving).

For what concern the relationship between the teacher and the student, it was still asymmetric since the teacher continued to own the control of the learning process, defining the objectives and the methodologies.

The cognitivist learning theory started to investigate perception, attention, memory and language, allowing the understanding of how these processes worked and it led to shift the attention from products to processes.

2.2.2. Cognitivist Learning Technology

Computers, as previously said, were the key-aspect of cognitivist learning theory and technology. The main technologies related to this theoretical framework were Intelligent Tutoring Systems (ITS) and Artificial Intelligence (AI).

As regards Intelligent Tutoring Systems, they developed in the 1970s from teaching machines and CAI thanks to the evolution of the hardware and software, which became more sophisticated. ITS was a more specific type of CAI thanks to the following attributes:

- Knowledge of the domain
- Knowledge of the learner
- Knowledge of the teaching strategies

The functioning of this model was well-explained by Shute and Psotka (1994, p.10), they wrote:

“A student learns from an ITS primarily by solving problems-ones that are appropriately selected or tailor-made that serve as good learning experiences for that

student. The system starts by assessing what the student already knows, the student model. The system concurrently must consider what the student needs to know, the curriculum (also known as the domain expert). Finally, the system must decide what curriculum element (unit or instruction) ought to be instructed next, and how it shall be presented, the tutor (or inherent teaching strategy). From all of these considerations, the system selects or generates a problem, then either works out a solution to the problem (via the domain expert) or retrieves a prepared solution. The ITS then compares its solution, in real-time, to the one the student has prepared and performs a diagnosis based on differences between the two".

Following Shute and Psotka (1996), the problem with ITS is that these technologies had never been adopted to be used in classroom realities but only in research laboratories.

Concerning Artificial Intelligence, Alan Turing is considered the creator of Artificial Intelligence studies since he believed that a computer could solve the same activities and operate in the same way as a human mind. After the II World War, there was an increased demand for education and the only solution to this "problem" was seen in the use of computers. Under these circumstances, the movement of AI grew, promising to reach the goal of "thinking computers". However, this was not possible because the movement slowly waned due to technical problems related to computer memory and speed.

2.3. Constructivist Learning Theory

Constructivist learning theory emerged in Europe, it spread to the USA in the 1970s during a period of social reform and civil rights movements and it rejected the aspect of programming computers as human minds.

Constructivism posits that humans were not a "tabula rasa", but they actively constructed their knowledge of the world through their experiences and interactions with other people. Taking into account the learning aspect, there was a significant

difference with the other theories since the knowledge was not transmitted from the teacher to the learner, but it was the learner, who constructed it under the guide of the teacher or peers. Basically, the idea of absolute and finite knowledge gave way to dynamic knowledge that could evolve.

The two major theorists associated with this theoretical framework were Jean Piaget, a Swiss professor of psychology and a biologist and Lev Semyonovich Vygotsky, a Russian psychologist.

Piaget and Vygotsky introduced two perspectives of the constructivist learning theory, cognitive constructivism and social constructivism.

2.3.1. Piaget and the Cognitive Constructivism

Cognitive Constructivism was a perspective developed by Piaget, who affirmed that children learnt actively and that learning was a process that involved the progressive construction of logical structures. Specifically, Piaget observed that children learnt through stages, these were universal and were based on their age, so, the learning process followed step by step the cognitive development of a child.

The knowledge that a human acquired had to be internalized first, this process of internalization followed three main stages, which were:

- Assimilation: it happens when an individual gets in touch for the first time with a new object or event and he uses pre-existing metal structures to interpret and assimilate the new one.
- Accommodation: it involves the changing or modifying of existing mental structures when the expected result has not been achieved. So, the individual has to accommodate new ways of interpretation.
- Disequilibration: it happens when an individual has to construct new cognitive structures since the pre-existing ones are not sufficient to assimilate a new action.

Harasim (2007, p. 66) wrote:

“The learner is not an empty vessel to be fulfilled with the knowledge of the teacher, but an active organism creating meaning through contact and interaction with the external world”.

So, the essence of Piaget’s theory was that the student actively constructed his knowledge in his mind, making connections with what he already knew of the world.

2.3.2. Vygotsky and the Social Constructivism

Nowadays, Vygotsky is the most prominent scholar related to the constructivist learning theory; his theory of social constructivism was proposed as a reaction against Piaget’s theory and it is still important for the learning theories of the 21st century, as we will see later.

In his theory, he affirmed that biological development did not occur in isolation, namely an individual developed cognitive functions through interaction and socialization. Social relationships played an essential role in the development and in the learning process of an individual.

The approach of Vygotsky to human development was different from that of the other psychologists: he focused on the entire process of development rather than a particular period of development, he saw socialization and interaction as the aspects that triggered new cognitive functions. The tool that mediated socialization, namely the relationship between humans and the external world was the language, to which Vygotsky gave a greater meaning than the one provided by Piaget. Roughly speaking, Vygotsky said that when an individual knew how to use the language in an “external” situation, namely dialoguing with others, he achieved the capacity to use the language in an “internal” situation, namely thinking and reasoning about himself, developing in this way a better cognition, perception and consciousness of what he had inside and outside (Peter, 2009).

Vygotsky proposed also the concept of “zone of proximal development” (ZPD) which was a psychological space in which students increase their knowledge but remaining

inside their space of potential development with the collaboration of teachers or more capable peers. ZPD was related to the term scaffolding, which referred to teaching methods or tools that supported the students during the learning process.

To conclude, it was possible to say that within a social context, the human got more awareness of himself.

2.3.3. Constructivist Instructional Design

Within this theoretical framework, the attention was on process rather than on products. There was still more emphasis on the active role of the student, who was no more considered as an information processor, but he elaborated and interpreted the information provided by a real context creating his meaning. Another key aspect of constructivist instructional design was the collaboration, mainly among students, where the member interacted and shared thoughts to construct knowledge, about that Cunnigham (1991, p. 14) wrote:

"The role of instruction in the constructivist view is to show students how to construct knowledge, to promote collaboration with others to show multiple perspectives that can be brought to bear on a particular problem, and to arrive at self-chose positions to which they can commit themselves while realizing the basis of other views with which they may disagree".

Therefore, Ertmer and Newby (2008) demonstrated which were the principles of constructivist instructional design:

- It is very important to identify the context in which the learner will acquire and subsequently applied knowledge and skills.
- Emphasis on how the learner manipulates the provided information.
- It is important to provide information in different ways.
- Support the learner to use the skills that can allow him to go over the information provided.
- Evaluation based on the transfer of experience and skills.

The constructivist learning theory took into account the individual differences of the learners and previous knowledge. The learning was more interactive even though the relationship between the teacher and the learner was still asymmetric, but less strict since the teacher guided the student in his learning process and the student created the meanings depending on his interpretation of the external world.

2.3.4. Constructivist Learning Technology

The technology progressed together with the theories, within the constructivist learning theory, it was possible to see how much the technology had advanced, creating the prototypes of the nowadays-technology, such as online courses and platforms for delivering these courses. Computers became essential in applying constructivist principles to education. Technological instruments related to this theoretical framework are The Logo of Papert, the Learning Networks and the Online Learning and the Course Delivery Platforms.

Papert strongly believed that children were perfectly able to manipulate technology and not the opposite, realizing projects and increasing their knowledge of the world. He developed The Logo, a programming language tool that allowed students of all ages to create inside a geometry microworld objects such as houses, building and cities. Papert thought programming was the key-aspect of the constructivist learning theory.

The Learning Networks started to develop in the 1980s and 1990s with the increasing use of emails leading to learning circles in which students from different schools and countries could communicate. The first learning circle was created by Margaret Riel, who continued to design these learning circles arriving to generate project-based learning communities with students and teachers from different countries.

The Course Delivery Platforms emerged in the 1990s to support online courses and activities. These platforms encouraged online learning, discussions, work projects among students and set the stage for platforms used nowadays similar to Moodle; they

have also triggered improvements in the field of online learning in both universities and schools, shaping Distance Education as we know it today.

21st century learning theories

2.4. Connectivist Learning Theory

In the past few years, modern societies have seen the rapid evolution in science and technology fields, increasing the emergence of the Internet, which provided broad access to knowledge, resources, views and opinions of others, resulting in the school-based learning networks.

The adoption of online learning occurred in the 1980s, with experiments of online collaborations and educational projects such as electronic pen pals and cultural exchange programs with schools in other countries. All of this led to distance education in the 1990s, with the first explorations of online learning networks for online course delivery.

So, according to that, there was a need to develop new learning theories which fit better these "technological times".

The two theoretical frameworks associated with the online learning networks were the connectivist learning theory and the collaborativist learning theory, the latter will be explained in the next section.

The connectivist learning theory first appeared as a post in a blog owned by George Siemens in 2004 and it was supported by his co-founder Stephen Downes. The definition of connectivist learning theory that Siemens gave was:

"Connectivism is the integration of principles explored by chaos, network, complexity and self-organization theories. Learning is a process that occurs within nebulous environments of shifting core elements – not entirely under the control of the individual. Learning (defined as actionable knowledge) can reside outside of ourselves (within an organization or a database), is focused on connecting specialized

information sets, and the connections that enable us to learn more are more important than our current state of knowing".

According to Siemens, this theoretical framework emerged to face the inadequacy of the existing learning theories during the digital age since they had not been influenced by technology, about that he stated (2004, p.1):

"Behaviorism, cognitivism, and constructivism are the three broad learning theories most often utilized in the creation of instructional environments. These theories, however, were developed in a time when learning was not impacted through technology. Over the last twenty years, technology has reorganized how we live, how we communicate, and how we learn".

This concept has been challenged by Harasim (2017) and Bates (2015) studies demonstrating that it was inaccurate since technology and learning have always been interconnected; learning technologies are not a recent phenomenon: the teaching machine was a learning technology such as the programmed instruction by Skinner and also the artificial intelligence together with the Papert's Logo. All these instruments were learning technologies developed over the years, so essentially, there was a problem in distinguishing between online learning technologies and technologies.

According to Siemens (2004), the other learning theories focused on what happened inside the learner during his learning process, while connectivism focuses on "learning that occurs outside of people manipulated by technology". The concept of learning was related to networks and connections, knowledge can be acquired through connecting with the right people in the right context; this capacity to connect and maintain the connection will result in continual learning or lifelong learning. Connectivism affirmed that learning was no more an internal and individual activity, and also suggested that the tools that a learner uses shaped his learning. The general principles of the connectivist learning theory devised by Siemens are:

- Learning and knowledge rest in diversity of opinion

- Learning is a process of connecting specialised nodes or information sources.
- Learning may reside in non-human appliances
- Capacity to know is more critical than what is currently known
- Nurturing and maintaining connections is needed to facilitate continual learning
- Ability to see connections between fields, ideas, and concepts is a core skill.
- Accurate, up-to-date knowledge (currency) is the aim of all connectivist learning activities.
- Decision-making is a learning process in itself.

Connectivism is an emergent theory and it has been the subject of criticism since the concepts are puzzling and disappointing from a theoretical and research point of view. There is a lack of explanation of how learning takes place, how a learner accesses knowledge through networks. Additionally, this theory has never been empirically demonstrated, there are no applications of connectivist approaches, so, essentially how an individual learns through connectivism is still an unknown point.

So, it is possible to say that there is a lot of confusion and chaos around this theory, which is caused by the frequent disagreeing between the two founders, Siemens and Downes, in their publications (Harasim, 2017). All of this confusion associated with this framework leads to not considering it a theory at all and about that, Tony Bates (2011) stated that to consider this theory as such, he needed a more defined and consistent theoretical framework supported by observational evidence.

2.4.1. The MOOC

Since the 19th century, there had been many attempts to automatize the teaching activity, an example was the production of the teaching machines. Within the connectivist theoretical framework, the most recent attempt to automatize education was seen in the MOOC pedagogy. The term MOOC appeared for the first time in 2007 in Canada with George Siemens and Stephen Downes, who launched an open-

participation online course called “Connectivism and Connective Knowledge” addressed to a small part of students (25 students), but approximately 2000 people signed to this online course. Unfortunately, just a few of them were actively participating in the course. It is important to distinguish between two types of MOOCs: cMOOC and xMOOC. cMOOCs are based on the connectivist pedagogy (c stands for connectivist), namely learner acquired knowledge through a network of connections in a community of practice. Even though there is not an accepted definition of what a MOOC is, it is possible to outline a set of common features (Banzato, 2012), such as open access, people can join an online course without paying or being a university student; the scalability, namely a cMOOC course can support an indefinite number of students, who can enroll or leave a course whenever they want; the creation of a learning community using social networks is a very significant feature in cMOOCs that helps to create and maintain connections between students. The teacher becomes a facilitator, his presence is more intensive at the beginning of the course, and it reduces more and more, in this way the facilitator promotes students participation and autonomy (Goldie, 2016).

For what concerns xMOOC, they are based on behaviorist pedagogy, so the teaching methods are more traditional: they were essentially open-access online courses where video-lessons are presented followed by a multiple-choice quiz, very similar to the teaching method of the Pressey Teaching Machine, the interaction between student and teacher was absent.

2.4.2. Connectivist Learning Technology

As seen in the previous sections, technology, within the connectivist theoretical framework, plays the most important role. So, in this learning theory for the digital era, as Siemens presented it, there is so much emphasis on intelligent networks which are based on artificial intelligence. The AI assumes so much prominence to become superior to humans, in this case, teachers. Siemens in an undated article wrote:

“Connectivism focuses on the inclusion of technology as part of our distribution of cognition and knowledge. Our knowledge resides in the connections we form - where to other people or information sources such as databases. Additionally, technology plays a key role in 1) cognitive grunt work in creating and displaying patterns, 2) extending and enhancing our cognitive ability, 3) holding information in ready access form (for example, search engines, semantic structures, etc). We see the beginning of this concept in tool-based discussions of Activity Theory. Connectivism acknowledges the prominence of tools as a mediating object in our activity system, but then extends it by suggesting that technology plays a central role in our distribution of identity, cognition, and thereby, knowledge”.

From this observation, it is possible to understand how much active are the “non-human appliances” in the learning process. According to that statement, in this digital era, the knowledge resided across the networks not only in the mind of the individual, so, it is also possible to say that the teaching machine becomes a thinking machine; everything is connected and related to network intelligence, which is the major organizer of human activities, becoming superior to the educator figure.

That can be considered the distinctive trait of connectivism (Harasim, 2017).

Harasim (2017) also suggested that technology cannot be considered as a replacement for human teachers. Teachers and students should not trust technology too much, they have to do good use of it since many messages presented on the network are controlled by big companies to increase their power and profit.

2.5. Collaborativist Learning Theory

Collaborativism emerged after 30 years of research and practice, it was focussed on the use of the Internet to provide courses and access to online resources, encouraging and facilitating collaborative learning among students, changing the formal environment of education. The collaborative ideology cannot be considered as new or linked only to the current technological times, in fact, according to Gaillet (1994),

these collaborative methods were experimented by Professor George Jardin at the University of Glasgow from 1774 to 1826. Professor Jardin introduced the peer-review method, where students could learn from one another, the weaker ones from the stronger ones. This approach, also known as student-assisted learning, was found to be successful.

As said before, another pioneer of collaborative learning theory was the Russian psychologist Vygotsky, who saw the importance of social relationships in the individual learning process.

The growth and the power of technology create, outside the classrooms, more opportunities for human communication and collaboration, for instance, learning networks, electronic pen-pals, online work projects, online courses, forums and seminars. All of these activities led to the improvement of online and distance education. Consequently, with all these changes, there was a need to introduce a theory adequate for these contemporary times since the constructivist learning theory was especially based on learning in classrooms.

2.5.1. The principles of collaborativist learning theory

Collaborativist learning theory aims to encourage students to work together to create new meaningful knowledge. The creation of new knowledge occurs trough collaboration between the members and through communication, which is identified with the term “discourse” in this theoretical framework. Collaboration and discourse are the main factors in creating, sharing, discussing and applying knowledge, especially in online education.

Garrison (2006, p.) supported this view, stating:

“Collaboration is a key component of a community of inquiry. However, collaboration must include communication or discourse that is purposeful, threaded and reflective. Students must be stimulated and motivated to consider the essence of the material

being presented and translate that into personal meaning that can be shared and collaboratively confirmed".

It is important to say that the collaborativist learning theory is based on the concept of divergent and convergent thinking, created by J.P. Guilford. Divergent and convergent thinking are two sides of the same coin: the first one involves the creation of new ideas, questions, problems and solutions; while the second one involves the recognition of the best potential solution to any problems. This process that leads the learner from divergent thinking to convergent thinking is composed of three stages:

- Idea generating: in this stage, each learner is engaged in a group discussion; everyone has to propose his ideas about the introduced topic, these ideas will produce different perspectives on the topic.
- Idea organizing: in this stage, there is a confrontation, a debate among students on the ideas introduced on the stage before. Through discussion, these ideas will be organized and elaborated, accepting some of them and rejecting others.
- Intellectual convergence: after the confrontation, there is a selection, in which learners accept some ideas and refuse others, arriving at a common position or resolution of the problem.

These three phases show that the learner is actively engaged in the learning process and that the knowledge is built through discourse and collaboration, which are considered the essential elements in the collaborativist learning theory. The teacher is not seen anymore as the transmitter of the knowledge, but he takes the role of facilitator, this means that he has to include each learner in the discussion, or the activity, namely he has to promote the participation in building the knowledge.

2.5.2. Collaborativist Learning Technology

One of the major researchers in the field of collaborativist learning theory is Linda Harasim. She claimed that technology, in this theoretical framework, is a significant factor in reaching efficient online learning but that it is secondary and it has to remain

in this way. In the past few years, there was the need to create an online learning environment for developing and delivering activities like group-discussions debates, role-plays or work-projects.

The online learning environment can be considered as a physical classroom on the Web. The Virtual-U was the first online learning environment to be invented: it was a shared online space where learners could engage in discussions, debates on different topics and span the geographical distance among students. This online environment facilitates and encourages collaborative learning. Another important aspect of this theoretical framework to take into account is the difference between Artificial Intelligence (AI) and Augmented Human Intelligence (AHI).

Augmented Human Intelligence is a new term coined within this theoretical framework. The Artificial Intelligence approach has given a central position to technology, aiming to replace the teachers and treating learners as objects rather than active participants. It has been said that this approach was leading to automating individuals in doing mechanic tasks rather than enable students to improve and empower their human thinking in the learning process. This view was also supported by Bates (2016):

“The danger with automation is that we drive humans to learn in ways that best suit how machines operate and thus deny humans the potential of developing the higher levels of thinking that make humans different from machines. For instance, humans are better than machines at dealing with volatile, uncertain, complex and ambiguous situations, which is where we find ourselves in today’s society”.

Finally, as previously seen, the AI approach is based on the cognitivist learning theory, so the human mind is thought to operate, solve problems as a computer machine. The AHI approach put the human in the central position rather than technology, which is seen as a device to support learners in their learning process, so it takes a secondary role.

What is certain is that teachers cannot be replaced by computer algorithms since they are essential figures in inducting students into a better understanding of the world, problem-solving and building knowledge through collaboration.

Harasim (2017) stated:

“Technology is important, but it is secondary. It should follow from and conform to the pedagogy, not the other way round. Technology should facilitate student discussion, peer collaboration and student-teacher interaction, not replace it. Analytical discourse and discussion, informed debate and access to experience and expertise are the basis of human knowledge. This has been and should continue to be facilitated and advanced by teachers, professors and educators of all kinds”.

To sum up, in this chapter, we have seen how technology had developed within the different theoretical frameworks and over the centuries. In the beginning, there was the idea that technology should take a central role in the learning process, arriving to replace the teacher, but fortunately, in the last years, there has been more awareness regarding the fact that learning cannot be automatized and that teachers cannot be replaced. So, technology occupies and has to occupy a secondary position in the learning process. It is a support instrument for students and teachers as this thesis wants to demonstrate, which improves and empowers the learning process, especially in online learning and distance education, which are the main topics in this dissertation. The next chapter will address the challenges and perspectives of distance education.

Chapter III: Challenges and Perspectives of Online Distance Education[3]

The Internet revolution has given us a massive opportunity to interact, collaborate and cooperate with people all over the world, without any time or place constraints. Nowadays, thanks to the Internet, we have unlimited access to online resources, anything we need is just a click away. This revolution has impacted on distance and online education, creating a new online environment, especially at university, where students can collaborate and construct knowledge together even if they are not in the same room and with the proper tools. Teachers have been hit by the Internet wave, together with the constant evolution of technology, so they had to reshape their modus operandi with reference to the new learning theories that have evolved to keep up with these technological times. Under these circumstances, the quality of distance education has improved and many countries are establishing new measures to develop a more open education, which is one of the main objectives in education, as seen in the first chapter.

Another main objective of distance education is to overcome the idea that this type of education is not considered a proper form of instruction, as pointed out Perry (1986, p.15) in Keegan, (1996, p. 27), but fortunately, teachers and learners can work together to reach these objectives and to overcome such barriers, building this new online environment with the intention to fit everyone's needs.

Moreover, it has been demonstrated that online distance education students are good as the ones of traditional education and also that online distance education has several benefits for learners: there are no time and place constraints, so students can proceed with their learning process at their own pace; learning materials are daily uploaded, so students can keep up with the program even if they did not attend the lesson, or they can review the material if they did not understand something; the feedback can be

[3] In this chapter, the term Online Distance Education will be used to indicate a distance teaching situation but with the support of online and technological tools.

provided immediately; the communication and interaction between student and teachers and among students are facilitated by e-mails, forums, online meetings, instant messaging; eventually, this type of instruction is considered cost-effective. Naturally, disadvantages are not missing: since technology evolves rapidly, it requires advanced skills in using it and in adapting to it, in producing and delivering content; there is no face-to-face interaction, which is considered very important in the learning process; there could be psychological difficulties due to the change from learning face-to-face to learning online; there could be the need to overcome the inequality gap of students in different financial situations: not all can have access to computers or Internet connection; at final, it is believed that online distance education requires more autonomy, responsibility and self-discipline from the learner, since he or she plays a central role in the learning process, he or she has to make choices, take decisions, organize his or her learning path. Nevertheless, as Cantoni, V. et al. (2004) pointed out, all these weaknesses could be remedied with a well-organized and well-built instructional design.

In the previous chapters, we have seen the historical background of distance education, how it has generated and how technology has affected it. Moreover, we have seen how the learning theories continuum has evolved within the field of technology, introducing the main principles that rule distance and online education nowadays. This chapter aims to give a better explanation of these principles and to identify which challenges have to face the educators in online distance education nowadays. Moreover, since online education and distance education are essentially used at university in Italy, this chapter makes people wondering why the Italian high schools are still backlogged, even if they have at their disposal all these new technological tools and online accessibility that can support students in their learning process. This chapter will set the stage for the fourth chapter, in which there is a study carried out in an Italian high school during the Covid-19 pandemic based on these principles.

3.1. The interaction in online distance education

Interaction is considered one of the main principles of the learning process itself, Dewey (1938, p. 25) affirmed:

"The principle that development of experience comes about through interaction means that education is essentially a social process. This quality is realized in the degree to which individuals form a community group. It is absurd to exclude the teacher from membership in the group. As the most mature member of the group he has a peculiar responsibility for the conduct of the interactions and inter-communications which are the very life of the group as a community".

Within the field of distance education, the interaction had been seen as a challenge; as we saw in the first chapter, in the first and second generation of distance education, the interaction between teacher and student and among students was totally or almost absent. Then, in the third generation, the concept of interaction gained more importance since the use of "one-way communication" was overcome by the use of "two-way communication".

Education as a social process, asserted also by Vygotsky, is a very recurring notion in the field of education, that is why there was and there still is the intention to create and maintain a strong social interaction between teacher and student and also among students. In online distance education, interaction takes place using the synchronous modality (which means that it occurs in real-time, like video-conferencing) or the asynchronous modality (which means that occur on a student's schedule, there is no real-time lesson) or both.

Hence, Michael G. Moore, in his article "Three types of interaction" (1989), stated how much the term "interaction" is puzzling since it can have many meanings and he wondered what is the ideal level of interaction in distance education to make learning effective. As a consequence of this, he identified three types of interaction in distance learning courses:

- Learner-content interaction

- Learner-instructor interaction
- Learner-learner interaction

Besides, Bounik and Tali (2006) identified another form of interaction, the interaction with the system, due to the evolution of technology during these last years.

3.1.1. Learner-content interaction

This first type of interaction presented by Moore (1989) occurs between the student and the content, or the study material. This type of interaction happens when the student encounters new information and compares it with the one already retained, creating new knowledge, changing his or her point of view or the cognitive structure in his or her mind. This process is not possible without the help or the guide of the teacher.

Roughly speaking, the interaction with the content happens when the learner gets in touch with new information in a written text, a television program, a podcast or during a lesson.

In medieval times, the only content interaction was possible with books or didactic text, whose aim was merely instructing, without any support or assistance by tutors. In the 19th century, things changed due to the development of new printing techniques and railway transportation which made possible the production and distribution of materials over large geographical areas, increasing the interaction with the content and introducing a little opportunity of assistance provided by distance tutors.

The interaction grew gradually with the invention of new tools, like the television or the radio, arriving at the present times, where the modern tools trigger a high level of content interaction. Under these circumstances, learners have to be able to exploit the online material properly and try not to be overwhelmed by the huge amount of information on the Internet (Swan, 2001). For these reasons, the teacher's help is required and once the learner has found the proper way to interact with the content, the learning process will be more effective and worthwhile.

Moore (1989) said that education is not possible without this type of interaction.

3.1.2. Learner-instructor interaction

The second type of interaction is about the connection between the learner and the instructor or the teacher. This type of connection is considered one of the most important aspects even in traditional learning. Swan (2001) pointed out that it has been demonstrated that in a face-to-face teaching situation, teachers' verbal and non-verbal behaviors can reduce the psychological distance between themselves and their learners, creating a comfortable environment, where the learning process can take place more successfully.

For this reason, even in online and distance education, the interaction between teacher and students has to be created more strongly and maintained since within this situation, besides the psychological distance, there is also a geographical distance and the communication gap has to be overcome through teachers' special behaviors.

While in the first generation of distance education, the interaction between student and teacher was very restricted, almost absent, nowadays, the new online technologies have improved communication at a larger distance, therefore, teachers can communicate, monitor and prevent their learners from "getting lost" in their learning process. The figure of the teacher is extremely important, he or she plays a fundamental role that cannot be replaced by machines. The educator has to design the course, prepare and decide the material to use, moreover, he or she has to motivate the student to achieve their learning goals, makes the student participates, provides immediate feedback, basically, he has to support and guide the learner in his learning experience. The assistance of the teacher has to be gradual: stronger at the beginning and then, gradually softened, to allow the learners to create their autonomy and to be more independent (Harasim, 2017).

Finally, it is important to say that the approach used by the teacher in interacting with students, in making students interact and in providing support are vital ingredients in creating the third type of interaction, namely the learner-learner interaction.

3.1.3. Learner-learner interaction

The third type of interaction concerns the interaction among the students of a class or members of a learning group, which was discovered to be a valuable resource, even essential in the learning process. With distance education, providing a proper interaction among students had been very challenging. Furthermore, when technology became commonplace in education there were shared thoughts about the fact that computer-mediated learning could not provide "social presence" and that only the physical presence of the learner could trigger that sense of belonging to a group. Fortunately, following Walther (1994), these assumptions have turned out to be inconsistent: it has been shown that communication and interaction among learners were possible even if they were not in the same room and that this type of "computer-mediated interaction" has no negative effects on social communication or relationships. Furthermore, Swan (2001) demonstrated that online course discussions are more equitable and offer more opportunities for students to participate. In online courses discussions, no student prevails on the other, everyone has a voice, even a student who is shy in face-to-face discussions is keener on participating in online ones since they feel less pressure (Kemp and Grieve, 2014).

As seen in the previous section, it is the approach that a teacher uses that lays the foundations for creating learner-learner interaction: teachers have to promote communication, encourage students to participate in online debates and discussions if they are in a synchronous learning situation; if students are attending a course in asynchronous modality, teachers have to encourage them to write and share their ideas through forums, chat-groups or e-mails. If a course is well-designed, well-structured

and based on discussions, it will bring benefits to learners, making them more satisfied with the learning course and with their learning process too (Swan, 2001).

Picciano (2002) stated:

“The ability to ask a question, to share an opinion with a fellow student, or to disagree with the point of view in a reading assignment are all fundamental learning activities. Web-based learning requires adjustments on the part of students and teachers for successful interaction”.

If a strong interaction is built, collaborative learning can take place comfortably and effectively.

3.1.4. Interaction with the system

The education field experimented a considerable shift in the last years, entering the area of online learning. The quality of distance education has aroused, becoming more effective and increasing the students' satisfaction with their learning process. The number of open distance institutions has grown thanks to the availability and sophistication of information and communication technology (ICT), showing that prejudices about the low quality of online distance learning are inconsistent.

Although the massive potential and availability of technology, there is no certainty that it can add quality to the students’ learning process. The world of technology is wide; for that reason, it can create difficulties and barriers for learners, such as: being overwhelmed by the amount of information available online if they have not guidance; the impossibility to overcome a psychological difficulty caused by the shift from face-to-face learning to online learning; getting lost during the online course for the inability to use systems, programs or tools. Some studies have demonstrated that the technical problems that students meet, need to be solved immediately or in the shortest possible time, because these problems could undermine the student’s level of motivation or satisfaction, leading him or her to slowly abandon this type of education.

A study carried out by Carswell et al. (2002) showed that once a problem is solved, students consider it as a “fact of life” and they learn how to live with it and later solve it by themselves.

The technical and technological support given to learners by educators is essential to preserve their learning motivation and satisfaction. This support is also related to their learning outcomes and their positive attitude towards the use of technology.

Before starting an online course, educators have to give learners all the information regarding the structure and the delivery of the course: which systems or programs they are going to use; which are the potential problems that the learners can encounter with the related solutions. Moreover, it would be necessary that the instructors provide an e-mail contact or create a forum where students can contact them or their peers or request more information.

To create an efficient online distance education environment, all of these four types of interaction must be present and interconnected, none of the four types of interaction work independently, in this way, all the weaknesses of online learning can be overcome, providing benefits for both students and teachers.

3.2. The role of the teacher in distance education

As distance education grew, the role of the teacher was gradually changing. Teacher needed to adapt to these technological times as soon as possible, especially since they evolve and expand constantly and rapidly. Within this field, the role of the instructor has been crucial.

As we have seen in the previous chapters, for many years, educators had total control of the learning environment and were seen as the only owners of the knowledge: the instructor transmitted the knowledge and the learner acquired it as it was, without questioning. These teaching methods reflected the behaviorist and cognitivist learning theories. When the constructivist learning theory emerged, the ideology changed, in fact, the teacher left the role of “dispenser of knowledge”, becoming a facilitator,

namely he helped and guided the students to build their knowledge giving the proper support and instruments. There is a shift from a teacher-centered perspective to a learner-centered perspective. Following this concept developed within the constructivist learning theory, in a distance learning situation, the teacher plays the same role, the facilitator role. Moore (1973, p. 670) defined the role of the teacher as "the ancillary, supporting, helpers' role, to be used and drawn upon, by the learner, to the extent that the learner desires".

Educators have to build a well-structured and well-design online course in which the student can access all the information and resources effortlessly and rapidly. Moreover, teachers have to provide constant feedback, which is very important for both parts, teacher and student, to monitor the progress of the students and to understand if students have received all the fundamental information properly. Students have more control of their learning experience with distance education.

Even though it seems that the figure of the teacher in distance and online education is just marginal, this is not true, in fact, the instructor has to put so much effort in developing and increasing student motivation and in encouraging them in participating in the lessons. There are also several challenges for them to face, for instance, the Transactional Distance, which is one of the most well-known theory of distance education developed by Moore in 1972. Transactional distance is defined as the separation between the two parts of the learning process, teacher and student, which is not a simple physical separation, but a pedagogical one, in which there is a gap between the communication and the understanding where the information or part of it could be lost. Moore affirmed that this gap to be fulfilled requires special teaching methods, which regard the structure of the course and the dialogue, intended at first as the interaction between teacher and learner, later also extended to interaction among students.

3.3. The role of the student in distance education

In the previous section, it has been observed how the role of the teacher has shifted from a central position to the role of facilitator, who guides and support the student in his or her learning path.

But what about the role of the student? Within the field of distance education, is it possible to talk about a learner-centered approach or a learner-directed approach?

What is certain is that online learning requires different skills from the ones associated with traditional learning: autonomy, responsibility, independence.

By drawing the concept of "independent learning", Moore (1973) had been able to show that the learner developed more autonomy since he or she was physically separated from the teacher, as a consequence of this, the learner had to take control over his or her learning process, developing a higher degree of responsibility. Similarly, Kaufman (1989) reported the "control of the learner" as one of the main characteristics of distance education, identifying it as the learner's ability to make decisions and choices and set goals related to his or her learning experience.

As previously saw, with the constructivist ideology, the figure of the learner became central, he is the architect of his learning path, the same situation occurs in distance education.

The teacher put the needs of the students in the first place, giving them the right advice and support to create an online environment that fits them all. As a consequence of this, the approach used in online distance education is a learner-centered approach but also a learner-directed approach since the studies presented so far indicated that students take control over their learning experience, developing a high degree of responsibility and autonomy; moreover, they become aware of their strengths and weaknesses and increase their motivation. Moore (1973, p. 669) wrote:

"The autonomous learner turns to teachers when he needs help in formulating his problems, gathering information, judging his progress, and so on, surrendering temporarily some of his learner autonomy as he says in effect "help me in my learning

task". However, if he is a truly autonomous learner, he will not give up overall control of the learning process". The autonomous learner is also named self-directed learner by Moore, who stated that distance and autonomy are "twin foundations of independent learning" (Garrison, 2003, p.162).

The notion of self-directed learning reflects the constructivist and the collaborativist theory, students in an online environment are expected to work together to facilitate the generation and understanding of new knowledge since the online environment is well suited for collaborative learning (Garrison, 2003).

This point will be taken into account in the following sections.

To conclude, an online student will succeed in an online environment if he or she is active and totally engaged in his or her learning process.

3.4. Instructional design (ID)

The definition of Instructional Design has always generated confusion, misunderstandings and ambiguities. What is certain is that the ID is a field of study that deals with the identification of the rules involved in the choice of adequate teaching methods.

The development of Instructional Design ran from the mid-1950s to the mid-1960s in the USA. One of the main contributors was Robert Gagnè, who published *The condition of learning (1965)*, founding the existing bases of ID and identifying the central educational and institutional principles that are still effective nowadays.

Gagnè aimed at creating a consistent link between ID and the learning theories; thus, the ID is built following the principles of the learning theory to which it refers.

He said that learners expect to gain certain skills once they have learned; so, in his book, Gagnè identifies five domains of learning outcomes.

1. Intellectual skills: abilities to carry out specific procedures, such as responding to the conceptualization of the environment in which the learners live.
2. Cognitive skills: abilities with which students control their learning process.

3. Verbal information: known as “the knowledge of the world” which is the ability to express and recall concepts previously learned.
4. Attitudes: emotions that influence the action or the choices of the learner.
5. Motor skills: abilities that permit the accomplishment of particular performances with the use of muscles.

In 1956, the learning outcomes were given another boost when Benjamin Samuel Bloom published *The Taxonomy of Education Objectives,* which is considered a point of reference in the educational technologies sphere.

Compared to Gagnè, Bloom identified three domains of learning outcomes:

1. Cognitive: it concerns the thinking skills of the students.
2. Affective: it includes the self-development, emotions and attitudes of learners.
3. Psychomotor: it refers to the physical movement, manual skills and coordination.

The taxonomy of Bloom is represented as a pyramid. Bloom stated that the learning process was sequential and linear, which means that it proceeded through a set of a well-defined stages, from the easiest to the most difficult, they are:

- Knowledge: identification and recall of information acquired through experience to education
- Comprehension: understanding, organization and selection of ideas
- Application: use of rules and principles.
- Analysis: examination of parts of something
- Synthesis: combining ideas or information to form a new one.
- Evaluation: development of the ability to make opinions and judgments.

In 2001, this first formulation of the taxonomy had been questioned and revised by an old student of Bloom, Lorin W. Anderson and David Krathwohl, who was one of the designers of the original taxonomy. They aimed to update the original taxonomy and adequate it to the needs of the teachers in the 21st century. The revision of Bloom’s Taxonomy introduced the following changes:

- Remembering, understanding replaced knowledge and comprehension.
- Synthesis became creating and it switched place with evaluation.
- Verbs replaced nouns: evaluation became evaluating, the application became applying.

In 2007, the first revision had been further challenged by Andrew Churchs, who created a new version of Bloom's Taxonomy, Bloom's Digital Taxonomy. Churchs included a new element in the taxonomy, which is the information and communication technology (ICT). He aimed to give proper preparation to his learners to use the technology as a support in their learning process. He started from the first revision of Bloom's Taxonomy made by Anderson and Krathwohl adding the technology, the information overload, the constant growth and evolution of ICT and cloud computing.

The digital taxonomy of Bloom does not concern the technologies in themselves, but their use, in order to facilitate and improve the learning process, emphasizing the quality of products and processes.

The ID is developed and designed following a specific framework, called the ADDIE model (analyze, design, development, implement and evaluate). The ADDIE model was designed in 1975 for the U.S. Army at Florida State University and then used for military training. In the beginning, each stage had to be completed to start the next one, but later, it had been revised becoming more flexible and dynamic.

The ID is critically important for distance education, moreover it has been demonstrated that it is related to distance education: while in face-to-face teaching situations, the ID could be implicit, sometimes marginal, with distance education the ID has to be explicit and always present (Bourdeau and Bates, 1996). Furthermore, many teachers make the mistake to think that teaching online just requires the same teaching methods, as a consequence of this, they simply take the curriculum used with face-to-face teaching situations and put it in the online course without making any modification. That is not possible, because if a teacher wants to deliver an efficient online course, he or she has to modify both his or her teaching methods and the

material. Palloff and Pratt (2007, p. 130) affirmed that: “when our pedagogy changes, so must the course”.

ID is made of three processes, which are the design, the development and the delivery. With the term design, it is intended the structure, the architecture of the instructional design, where the educators decide which are the adequate components for the course. Teachers have to keep in mind that the provided materials require to be flexible and adaptable to respond to students’ different needs. Another significant aspect is the provision of full access to the resources of the course, constant support, immediate feedback and encouragement in participation.

Developing an instructional design means putting into practice all the ideas proposed in the first stage: educators are expected to prepare and produce a great variety of materials, introducing an online learning environment with detailed information of the course, that help the students in advancing in their learning experience and stimulate them to interact.

The delivery is the part that distinguishes face-to-face learning from distance learning. The course could be delivered in an asynchronous mode, in this case, instructors need to find the best way possible to prevent the student from the isolation; the course could be delivered in a synchronous mode: several studies demonstrated that this mode is the most effective to deliver an online course (Bourdeau and Bates, 1996).

Building an effective instructional design that satisfies students expectations, means also taking into consideration several challenges, such as the type of the audience, the distance, the technology used, the goals of the learner and the cost of the course.

Bourdeau and Bates (1996) outlined a list of principles to solve the problems related to ID that aimed to provide accessibility, keep the motivation high and ensure quality and equality.

Gagnè et al. (1992, p. 4) wrote:

“The purpose of designed instruction is to activate and support the learning of the individual student. This aim is characteristic of instruction wherever it occurs, whether

between a tutor and a single student, in a school classroom, in an adult interest group, or in an on-the-job setting. Instruction for the support of learning must be something that is planned rather than haphazard".

3.5. The assessment

The assessment is a vital ingredient in the learning process. Over the years, this term had always been used interchangeably with the term evaluation, but they have different meanings: assessment means to identify and judge the progress and the outcome of the students, assigning grades during a course or at the end of it; the evaluation is an instrument to investigate the satisfaction of students about their teachers' performance, the tools that they use, or generally speaking, about the entire course they are attending.

Recently, the traditional assessment has changed to face the new challenges of contemporary society. One of them is online and distance education.

The assessment is a powerful tool in learning and teaching for both students and teachers. It makes students aware of how their learning experience is going on and which are their strengths and weaknesses; while through it, teachers can observe if their teaching methods are effective.

There are two types of assessment: the formative assessment that occurs at any point of the course, as a monitoring instrument to make adjustments where they are needed; the summative assessment occurs when the course is completed. The formative assessment, as well as the summative assessment, are highly required even in distance education. The formative assessment can prevent students from dragging out difficulties previously met.

It has been demonstrated by the study of Black and Wiliam (1998) that the use of assessment improved the learners' achievement, encourage them to advance in the course and increase motivation, in a few words, the assessment becomes a driver in the learning process. This view is supported by Bates (2015, p. 466), he wrote:

“Probably nothing drives the behavior of students more than how they will be assessed. Not all students are instrumental in their learning, but given the competing pressures on students’ time in a digital age, most ‘successful’ learners focus on what will be examined and how they can most effectively (which means for students in as little time as possible) meet the assessment requirements”.

One of the problems that concern the teachers has to do with the dishonesty of some students. Teachers believe that students are inclined to cheat in online tasks, as a consequence of this, educators adopted several measures to control and surveil students, making a test stressful and putting more pressure on students.

The solution to this problem is delivering a well-constructed, well-designed, learner-centered course that increases the learner motivation, self-confidence and self-reliance and with the possibility to ask for information and interact with the teacher and with other students without limits. Palloff and Pratt (2007) supported this view, adding a great variety of assignments that promote students’ critical thinking and collaboration, will help avoid cheating.

As the collaborativist learning theory spread, students started and learnt to use peer-assessment and self-assessment. These two types of assessment will lead the learner to achieve a higher degree of autonomy and responsibility. In their study, Black and Wiliam (1998) found out the majority of the students that worked with the peer- and self-assessment admitted that they were likely to think more and learn more.

So, it is possible to say that assessment is an essential tool that has to be integrated into the learning process and has to be used by well-skilled instructors that understand its potential and functions to help the learner to develop, through it, the motivation and the necessary skills to advance, to be productive and engaged in the course (Earl, 2010).

3.6. The Online Collaborative Learning

It is a shared thought that learning is a social activity. This view had been first introduced by Vygotsky with his theory of social constructivism. The constructivist learning theory changed the learning approach: with the behaviorist and cognitivist learning theory there was a teacher-centered approach; with constructivist learning theory, the focus was on the students and their ability to construct knowledge of the world through experience and interactions with other people.

With the rapid growth of technologies, the traditional teaching methods needed to be modified, hence in 2004, Siemens proposed a new theory, the connectivist learning theory, that recognize the presence of technology in the educational field. According to Siemens (2004), the learning process is not an individual activity but is about individuals that interact with others and technology creating new knowledge. From this perspectives, it is possible to affirm that online distance learning consists of collaboration and cooperation among students. About that, Garrison (2003) holds the view that the online environment is well-suited for collaborative learning.

The connectivist learning theory had been challenged by several scholars since it didn't meet the proper parameters to be a theory. The recognition of the potential of technology and computer-mediated communication in collaborative learning led to the introduction of a new learning theory, namely the collaborativist learning theory. We have already seen in the previous chapter, how the collaborativist learning theory has taken hold in the last years and how the first attempts of collaborative learning (at those times called peer-review method), with Professor Jardin at the University of Glasgow resulted in success (Gaillet, 1994). Collaborative learning has increased more and more when technology has become commonplace in the education field.

The online environment can be a lonely place, some researchers demonstrated that students feel isolated with distance education, the collaborative learning can overcome this problem. By learning together, learners can deepen their learning experience, gain experience in collaboration, sharing ideas, develop skills of critical thinking, self-

reflection and problem-solving. Furthermore, they will be able to cooperate and collaborate to construct and understanding new knowledge (Harasim, 2017; Jonassen et al., 1995; Brindley et al., 2009; Pratt and Palloff, 2007).

The collaboration aims to promote interdependence among the members of the learning group and a full engagement in the online course. An effective collaborative learning environment can be created through a set of factors all interrelated with each other. These factors are the ones mentioned before, namely interaction, instructional design, and assessment.

Firstly, for what concerns the interaction, it is important that a well-skilled instructor ensures the active participation of the learners and encourages them to dialogue, to share opinions, ideas, problems and solutions, to debate and consequently to develop critical thinking and responsibility. Discussion is very important among students, the instructor has to facilitate it without dominating it, leading to the creation of a strong collaboration. With this regard, Brookfield and Preskill (2012, p. 33) wrote:

"If the conditions for democratic, critical discussion are carefully created and respected, students can end up learning collaborative habits. They learn to listen respectfully and attentively to each person's contributions to the group. Through valuing devil's advocacy and critical analysis, they learn to reduce the tendency toward groupthink whereby certain ideas come to be regarded as off-limits, sacred, unchallengeable. They learn to create spaces in which everyone's efforts are recognized. They learn that being a productive group member is not the same as directing everybody else or speaking all the time. They learn to value silence and reflective speculation Learning to do these things is crucial if students are to work well in collaboration".

Interaction is a key-factor in the development of collaborative learning.

Secondly, as previously saw, a well-structured instructional design will provide a more effective online course, providing the proper support for learners and creating an online environment that suits all the learners learning needs.

First of all, to create collaboration among students, it is important to introduce the course, giving all the information about the requirements to participate. Moreover, what is required is the transparency of expectations, clear instructions, creation of shared goals, assignment of appropriate tasks, setting the learning objectives.

It is a shared thought that the context of collaborative learning and also the assigned tasks need to be very close to the reality of the learners. Palloff and Pratt (2007) pointed out that proposing to students real-life examples about a situation that they have in common outside the classroom, is a good way to lead them to work together.

Another significant aspect is that the guidance of the instructors is essential in creating this environment that promotes collaboration, cooperation that will lead the learners to construct knowledge. A well planned instructional design improve the collaborative learning experience, bringing many benefits to the learners, such as build their confidence and their skills, become aware of the strengths and weaknesses and develop a sense of duty towards learners in need.

Finally, it is important to recognize the power of the assessment as an encouragement for students to keep going on with the workgroup or the course. Traditional assessment techniques need to be rethought to be used in collaborative groups, in fact, it has to take into consideration that collaborative learning is not just a group activity, but also an individual one. Hence, to promote and improve collaborative learning, making it effective, the instructor has to assess both individual activity and group activity (Johnson, Johnson and Smith, 1998; Swan et al. 2006).

In the previous section, we saw the importance of the peer-assessment, which has to be integrated into workgroups and students are expected to provide constructive and meaningful feedback to the other members of the group. Feedback is a part of the assessment, which inform the student about his or her performance, it can be seen as a suggestion or a constructive critic that leads to and improves the student self-confidence and self-awareness. Despite this, the little use of feedback among students could lead to conflicts since learners could take it personally; the instructor has to

mediate these conflicts, explaining the real function of the feedback (Palloff and Pratt, 2007).

The peer-assessment and the feedback from student to student deepen the connection among the members of the group and allow them to see their ideas also in other respects, going beyond their initial ideas and embracing the ones of their peers.

In this chapter, the challenges and the perspectives of online distance education have been outlined taken into consideration the theoretical part of them.

In the next chapter, these challenges and perspectives, previously mentioned, have been put in a questionnaire and given to students and teachers of an Italian high school. They have experimented remote learning during a pandemic. The questionnaires will be analyzed also the economic aspect of remote learning and the psychological impact on students.

Concerning the economic aspect, there are differing opinions regarding the fact that online distance education amplifies disparities among students, especially the financial ones. Bates (2005) said that with distance education people can finally complete their studies even if they have family or work responsibilities, or limited economic resources, ensuring social equity and open access. On the other hand, some researches focussed on the fact that not everybody can have a stable connection or a personal computer; maybe they have to share the PC with the other members of the family or, they do not own one at all (Harasim et al., 1995; Sarsini, 2020).

The psychological impact is a significant aspect to focus on since Italian high school students are not used to remote learning. With the sudden changing of teaching and learning methods, learners have experienced negative feelings, such as loneliness since the developmental age in which they are, lead them to emotional and cognitive fragility (Mancaniello, 2020).

As said before, Italian high schools are very backlogged with the use of ICT in education. Hence, this situation has caught them all off guard, because they were not

used to and ready for remote learning. We will see students' and teachers' opinions and how this experience has gone and if the integration of ICT in education can renew the high schools in Italy.

Chapter IV: The investigation

4.1. Objectives, Research Questions and Hypothesis

In the previous chapters, we have seen the historical background of distance education, how technology has led to many significant changes in this area of education, how the learning theories have influenced the use of technology and which are the most important aspects and features to deliver an efficient web-based distance education course.

A considerable amount of literature has been published on distance education. These studies mainly concerned with which are the origins of distance education and how it evolved (Garrison, D. 1985; Keegan, D. 1996; Trentin, G. 2001; Anderson, T. & Dron, J. 2001); which are the advantages and disadvantages of distance education and the salient points of a distance education course (Bates, 2005; Moore, 2003; Garrison, 2011; Bates, 2015), the degree of students' satisfaction with this type of education (Picciano, 2002; Kemp and Grieve, 2014); and finally, which are the effective strategies to carry on a virtual course (Trentin and Olimpo, 1993; Palloff and Pratt, 2007).

Although so many researches have been carried out on distance education, no studies have been found which focus on the possibility to use online distance education, not only with the function of "online distance lesson", but with the function of supporting students in their learning experience and in this way, remodel or renew the Italian school systems.

In the last year, all the schools have been closed and only the remote learning (*Didattica a Distanza* in Italian) assured the institutions to carry on with the education in total safety: teachers delivered their lesson in real-time, using video-conference platforms, such as Zoom or Google Meet. Since distance education and remote learning are used only in the higher grades of education, namely universities, while the lower grades, such as high, middle and elementary schools experienced a new

form of education. Covid-19 marked a turning point, educators and teachers finally became aware of the new technological tools and Italian school is not going to be the same anymore (Roncaglia, 2020).

The major objectives of this investigation have been:

1. To investigate how remote learning had been carried out in an Italian high school, during the pandemic of Covid-19.
2. To investigate the introduction of remote learning in the ordinary frontal lessons as a tool of support for students and not only a replacement of frontal lessons, bringing innovation to the Italian school system.

In particular, this dissertation will address the following research questions.

I. RQ1: What challenges did students and teachers face?
II. RQ2: How should remote learning change to be more effective?
III. RQ3: Could remote learning and traditional frontal learning coexist?

While the hypothesis of research that will be tested is to determine the positive attitudes of students and teachers towards the integration of remote learning in traditional learning as a tool of support for students, with the aim of increasing their motivation, autonomy and encourage them to take over control on their learning process since they have "discovered" new devices.

4.2. Participants

In this research, the participants were students and teachers of an Italian high school in Monselice (PD) in the region of Veneto (Northeast of Italy). The sample was made of 207 students (70% females and 30% males) and 37 teachers (81,1% females and 18,9% males) of the same high school, which has different schooling curricula (*Liceo Scientifico, Liceo delle Scienze applicate and Liceo delle Scienze umane*). The students are between the ages of 13 and 21, while teachers are between the ages of 28 and 65.

Teachers and students experienced a situation of total remote learning due to a health emergency caused by COVID-19, which led to a total closure of schools in all the country.

4.3. Research materials

The research has been carried out basing on students' and teachers' responses to the questionnaires, which was the instrument used for collecting the data. The questionnaires have been built on Google forms and they largely consisted of closed-ended items, such as yes/no questions, multiple choices, Likert scales and numerical rating scales, making the questionnaires easy and quick to fill out. The open-ended questions are mostly present in the questionnaires of the teachers since they are more willing to answer open-ended questions. In both questionnaires, some questions allow students and teachers to add a personalized point of view "other…" (*Altro*...) if they don't fit themselves with the ones proposed.

The questionnaires have been organized into four sections.

After collecting the general information of the individuals, such as age, gender, grades and years of teaching (for teachers' questionnaire), the first section "*Esperienza della didattica a distanza"* addressed the experiences of teachers and students with remote learning during the pandemic. The first section of the questionnaire has been specifically designed for the purpose and it was not based on pre-existing questionnaires except for two questions: the first one was about the technical support provided by teachers to students, which is based on an article written by Cantoni and Esposito in 2004; while the second one, which concerns the change of teaching method for teachers was based on the articles written by Bouhnik and Tali (2006) and Mercado (2008).

The second section "*Risorse Digitali*" aimed at understanding whether remote learning increased families' expenses for school, for both parts, students and teachers. It also investigated if students and teachers had the skills to face the remote learning

situation. All the questions of this part were derived from previous studies of Tsatsou and Panayota (2011), Deursen and Helsper (2015) and Mercado (2008).

The third section of the questionnaire "*Impatto Psicologico"* aimed at exploring which are the opinions and the reactions of students and teachers in this situation of remote learning and how the interaction between student and teachers and among students have changed. Also, this part of the questionnaire was based on previous studies: Bray, et al. (2008), Pozgaj, et al. (2007), Kaye (1992), Bouhnik and Tali (2006), Swan (2001) and Moore (1989).

The fourth section of the questionnaire "*Didattica a Distanza come strumento di supporto"* concerned the hypothesis of the research and which are the views of students and teachers about it, namely using remote learning as a tool of support to accompany the traditional frontal learning, bringing innovation to the schools and students' learning experience.

This last part of the questionnaire has been specifically designed for the purpose and it is not based on previous studies since the resources on this topic are very scarce.

The questionnaires have been drawn up in Italian and they were anonymous. This instrument has been chosen because it was very versatile and it allows the gathering of a large amount of information in a short time, even at distance; in addition, it is very easy and quick to fill out for the respondents since "*un questionario lungo viene cestinato"* (Balboni, 2003). The questionnaires will be found in the Appendix.

4.4. Methodology

This dissertation can be defined as exploratory research on a recent phenomenon, namely the remote learning during the pandemic of COVID-19. Since this phenomenon is recent and new, this research can be considered a preliminary step towards remote learning in Italy. Thanks to the literature, this study clarifies some concepts, explains and analyses what has happened, what were problems, what has changed, and it gathers opinions and ideas of the participants through a questionnaire

built on Google forms and then, the link was shared in the official web site of the high school. The investigation was conducted in January of the academic year 2020/2021. The participants were students and teachers of the same high school who spontaneously and anonymously filled out the questionnaires. This procedure reached a consistent number of responses in a short time, moreover, in this way, also students' parents could check the questionnaire. The online format has facilitated the analysis of the data.

The respondents had to answer a set of questions concerning their experience with remote learning, their opinions about it, their reactions to it, and finally they had to answer to a set of questions, regarding the research hypothesis, expressing their ideas about the use of remote learning as a tool of support in their learning and teaching experience. The data collected have been arranged in tables and charts for a better understanding. For the analysis of students' and teachers' open-ended responses, it has been read through students' and teachers' responses to find repeated patterns or features that can be grouped.

4.5. Results - Students' responses

This paragraph deals with the analysis of the data collected by the questionnaires filled out by students.

4.5.1. First section - Remote learning experience

The first section of the questionnaire has been composed of three informative items which identify the general information of the individuals who took part in the survey, such as age, gender and school grade. The sample was made up of 207 students. The following questions are general question on the experience with the remote learning.

To the question "*in questo periodo di emergenza sanitaria stai seguendo le lezioni online*?", 99,5% of students answered yes. The table below (Fig.1) represents the next

questions concerned which modality they have used in remote learning (asynchronous, synchronous or both), and which one they preferred.

Fig.1: Modalities of remote learning

	Modality used	Favorite modality
Synchronous	87%	80,2%
Asynchronous	12,6%	19,8%
Both	0,5%	-

Later, it has been asked to students to explain with a open-ended question why they preferred the synchronous or the asynchronous modality. There have been 194 answer to this question, 13 students didn't express their opinion. 155 students preferred the synchronous

modality and the reasons have been grouped in five categories. 39 students preferred the asynchronous modality and the reasons of their choice have been grouped in three categories. The data and the categories are presented in the table below (Fig. 2).

Fig. 2: Students' opinions on remote learning modality

	Synchronous	Asynchronous
More interaction	48,4%	-
Immediate doubts explanation	23,2%	-
Encourage the participation	16,1%	
The only modality used	9,7%	-
It makes no difference	2,6%	-
Less distraction	-	5,1%
Possibility to rewatch the lessons	-	61,5%
Better managing of the learning	-	33,3%

The following question aimed at understanding whether the study load has increased with remote learning: 61,4% commented that the study load was above average.

For what concerns the technological support provided by teachers to students, the majority of the respondents (45,4%) indicated that teachers facilitated the participation to the online lesson using only one platform. What is interesting is that students said that there was a little technological support provided by teachers (36,7%) and that were students themselves who provided technological support to teachers (43%).

An important aspect that has been addressed concerned the tests and the assessment since many students have complained about the fact that teachers were more strict during tests because they believed that that remote learning allowed students to cheat on tests, as we seen also in Chapter 3 with Palloff and Pratt (2007). It has been asked to participants if they were having tests during the remote learning and if they took these online tests (written or oral) as seriously as classrooms tests. So, 96,1% were having online tests and about that 80,2% of students said that these tests were equally important for as classroom test, while 19,8% of students claimed they took them more lightly. Nevertheless, when the participants were asked to express their opinions about the notes of tests, the majority commented that they considered them in the same way. The last question of this section investigated the grade of satisfaction of students with remote learning, the results are shown in the chart below (Fig. 3).

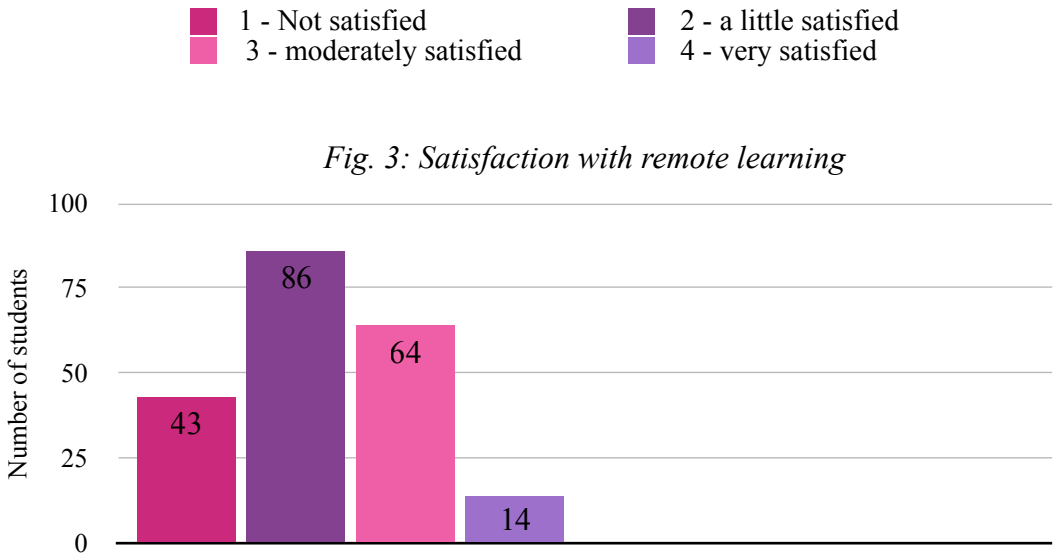


Fig. 3: Satisfaction with remote learning

Taken together, these results suggested that the experience of remote learning occurred mostly in the synchronous modality, which is also the students' favorite modality, even though a significant number of students would like to have recorded lessons to rewatch them if they needed it. The online tests and the related notes still had the same importance for students. Although, as we can see from the chart above, the majority of the learners was unsatisfied with the remote learning experience.

4.5.2. Second section - Technological resources

The second section of the questionnaire concerned the financial aspect of the remote learning, namely this section aimed to investigate if remote learning have increased the families' expenses for school and if the students had the right skills to face this new and unexpected situation.

The data showed that 35,7% of the learners had to buy a new device to follow the online lessons, while 64,3% did not have to buy a new device or couldn't have the economic resources to buy it. About this fact, in this section it has also been taken into account the aspect of sharing the device among the members of the family and if this sharing affected the participation to the lessons. The results demonstrated that almost 30% of students had to share the device with the other members of the family and 13% of this 30% had problems in following the lessons due to this sharing. The data are gathered in the table below (Fig. 4).

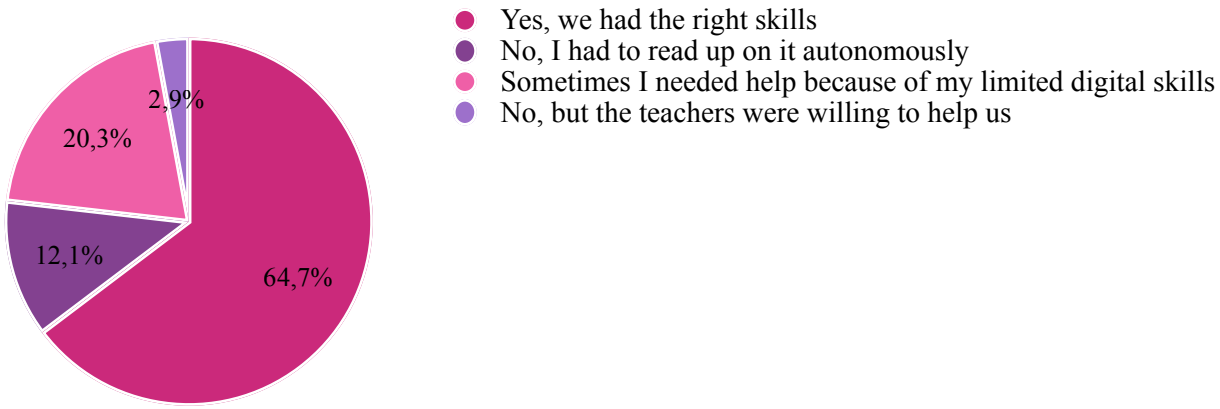
Fig. 4: Sharing of the device

	Yes	No
Sharing the device with family members	29%	71%
The sharing affected the participation to the lessons	13%	87%

The next part of this section gathered information about the skills of the students in facing the remote learning situation. It has been asked to learners if they had the

necessary skills to follow the lessons or if they met some difficulties before getting used to this new modality of learning. The data are presented in Figure 5.

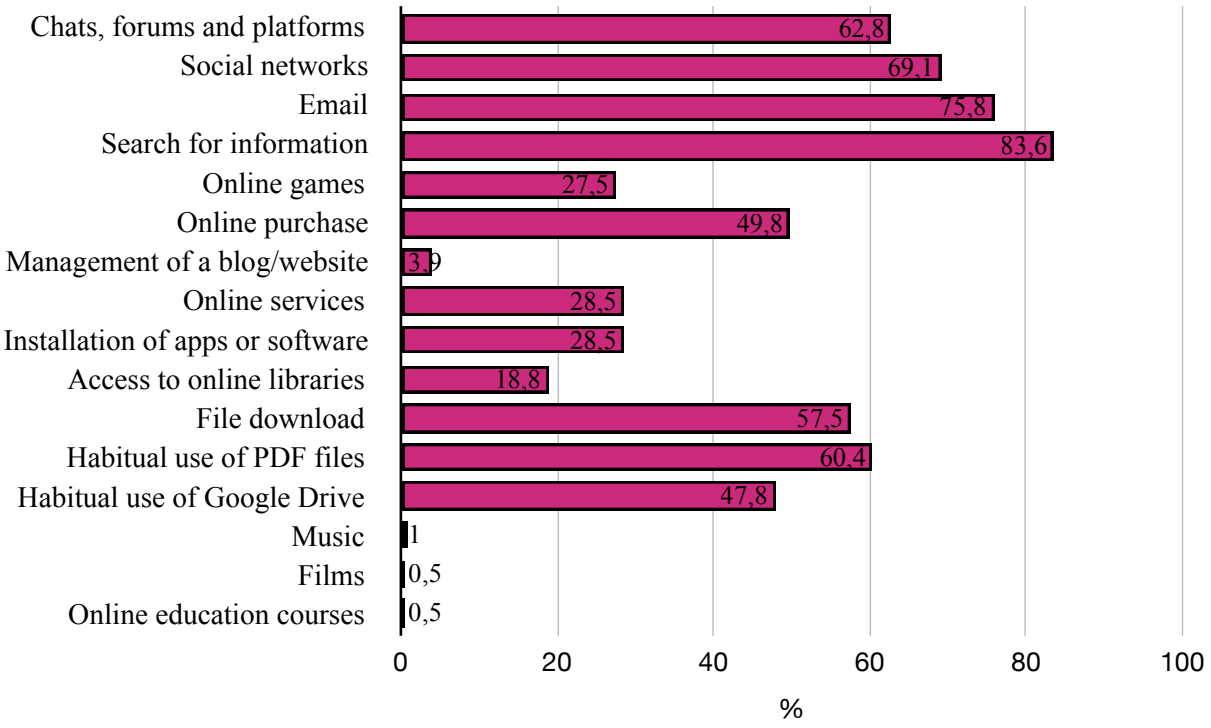
Fig. 5: Students' digital skills



The last result "No, but the teachers were willing to help us" for 2,9% is significant and is correlated with the data in the first section about the fact that were students whom provided technological support to teachers.

The next question concerned the activities that participants usually do online. The results showed that students do many things on internet, the most selected activity is "Search for information" (83,6%), followed by the "use of Email" (75,8%), "Social networks" (69,1%) and finally the use of "Chats, forums and platforms" (62,8%). The chart below shows in detail the students' online activities.

Fig. 6: Students' online activities



The results in this section suggest that remote learning did not increase so much families' expenses for school, but there were several individuals who shared the device with the other member of the family and this affected their participation to lessons. All students should have equal access to education without these kind of problems. Concerning students' skills the chart in Figure 6 demonstrates that students are used to carry out many activities on the Internet. So, there is a positive correlation between the fact that students have had few problems in changing the learning modality from traditional learning to online learning and the regular activities that they do on the Internet. "The experience and the breadth of use" (Helsper and Eynon, 2010) that students have with online tools leads them to understand quickly how they have to move on the online environment.

4.5.3. Third section - Psychological impact

The third section of the questionnaire regarded the psychological impact that the remote learning had on students taking into account students' feelings during this situation and analyzing how the three types of interaction proposed by Moore (1989) have changed and how. The last question aimed at understanding what students think about the collaborative learning, laying the foundation for the next section which concerns the hypothesis of research which is mostly based on the collaborative learning strategy.

It has been asked to students to express their opinions and feelings about remote learning modality. All the data have been gathered in the table below (Fig. 7) for a better understanding.

Fig. 7: Students' opinions and feelings

	A lot	Quite a lot	Not much	Not at all
I feel more motivated	4,8%	30,4%	33,3%	31,4%
I feel more independent and autonomous	23,7%	45,4%	25,1%	5,8%
I am more engaged in lessons	8,7%	35,7%	37,2%	18,4%
I am more distracted	34,3%	41,1%	20,3%	4,3%
My digital skills have improved	32,9%	32,9%	25,6%	8,6%
I feel like I am learning less	19,9%	40,1%	27,5%	12,5%
I am lazier	25,6%	32,9%	28%	13,5%
I like following lessons at home	26,6%	33,8%	22,7%	16,9%
I feel lonely	32,4%	23,7%	22,2%	21,7%
It's exhausting using the computer for hours	56%	25,6%	12,1%	6,3%

From the table in Fig. 7, we can see that the motivation of students did not increase so much, moreover, they felt more distracted, lazier and had the feeling of learning less with this modality. All of this could be a consequence of the fact that they followed

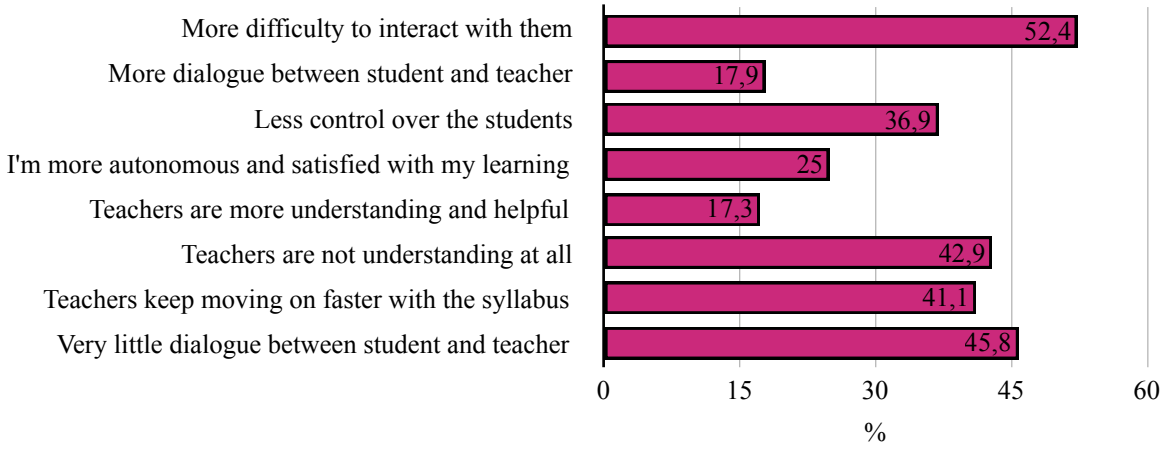
online lessons for five/six hours a day continually, in fact 56% of students said that "It's exhausting using the computer for hours". Nevertheless, the results showed that the respondents felt more independent and autonomous and that their digital skills have improved using remote learning. Another problem that appears from the table is the loneliness that students felt.

Since learners have experienced both traditional frontal learning and remote learning, they were asked whether and how they would use remote learning. The majority of them (48,8%) suggested to use remote learning as a tool of support, 29% suggested to not use remote learning at all, while 22,2% suggested to use only remote learning. This last data could be correlated with the fact that they expressed a preference to follow lessons at home, as we seen in the table above.

The next topic that has been addressed in this section is the interaction: interaction between student and teacher, among students and with the content. It has been asked to students if they have noticed some changes in interaction with Yes/No items, after, they had to express their ideas about how interaction has changed through a multiple-choice item, to which has been added the option "other…", so they could give a personalized response.

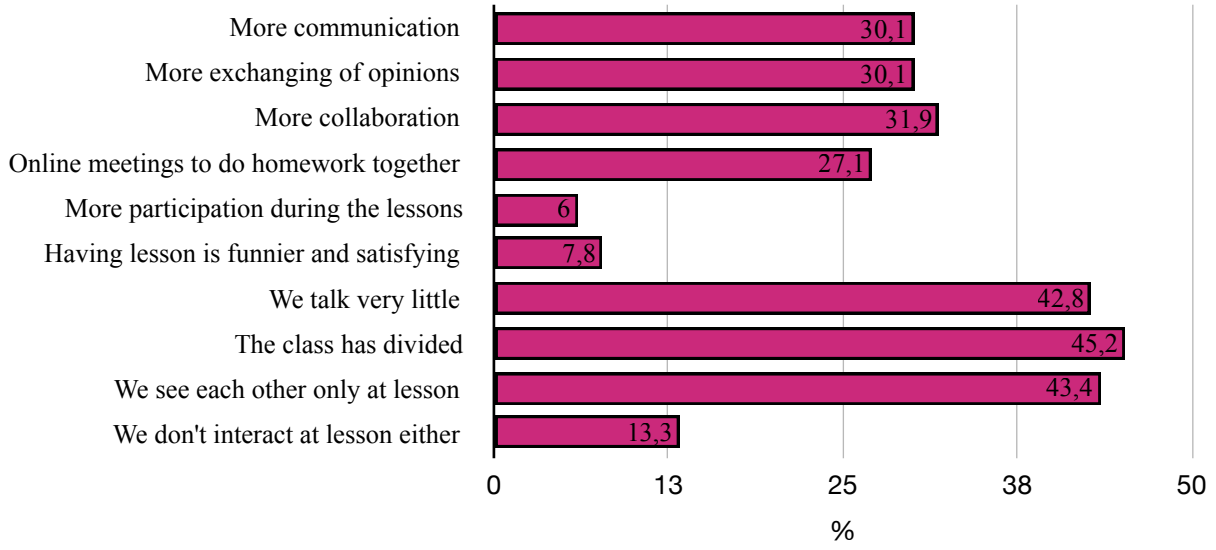
Concerning the interaction with the teacher, almost the 80% of those who responded, noticed that the relationship with the teachers has changed. The chart below (Fig. 8) shows the reasons related to that.

Fig. 8: Reasons why the interaction with teacher has changed



In the option “other…”, the participants express their personalized responses, which can be summarized with less attention of teacher on students’ problems, little faith on students during tests and as a consequence of this, there are considerable time constraints for doing test. Finally, there was an increase of study load and homework.
With respect to interaction among students, the data are very similar to the ones of interaction between students and teachers. 75,8% confirmed that the relationships among students has changed either. The chart below (Fig.9) shows why.

Fig. 9: Reasons why the interaction among students has changed

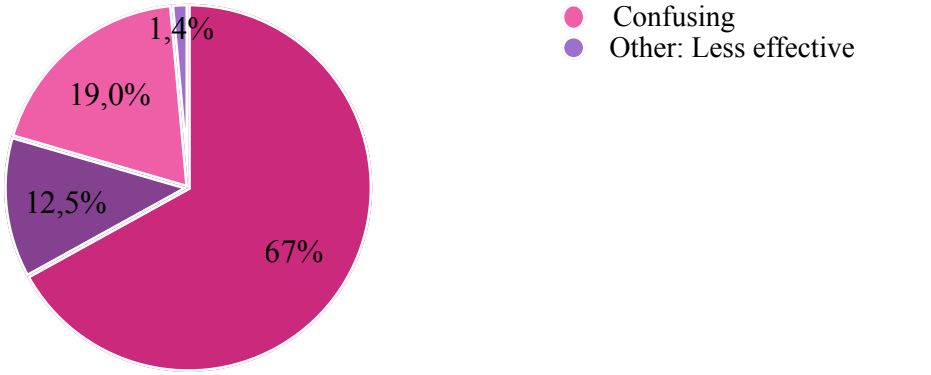


Although the chart shows some positive data, like the increase of communication, collaboration and exchanging of opinions, it is evident that the loneliness that students experienced, as we saw before, is caused by the less interaction they have with their peers. This little interaction is seen also in the personalized responses given in the option “other…”, almost all students said that the group class has divided and as a consequence of this they have lost contact with the some peers, while with other they still have a bond. To sum up, they complained about the fact that they did not have the possibility to widen their relationships inside the classroom.

The data which regards the interaction with the content confirmed the data about the increase of the workload, indeed over a half of students (52,2%) said that they have spent more time on online lesson and the related activities and homework.

The last question, as mentioned above, concerns the thoughts of students about the collaborative learning strategy. Also in this question students could express their personalized response through the option "other…". The responses have been gathered in the chart below (Fig. 10).

Fig. 10: Opinions on collaborative learning



So, the results show that the majority of students have had a positive reaction to the use of collaborative leaning. That is a good start for the development of the hypothesis that will be analyzed later in the next section. I think that the other reactions are due to the fact that no one of these students have experimented the collaborative learning, so they just see it as a sort of a game and they underestimated its power.

To conclude, in this section we have seen that the remote learning has had a huge impact on students: on one hand, it has had a positive impact on independence, autonomy and collaboration and it has been seen as a new tool for supporting them during their learning experience; on the other hand it has had a negative impact on motivation and interactions/relationships.

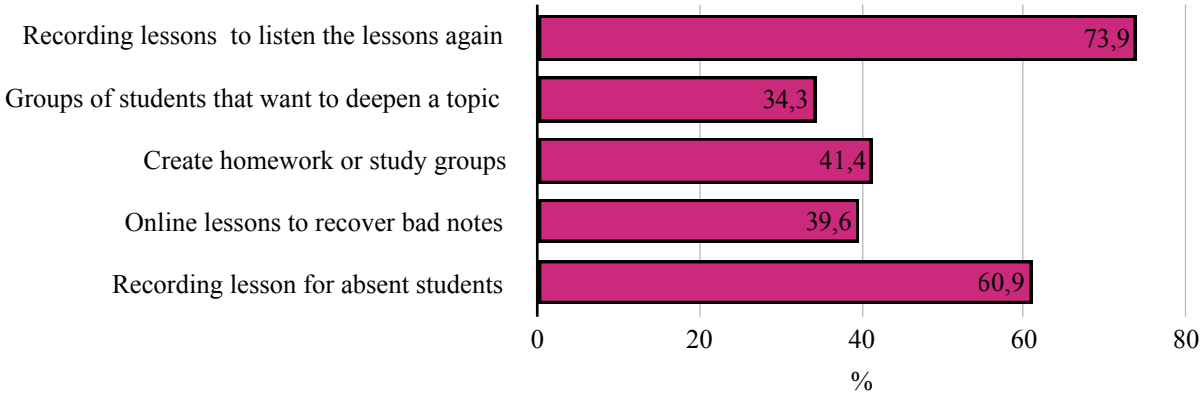
4.5.4. Fourth section - Remote learning as a tool of support

The fourth section of the questionnaire deals with the hypothesis of research, namely it investigates students' attitudes towards the introduction of remote learning as a tool of support. With the concept of remote learning as a tool of support has been intended:

- Recording the lessons, so the students can listen to them again as a review, or comprehend something that was not so clear during the lesson, moreover, this strategy could be helpful also for absent students.
- Create groups of students who study and do their homework together after school, if they have not the possibility to move autonomously.
- Create groups of students that want to deepen or clarify a topic with the teacher after school.
- Use remote learning lessons for the recovery of bad notes: this will reduce the tiredness to remain at school beyond the regular time and schedule the lesson at a time that is good for everyone.

In the first question, respondents were asked to express their views on these approaches with the remote learning. The chart below (Fig. 11) will show the results:

Fig. 11: Students' opinions on remote learning approaches



From the chart, it is evinced that the participants has been more interested in the approach of recording lessons to listen or watch them again if something has not been

understood in classroom and in recording lessons for students who were absent from school. The respondents showed positive attitudes towards creating groups to deepen or clarify a topic with the teacher, to do homework and study together through remote learning and also to organize online lessons after school for the recovery of bad notes. The majority of respondents (87,4%) expressed the belief that with these approaches they would be more independent and autonomous in their learning process, and 74,4% would try to integrate these approaches in their learning process, because they think that it would be very useful. Only small numbers of individuals indicated that they will use these options temporarily (14,5%), or occasionally when they need it because they would require more time than usual (11,1%).

The next question concerns views of participants about the creation of groups to deepen or clarify a topic with the teachers through remote learning. Over half of them thought that this could be a good way to confront, to listen to the doubts of the other peers and find a solution together under the guide of the teacher. The pie chart in Figure 12 shows the results.

Fig. 12: Creating groups to deepen or clarify a topic with the teacher

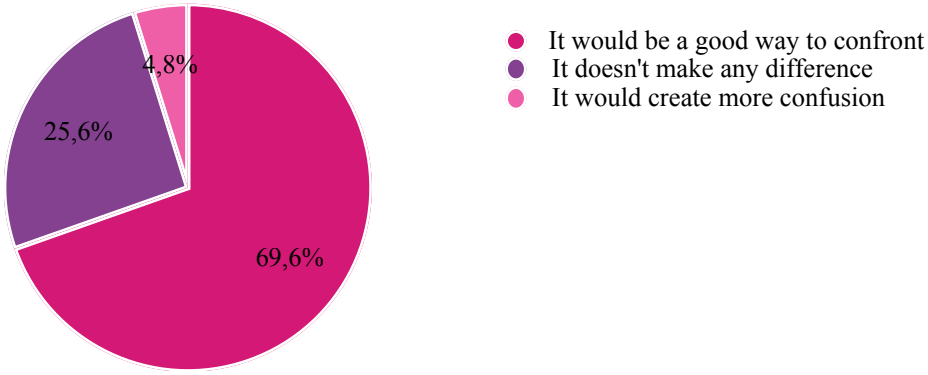
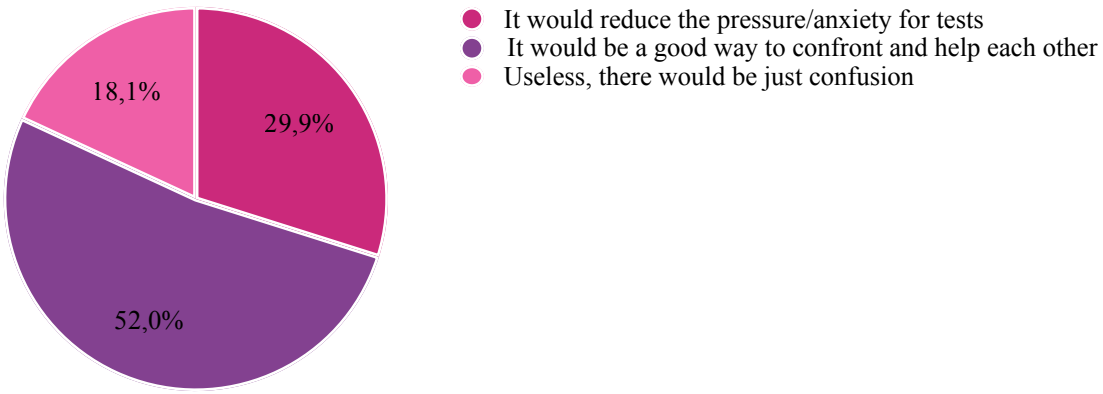


Fig. 13: Creating homework and study groups



According to the pie chart above (Fig. 13), we can see that students were in favor of creating homework and study group (where possible) . Indeed they though that it would be a good way to confront and help each other.

Finally, the respondents showed a preference (60,9%) for doing online lesson at home to recover bad notes, in order to reduce the tiredness of staying at school after the regular schedule.

The last question aimed at understanding if students agree with the sentence "education takes place at school". This sentence have been used as slogan in many public events and protests against the closure of the schools during the pandemic. Data are almost equivalent: 50,2% agree with this sentence, while 49,8% disagree with it.

4.6. Results - Teachers' responses

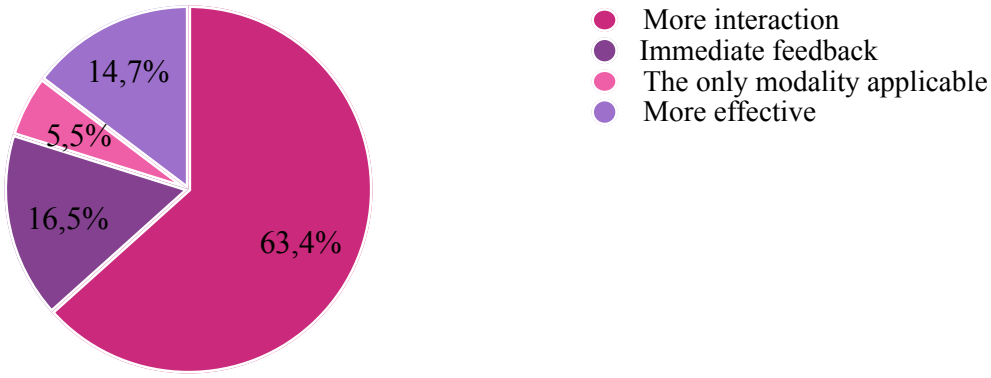
In this paragraph, the data concerned the teachers responses to the questionnaire have been collected.

4.6.1. First section - Remote learning experience

The first section of the questionnaire has been composed of three informative items which identify the general information of the individuals who took part in the survey, such as age, gender and years of teaching. The sample was made up of 37 teachers. The average age of the teachers is 45 years and the years of teaching go from 1 to 40. The following questions are general question on the experience with the remote learning.

100% of the teachers have used remote learning to continue with lessons, 97,3% of them prefer the synchronous modality to have lessons and only 2,7% prefer the asynchronous modality. Consequently, it has been asked to the teachers to express the reason why they prefer the synchronous modality through an open-ended question. The responses have been read and grouped into categories. The data are shown in the pie chart below (Fig. 14).

Fig. 14: Teachers' opinions on remote learning modality

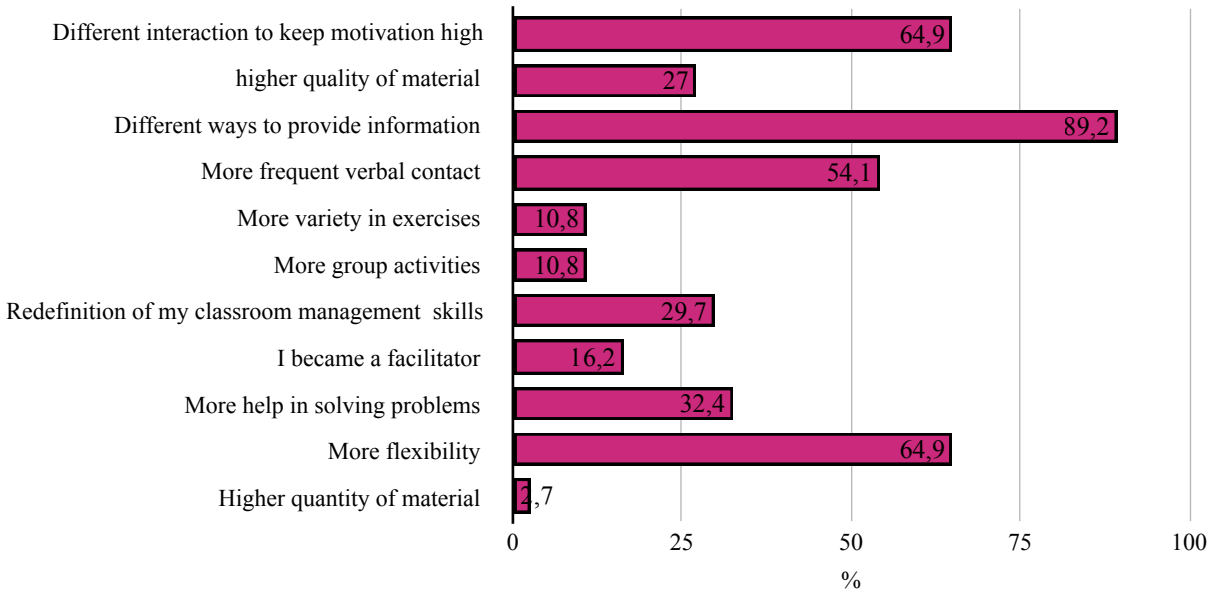


The next question deals with increase of the workload, teachers (86,1%), as well as students, have confirmed that the workload has increased with the remote learning.

Concerning the technological support provided by teachers to students, the sample indicated that facilitated the participation to the lessons of the students using only one platform (81,1%), posting alerts and homework in the same platform (67,6%) and giving detailed instruction for the use of new media (43,2%). A minority of participants indicated that they organized practice sessions before the use of a new media (16,2%) and tried to facilitate the communication between student and teachers (27%).

It has been asked to teachers if they had to change their teaching style and strategy with remote learning. Just a small number (2,7%) of those interviewed said "no". Basically, teachers had change their teaching methods and the chart below (Fig. 15) shows how.

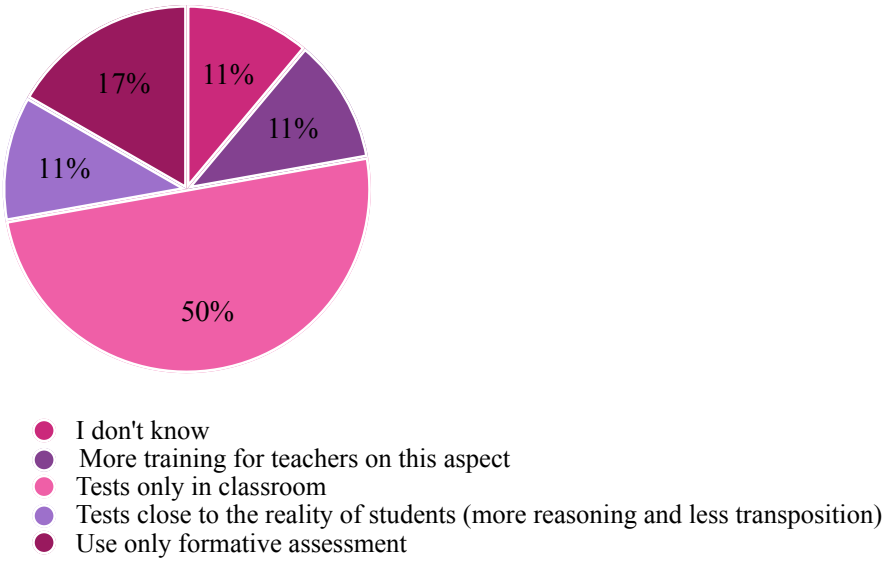
Fig. 15: How teachers have changed their teaching methods



The questionnaire has addressed the problem of test and assessment, in fact we saw that teachers believed that students are more set up at cheating on tests with remote learning (Palloff and Pratt, 2007). The majority of respondents (97,3%) said that they

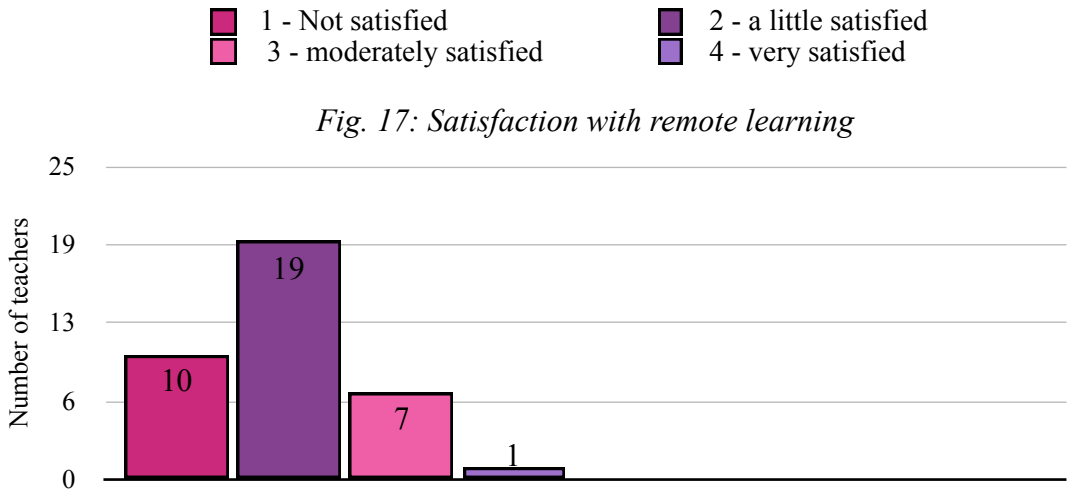
were still having tests, both written and oral tests. Nevertheless, from the data collected on the assessment, almost two-thirds of the participants (64,9%) responded that the assessment has lost its value. As a consequence of that, it has been asked to them with an open-ended question what they would suggest to improve this aspect. The chart below (Fig. 16) demonstrates all the data.

Fig. 16: Suggestions to improve assessment with remote learning



The last question of the questionnaire concerned the teachers' satisfaction with remote learning. The results are shown in the chart below (Fig. 17).

Fig. 17: Satisfaction with remote learning



In summary, these results showed that teachers preferred the synchronous modality to have lessons since it allowed more interaction. The tests and the assessment are weaknesses in remote learning: teachers continued to have tests (written and oral), but with the belief that students were more inclined to cheat on them and consequently the assessment lost its value. According to the chart above (Fig. 16) , we can see that the suggestions given by the teachers to improve the assessment aspect are very scarce, they saw “tests only in classroom” as the only solution. Mostly, teachers were little satisfied with remote leaning.

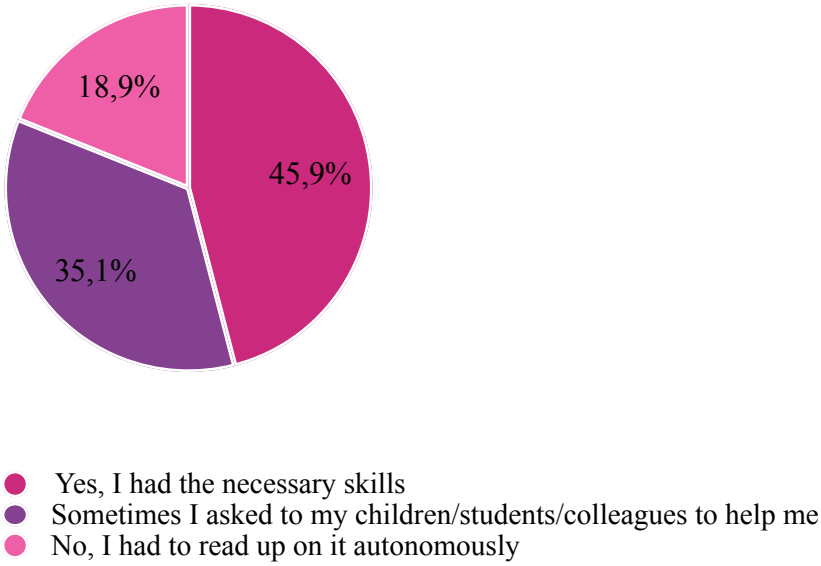
4.6.2. Second section - Technological resources

The second section deals with the financial aspect of the remote leaning and investigates whether teachers had the right skill to face the remote learning.

It has been asked to teachers, as well as students, if they had to buy a new technological devices to lecture. The results show that the almost a half of respondents (43,2%) bought a new device, while 56,8% of them did not need a new device or could not have the economic resources to buy it. Also from this questionnaire emerged that a minority of participants (13,5%) had to share the device with the other members of the family. For 25% of those who shared the device, there were problems in teaching a class caused by the sharing.

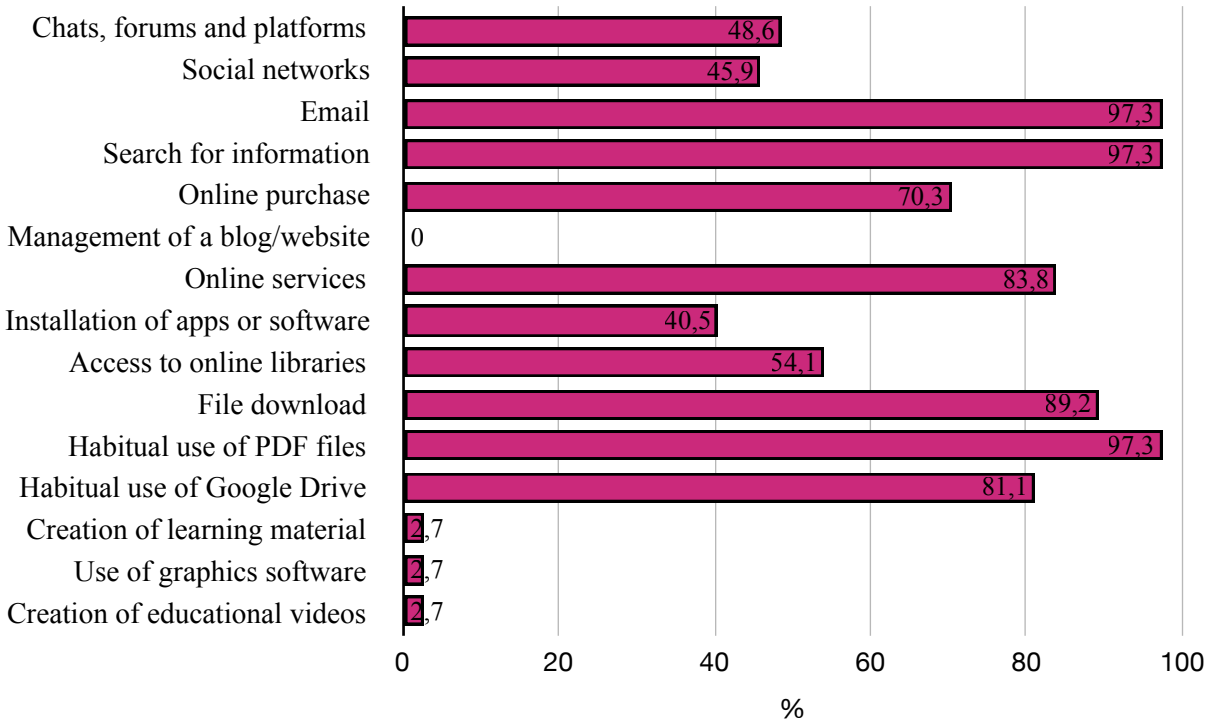
Concerning the teachers’ skills, it has been asked if their digital skills were necessary to teaching at distance. The pie chart below (Fig.18) shows the results.

Fig. 18: Teachers' digital skills



From the chart above, we can see that even though the majority of those who responded had the necessary skills to teach a class at distance, there was a significant number of teachers that asked for help. The next question investigated which were the habitual activities that teachers do online. The results gathered in the chart below (Fig. 19) show that teachers are used to the Internet environment, it is not unknown place for them.

Fig. 19: Teachers' online activities



In summary, these results showed that remote learning increased teachers' expenses for schools and that also a few individuals have problems in teaching a class due to the sharing of the device. The findings on the teachers' digital skills indicated that their digital skills were necessary to lecture at distance and they were used to move in the Internet environment.

4.6.3. Third section - Psychological impact

The third section of the questionnaire concerned teachers' opinions on how remote learning has impacted on students and on the three types of interactions seen above. The last two questions deals with collaborative learning, to introduce the hypothesis section which mostly focuses on collaborative learning strategy.

It has been asked to teachers their how they saw students during the remote learning situation. The data has been gathered in the table below (Fig. 20) for a better understanding.

Fig. 20: Teachers' opinions on students

	A lot	Quite a lot	Not much	Not at all
Students are more motivated	0%	2,7%	59,5%	37,8%
Students are more independent and autonomous	10,8%	27,1%	48,6%	13,5%
Students are more engaged in lessons	0%	18,9%	45,9%	35,1%
Students are more distracted	43,2%	51,3%	5,4%	0%
Remote learning is less effective than traditional learning	48,6%	35,2%	13,5%	2,7%
Students are lazier	27%	56,8%	10,8%	5,4%
Students suffer from loneliness	45,9%	45,9%	8,2%	0%
Students' and teachers' digital skills have improved	40,5%	48,6%	10,8%	0%
Students are exhausted by using the computer for hours	56,8%	32,4%	10,8%	0%
Having lessons at home is more confortable	10,8%	40,5%	27%	21,6%
Students do not respond to stimuli	13,5%	56,8%	27%	2,7%

The data collected in this table are not very positive. Teachers noticed that students' motivation has decreased as well as their autonomy, independence and engagement in lessons. Students are more distracted and they do not respond to the stimuli as they did before. All of this could be a cause of the loneliness they felt and the many hours that they spent in front of the computer.

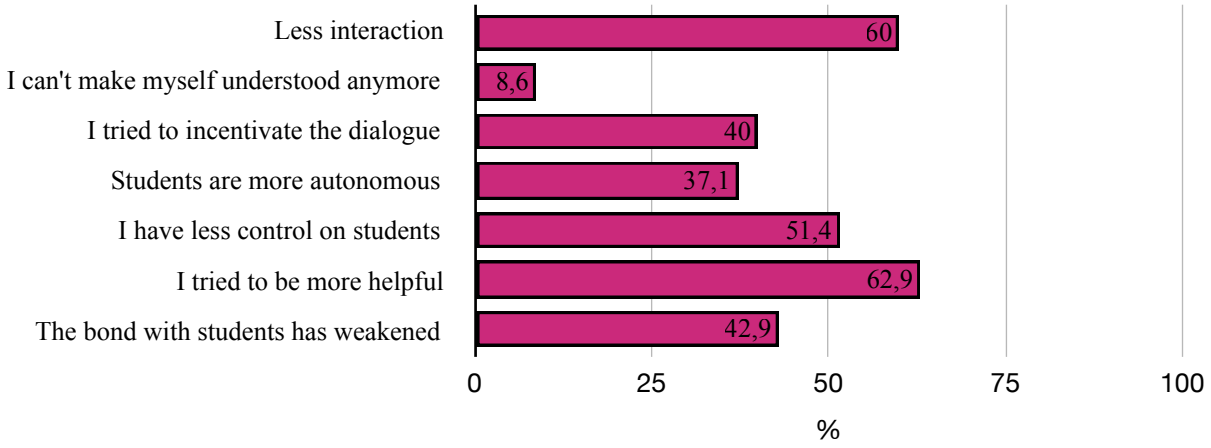
Since teachers have experimented both traditional learning and remote learning, it has been asked whether and how they would use remote learning. The majority of participants (78,4%) suggested that they would use remote learning as a tool of support, while 21,6% prefers to not use remote learning at all. This result is very positive for the hypothesis of research.

Then, the three types of interaction proposed by Moore (1989) have been addressed. Participants were asked to indicate if some changes have occurred in interaction

through a Yes/No item, moreover, they were asked to express their opinions on how it has changed through a multiple-choice item, in which there has been added the option "other…" to make them give personalized point of views.

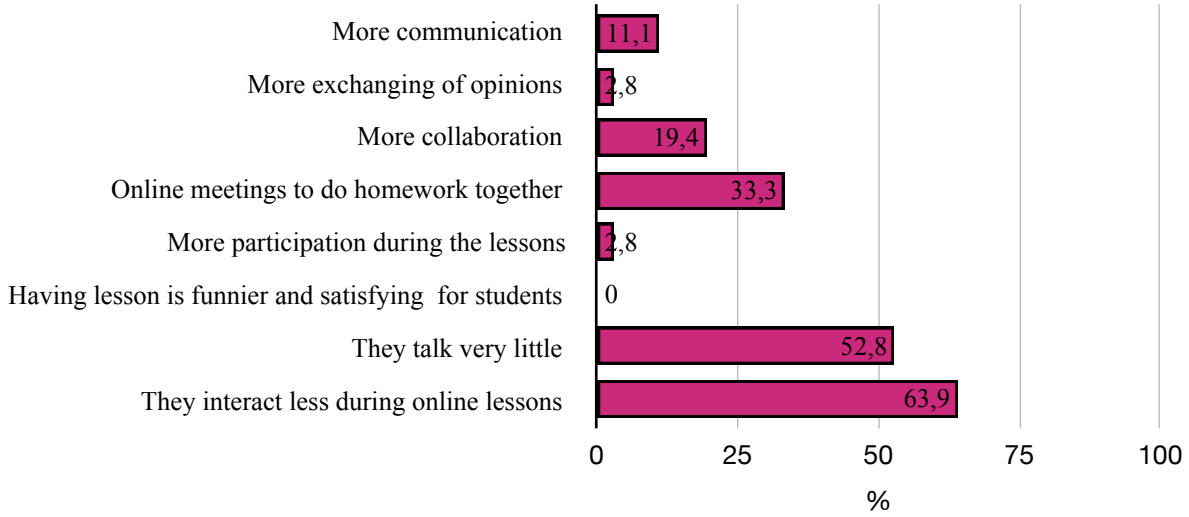
Teachers agreed on the fact that interaction between the learner and educator has changed (96,4%) and the reasons related to that have been collected in the chart below (Fig. 21). In the option "other…", a teacher expressed how much she/he missed his/her students.

Fig. 21: Reasons why interaction with students has changed



Concerning the interaction among students, teachers agreed again on the fact that the interaction among them has changed (97,3%). The chart below shows for which reasons (Fig. 22).

Fig. 22: Reasons why interaction among students has changed



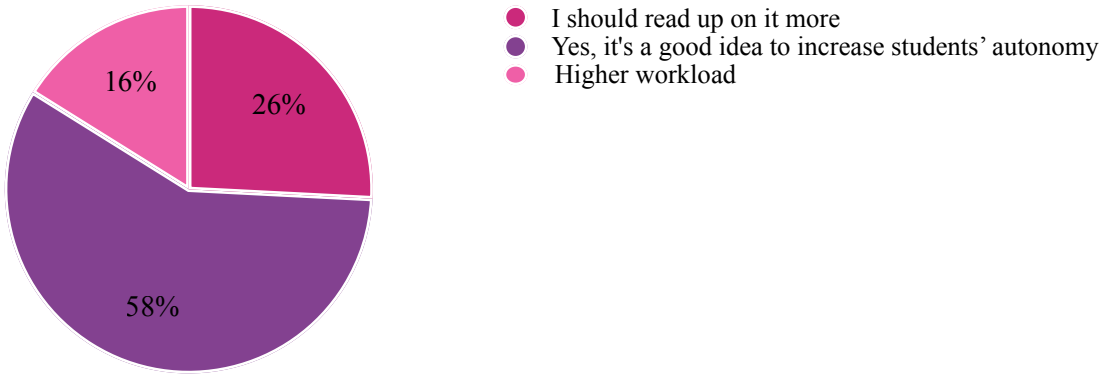
From the chart above we can see that the interaction has decreased a lot among students, this data was also confirmed by students questionnaire. There are very little positive results about the fact that they collaborate more and that they organize online meeting to study or do homework together. In the option "other…" teachers said that students communicate mainly through online chats, so the oral communication has reduced. Also, they pointed out that there was a tangible division between those students who are more willing and those students who are lazier. This division has been confirmed also by students' responses.

The next topic deals with the interaction with the content, namely whether online lessons/activities and homework took more time for students to accomplish them. The results here are very close: 40,5% said that online lessons/activities and homework took more time; 32,4% said that the time taken was the same as in traditional learning; 27% said that the time taken was lower.

The last theme that has been addressed in this section is the collaborative learning strategy. It has been asked to teachers if they think that remote learning encourage the collaborative learning. The majority of respondents (78,4%) reacted positively to this question. Furthermore, participants were asked if they were willing to create online

group works. The responses have been gathered in the pie chart below (Fig. 23). Also, it has been added the option "other…", so teachers could give personalized opinion.

Fig. 23: Opinions on collaborative learning



From the option "other…" emerged that a small part of teachers are already using the collaborative learning strategy, some of them have not seen concrete results and they consider this strategy too difficult to use or useless and less significant.

To conclude, from teachers' point of view remote learning had not a positive impact on students, it lowered the motivation and the engagement in lessons. Nevertheless, they saw more collaboration among them and organization of groups to study and do homework together. About this fact, they demonstrated to be more willing to introduce collaborative learning strategy to increase students' autonomy, even though there have been some initial difficulties with the use of it.

4.6.4. Fourth section - Remote learning as a tool of support

The fourth and last section of the questionnaire deals with the integration of remote learning as a tool of support for students and investigates teachers' attitudes towards it. In this first question, respondents were asked to express which of the remote learning following approaches they would use:

- Recording the lessons, so the students can listen to them again as a review, or comprehend something that was not so clear during the lesson, moreover, this strategy could be helpful also for absent students.
- Create groups of students who study and do their homework together after school, if they have not the possibility to move autonomously.
- Create groups of students that want to deepen or clarify a topic with the teacher after school.
- Use remote learning lessons for the recovery of bad notes: this will reduce the tiredness to remain at school beyond the regular time and schedule the lesson at a time that is good for everyone.

The data have been collected in the table below (Fig. 24).

Fig. 24: Teachers' opinions on remote learning approaches

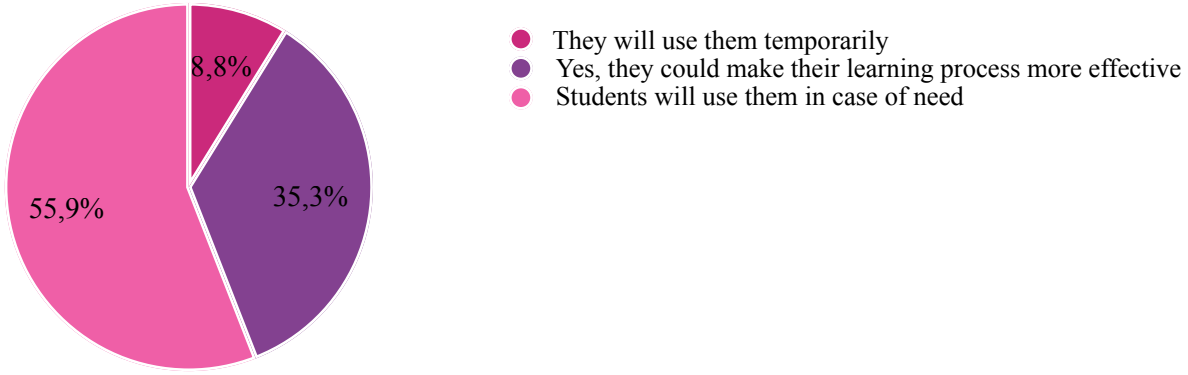
	Yes	No
Recording lessons for absent students	51,4%	48,6%
Organize online groups of students who want to deepen a topic	78,4%	21,6%
Recording lessons to allow students to listen to them again	40,5%	59,5%
Encourage the creation of homework/study groups	75,7%	24,3%
Organize online lessons for recovering the bad notes	75,7%	24,3%

From the table above, it is possible to see that teachers are willing to use these approaches to support students' learning experience, except for both the approaches of "recording lessons". There is a positive correlation between the encouragement of creating homework/study groups and their opinion on collaborative learning in previous section.

Then, it has been asked to teachers if these approaches would increase students' autonomy and independence in their learning experience. Almost 60% of them said "yes", however 40% of them gave a negative response. As a consequence of this, it

has been asked if students would make a good use of these approaches. Also, it has been added the option "other…". The data will be shown in the pie chart below (Fig. 25).

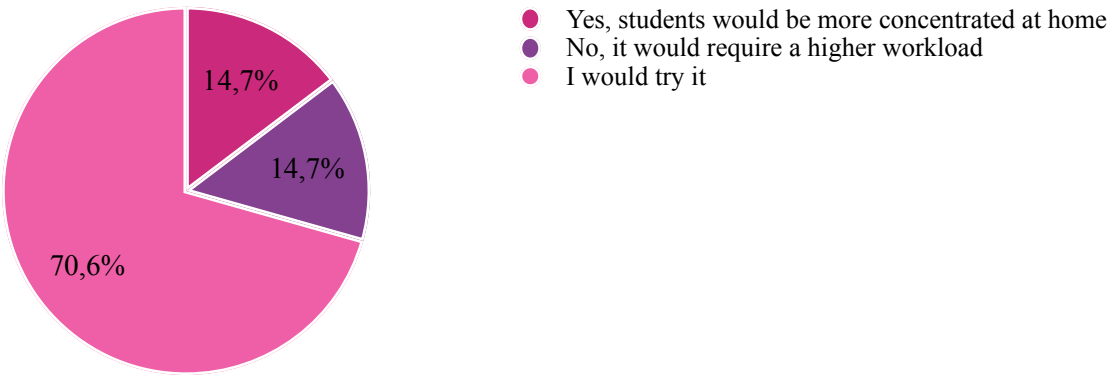
Fig. 25: Teachers' opinions on students' approach towards remote learning



From the pie chart above, we can see that teachers are a bit skeptical about the use that learners could make of these approaches, indeed the majority of them responded that students would use these support tools only in case of need without integrate them entirely in their learning process. In the option "other…" they expressed that the recording of lessons would allow students to be distracted during the lessons since they know they can see the recorded lessons anytime they want. While the other respondents said that some of the approaches mentioned would be more effective in frontal lessons rather that at distance.

The next question investigates teachers' inclination to organize online lessons for recovering of bad notes. The data are shown in the chart below (Fig. 26).

Fig. 26: Opinions on recovering bad notes online



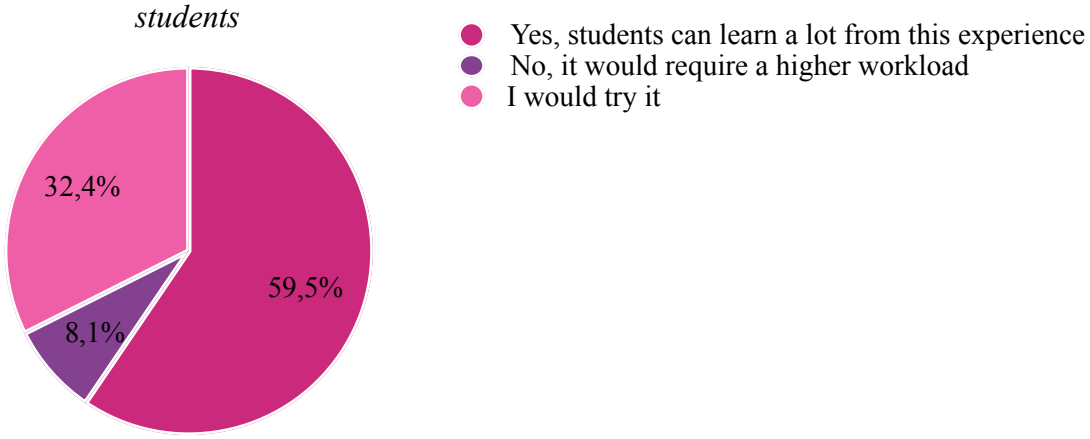
From the chart above, it is evinced that teachers would like to try this approach, this could be because they know that students would prefer follow the lessons at home where they are more concentrated and relaxed, rather than staying at school after school hours. Some respondents added that they have already organized online lessons for the recovery of bad notes in previous years.

The next two questions gave positive results for what concerns collaborative learning strategy.

Regarding the homework/study groups, the majority of participants (89,2%) thought that this approach "would be a good way for students to confront and help each other". Moreover, 43,2% of the respondents said that "studying together would be a good way to lower pressure and worry for tests". There are very little negative responses: students would overshadow studying (5,4%); individual learning is fundamental (2,7%); online study/homework group are not effective (5,4%).

Another significant aspect is teachers' willingness to organize online meetings with students to deepen or clarify some topics. The data will be shown in the pie chart below (Fig. 27).

Fig. 27: Teachers' willingness to organize online meetings with students



According to the pie chart above, teachers have reacted positively to this option.

The last question concerns the slogan used in many protests against the closure of schools "education takes place a school". The results showed that the majority of respondents (78,4%) agreed with this sentence, while just 21,6% disagreed with it.

To conclude, in this section we saw that teachers are still skeptical in using remote learning. Nevertheless, it is possible to observe that they became more aware of the technological devices that they can use and the strategies that they can add, moreover, they showed willingness to integrate them into traditional learning.

Chapter V: Discussion and Conclusions

5.1. Discussion

Chapter 4 has presented and described the data resulting from the survey in a detailed way. In this chapter, these data will be taken into consideration and discussed, by comparing teachers' and students' responses to answer the research questions. This procedure will draw the findings up, considering the literature reviews in the previous chapters, and it will lead to the conclusions of the dissertation.

5.1.1. RQ1:What challenges did students and teachers face?

To answer this research question, we have to consider the first three sections of the questionnaire.

First of all, it is significant to say that both students and teachers were dissatisfied with remote learning. In the first section, the main problems were the workload and the tests and assessment aspects.

Students and teachers have noticed that their workload has increased during this situation. Students, especially, complained about teachers, who took advantage of the fact that learners are at home to increase the load of homework and study. Concerning tests and assessment, teachers believed that the assessment lost its value since with remote learning students are more inclined to cheat on tests. As a consequence of this, teachers put a lot of constraints, especially time constraints, during online tests. On the other hand, students felt this lack of trust towards them. The time constraints during tests penalized them and it seemed a punishment for something that did not depend on them.

Secondly, in the next section, which concerns the technological resources and the economic aspect of remote learning, the current study found out that several individuals had to buy a new device to follow or teach the lessons. From the data concerning the sharing of the device, we can also infer that some families could not

afford the purchase of a device and for this reason, the tool had to be shared with the other members of the family affecting the participation of the individuals to the lessons. Although nowadays we live in a world where everybody owns a PC, it is possible to say that remote learning has an economic impact on some families. Contrary to expectations, this study found out that students have adapted easier to this new learning modality and that their digital skills were sufficient to face this emerging situation of remote learning, while teachers had more difficulties in changing the teaching modality, they have been caught off guard and it took more time for them to adapt to this situation.

Finally, for what concerns the psychological impact, the results of this section were not encouraging. Both parts agreed on the fact that remote learning is less effective than frontal learning, students felt lonely and exhausted from using the computer so many hours a day and for that reasons, their motivation and participation has decreased, making them more distracted and lazier. Students and teachers did not agree on the independence and autonomy aspects: teachers said that students did not show autonomy and independence, while students felt more autonomous and independent.

Moreover, another issue that emerged from this section is the interaction. All the data related to the interaction are negative, from both teachers and students point of view. The interaction between students and teachers has changed, there is less communication between them and it is also difficult to communicate. Students complained of a lack of understanding of teachers towards them, giving their personal opinion in the option “other...”. In addition, the interaction among students has decreased and the group class has divided.

The data that emerged from this last section were striking since the literature on this topic affirmed that distance education has not these negative effects on interaction (Walther, 1994). Moreover, Swan (2001) pointed out that online discussions are more equitable and offer more opportunities for students to participate.

5.1.2. RQ2: How should remote learning change to be more effective?

This research question sought to indicate which are the potential solutions for the challenges that students and teachers met and which are mentioned in the previous section. In Chapter 3, we have seen which are the main principles and features to carry out an effective remote learning course/lesson.

The first aspects that we take into account are the tests and the assessment. As we saw in the first paragraph, students and teachers had problems with assessments and tests: teachers believed that assessment lost its value and they started to put time constraints in order to avoid students cheating on online tests, while students felt penalized by this lack of trust towards them.

Some teachers expressed opinions that are noteworthy to improve these aspects using tests closer to the reality of the students, more training of the teachers on this aspect and the use of formative assessment. There are similarities between the opinions expressed by teachers in this study and those described by Palloff and Pratt (2007). Indeed, Palloff and Pratt (2007) pointed out that giving to students real-life tests as well as delivering a well-constructed, well-designed, learner-centred lesson will not only help with the cheating problems but will also increase learners' motivation, self-confidence and self-reliance. To make assessment regain its value it could be helpful to use both types of assessment, not only summative but also formative as teachers pointed out. Formative evaluation can prevent students from dragging out difficulties previously met and teachers can constantly monitor their learning path. Furthermore, the introduction of peer assessment and self-assessment could be a good idea to make learners achieve a higher degree of autonomy and responsibility.

Adapting to this new learning modality was not a problem for learners, while for teachers, the adaptation took more time. As all the literature reviews asserted, teachers should be more prepared and well-skilled on different teaching methods since their role is fundamental to help, support and guide the learners (Moore, 1973).

As regards the financial aspect of remote learning, the findings of the current study are consistent with those of Harasim et al. (1995) and Sarsini (2020) who stated that not everybody owns a PC or a stable connection and the purchase of it could be a big expense for some families. To solve this problem, schools or institutions could provide technological devices on loan for use to the families that cannot afford one, ensuring the equal possibility to learn to all students.

Concerning the psychological impact, it has been demonstrated that motivation and autonomy have emerged to be lower with remote learning. The results of these sections differ from the published studies mentioned in the previous chapters (Moore, 1973; Kaufman, 1989; Garrison, 2003). The cause of this could be found in the sudden situation that occurred, no one was ready and everybody has been caught off guard, moreover, teachers just focussed on keep going on with the prefixed curriculum and tried to finish it, as students complained, without taking into consideration students' needs.

The literature informs us that to keep students motivated and develop students autonomy and control over their learning experience, teachers have to develop an instructional design which is fundamental in distance learning (Bourdeau and Bates, 1996). In the questionnaire, it has been asked to teachers how they changed their way to teach and those who responded said that they changed their way to interact with students, their way to provide information and they became more flexible. Nevertheless, no one of them has changed how they deliver the lessons, they made the mistake to take the same curriculum used in class and deliver it online without any adjustments. Distance students have different needs from face-to-face students, so educators need to select the adequate components for the course, provide materials that fit distance students' needs, giving them full access to the resources and detailed information of the lessons, and especially encourage participation and interaction using the collaborative strategy. Palloff and Pratt (2007) stated that "when our pedagogy changes, so must the course". Teachers have to pay attention to this fact,

remote learning is not preparing and giving more materials, increasing both students and teachers workload, but it is selection, planning and structure (Gagnè, 1992; Moore, 1973).

These teaching methods, selection, planning and structure, are essential to create and maintain the interaction between student and teacher and among students as well as interaction with the content. With the constructivist theory, Dewey (1938) and Vygotsky with his theory of social constructivism, we learnt that education is a social process and it cannot take place without interaction and teachers must create an online environment that encourages interaction and participation, preventing the students from getting lost in their learning process. We saw that teacher's assistance has to be gradual, stronger at the beginning and then, gradually softened, to give the possibility to students to create their autonomy and independence. If a strong interaction is built, collaborative learning can take place comfortably and effectively since the findings of this explorative research showed positive attitudes of teachers and students in using this strategy. To sum up, all these weaknesses could be remedied with a well-organized, well-structured and well-planned instructional design built by a well-skilled teacher/educator who puts students' needs and goals in the first place.

5.1.3. RQ3: Could remote learning and frontal learning coexist?

The findings of this explorative research showed that these two modalities of learning can coexist. It has been asked to the participants whether and how they would use the remote learning now that they have experienced both modalities. The majority of them suggested using it as a tool of support. So, it is possible to say that remote learning and frontal learning can coexist. This view is also supported by the study of Maule (1997) in Allan Macpherson et al. (2004). This finding has important implications for the development of the following hypothesis of the research.

The results which came out from the hypothesis of research were positive and confirmed that students and teachers have positive attitudes towards the introduction of remote learning as a tool of support. Students agreed with the introduction of lessons recordings, with the creation of a study group and with the organization of online lessons to recover bad notes. Again, students showed their willingness to try to work in groups. Teachers agreed on organizing groups of students to deepen on or clarify a topic, encouraging the creation of study groups and organizing online lessons to recover bad notes. They do not agree with the recording of lessons, teachers believed that in this way the attention of the students could be lost during the frontal lesson because they can see the recording lesson anytime they want. This problem could be solved by giving detailed information about what is the real function of recording lessons and setting goals and define objectives to encourage them to carry out their learning experience using these new approaches in the right way, increasing their independence, autonomy and motivation. So, to conclude, even though this initial skepticism, teachers became aware of the new technological tools and the strategies they can add and are willing to integrate them in frontal learning. All of this will improve their skills and teaching methods more and more and will make them more flexible and able to adapt to the new teaching situation.

Conclusions

The present study was designed to determine how remote learning has been performed in an Italian high school during the pandemic of Covid-19, taking into consideration the opinions and the skills of students and teachers along with the economic and psychological aspects. A further aim was to determine if the Covid-19 pandemic led to some important changes in the Italian education system, encouraging teachers and students to integrate remote learning as a tool of support.

The study has been carried out through the administration of questionnaires to which students and teachers responded spontaneously and anonymously. The investigation has found that generally, both parts involved were dissatisfied with remote learning and have faced several challenges, such as tests and assessments, the decreasing of motivation, participation and interaction. A possible explanation for these not encouraging results could be the lack of preparation and knowledge of teachers and students in this sudden and new situation. Thanks to the literature, which have outlined a set of principles to carry out and deliver an effective distance course or lessons, all these weaknesses can be remedied with organization, selection and planning and the guide of a well-skilled teacher. Another significant finding to emerge from this study is that collaborative learning is gaining importance since teachers and students showed a positive approach towards it. Moreover, the evidence from this study suggests that frontal learning and remote learning can coexist and this finding led to the confirmation of the research hypothesis. Even though there is some skepticism, especially from teachers' part, the participants to the survey showed positive attitudes towards the integration of remote learning as a tool of support.

Previous studies have been presented as a guide on distance education and have focussed their attention on outlining a set of rules and principles to carry out an effective online distance course. The current study investigates the possibility to use distance education, not with the function of "have lesson" but with the function of supporting students in their learning experience. This research extends our knowledge

on remote learning as a tool of support with the intent to increase students' motivation and autonomy and to improve and expand teachers' skills and teaching methods, making them more flexible and adaptable to new situations. As a consequence of this, this investigation has been intended as a set of suggestions for teachers to make them close to a new teaching modality.

Finally, several important limitations need to be considered. First, the major limitations of this study are the short time available to carry out the research, which would have been more interesting adding some interviews to deepen some aspects. Second, the sample size is small, especially the sample of teachers. So, with small sample size, caution must be applied, as the findings might not be generalizable, hence not transferable.

Further research might explore whether students require and use these new approaches and whether the application of these new tools actually increase their motivation and autonomy.

To conclude, the last question of the questionnaire, which aimed at understanding if the participants of the survey agreed with the sentence "education takes place at school". As already said, this sentence was used during the manifestations against the closure of schools. Half of the students who responded to this question disagreed with this sentence, while only 21% of teachers disagreed with it. However, since this study is intended as a set of suggestions for teachers, it is important to state that education does not take place only at school, and the entire historical background in the first chapters showed that. Education took place likewise, although the scarcity of technological resources and many scholars agreed on the fact that distance students are good as traditional students. So, it is possible to say that education is not made of walls, chairs and desks, it is made of experience, interaction, connection and collaboration, and all of this does not need an institution to make it happens. This view has been supported by Siemens and Downes and many constructivist and collaborativist researchers, as we saw in the first chapters.

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Appendix

Student's questionnaire

1. L'esperienza della didattica a distanza

- Sesso
  - M
  - F
- Età
- Classe
- In questo periodo di emergenza sanitaria stai seguendo le lezioni online?
  - Sì
  - No
- Con quali modalità segui le lezioni online?
  - In tempo reale
  - Video registrato
  - Entrambe
- Quale modalità preferisci?
  - In tempo reale
  - Video registrato
- Perchè?
- In questo periodo di sospensione delle lezioni incarico di studio è:
  - Sopra la media
  - Nella media
  - Sotto la media
- Durante lo svolgimento delle lezioni, gli studenti stanno ricevendo supporto tecnico da parte dei docenti?
  - Istruzioni dettagliate per l'utilizzo dei nuovi media
  - Sessioni di pratica prima dell'inizio delle lezioni
  - Facilitazione della comunicazione con i docenti
  - Scelta di un'unica piattaforma per seguire le lezioni
  - Pubblicazione di avvisi/compiti sulla stessa piattaforma
  - Non c'è molto supporto tecnico da parte dei docenti
  - Sono gli studenti che forniscono supporto ai docenti
  - Altro …
- Stai svolgendo verifiche online in questo periodo di sospensione delle lezioni?
  - Sì
  - No

- Svolgi di più:
  - Verifiche scritte
  - Verifiche orali
  - Entrambe
  - Altro …
- Riguardo le verifiche/interrogazioni a distanza:
  - Le prendo con la stessa serietà di sempre
  - Le prendo con più leggerezza
- Riguardo ai voti delle verifiche/interrogazioni a distanza:
  - Penso che siano più importanti per la mia media e la mia promozione, vista la situazione
  - Penso che siano diventati irrilevanti perché non posso essere penalizzato o bocciato
  - Li consideravo allo stesso modo
- Quanto sei soddisfatto della didattica a distanza?
  - Per nulla
  - Poco
  - Abbastanza
  - Molto

2. Risorse digitali

- Quale/i dispositivo/i utilizzavi per seguire le lezioni?
  - Computer fisso
  - Computer portatile
  - Tablet
  - Cellulare
  - Altro …
- Hai dovuto acquistare un dispositivo più adeguato per seguire le lezioni?
  - Sì
  - No
- Il dispositivo che utilizzi per seguire le lezioni, viene condiviso con altre persone?
  - Sì
  - No
- Se sì, questa condivisione influenza la tua partecipazione alle lezioni?
  - Sì
  - No

Competenze digitali

- Le tue competenze digitali sono necessarie per seguire le lezioni con la modalità a distanza?
  - Sì
  - No, ho dovuto informarmi autonomamente per imparare ad usare le piattaforme
  - Qualche volta ho avuto bisogno d'aiuto a causa delle mie limitate competenze digitali
  - No, ma i docenti erano molto disponibili ad aiutarci
- Quali sono le attività che svolgi abitualmente su internet?
  - Chat, forum, piattaforme
  - Social networks
  - Email
  - Ricerca informazioni varie
  - Giochi online
  - Acquisti online
  - Gestione di un sito web o blog
  - Servizi (banche online, biglietti treno/concerti/cinema, orari, prenotazioni mediche…)
  - Installazione software o app per migliorare l'efficienza dei miei dispositivi elettronici
  - Accesso a librerie online
  - Download di file da Internet
  - Uso abituale di file PDF (download, lettura, invio)
  - Uso abituale di Google Drive
  - Altro …

3. Impatto psicologico della didattica a distanza

- Con la didattica a distanza:
  - Mi sento più motivato — Molto - Abbastanza - Poco - Per nulla
  - Mi sento più indipendente e autonomo/a — Molto - Abbastanza - Poco - Per nulla
  - Partecipo più attivamente alle lezioni — Molto - Abbastanza - Poco - Per nulla
  - Mi distraggo più spesso — Molto - Abbastanza - Poco - Per nulla
  - Sono migliorate le mie abilità tecnologiche/digitali — Molto - Abbastanza - Poco - Per nulla
  - Mi sembra di imparare meno — Molto - Abbastanza - Poco - Per nulla
  - Sono più pigro/a — Molto - Abbastanza - Poco - Per nulla
  - Mi piace fare lezione da casa — Molto - Abbastanza - Poco - Per nulla
  - Mi sento solo/a — Molto - Abbastanza - Poco - Per nulla
  - E' molto stancante fare lezione per molte ore davanti al computer — Molto - Abbastanza - Poco - Per nulla
- Ora che hai sperimentato due modelli di didattica (didattica a distanza e didattica tradizionale o frontale) nella tua scuola preferiresti:
  - Fare lezione solo attraverso la didattica a distanza
  - Utilizzare la didattica a distanza come mezzo di supporto
  - Non utilizzare affatto la didattica a distanza

Interazione tra docente e studente

- Secondo te, la didattica a distanza ha cambiato il rapporto tra studente e docente?
  - Sì
  - No
- Se sì, in quale modo?
  - E' più difficile comunicare con i docenti, sono più lenti a rispondere alle mie domande
  - C'è più dialogo tra studente e docente
  - Il docente esercita meno controllo sugli studenti
  - Studio in modo più autonomo ed sono più soddisfatto del mio apprendimento
  - I docenti sono più disponibili e compresivi
  - I docenti non sono per nulla comprensivi
  - I docenti continuano ad andare avanti con il programma nonostante ci siano richieste di ulteriori spiegazioni
  - C'è pochissimo dialogo tra docente e studente
  - Altro …

Interazione tra studenti

- Secondo te, la didattica a distanza ha cambiato il rapporto con i tuoi compagni di classe?
  - Sì
  - No
- Se sì, in quale modo?
  - Comunichiamo più spesso
  - Ci scambiamo più idee e opinioni
  - Collaboriamo e ci aiutiamo più spesso
  - Organizziamo incontri online per fare i compiti insieme
  - C'è più partecipazione durante le lezioni online
  - Fare lezione è più divertente ed sono più soddisfatto del mio apprendimento
  - Ci contattiamo e parliamo di meno
  - La classe si è divisa molto
  - Ci vedevamo solo a lezione
  - Non interagivamo nemmeno a lezione
  - Altro …

Interazione con il contenuto

- Il tempo che impieghi per le lezioni online, le attività/compiti e studio rispetto alla didattica tradizionale era:
  - Più alto
  - Più basso
  - Impiegavo lo stesso tempo

Apprendimento collaborativo

- Secondo te, lavorando in gruppo, l'apprendimento sarebbe:
  - Più efficace e divertente
  - Più divertente ma inutile
  - Confusionario

4. Didattica a distanza come strumento di supporto

- Segna l'/le opzione/i che ritieni più utile per applicare la modalità della didattica a distanza:
  - Registrare le lezioni per riascoltare un argomento o un passaggio poco chiaro
  - Registrare le lezioni per studenti che sono assenti
  - Creare un gruppo di studenti che vuole approfondire o chiarire un argomento con il/la docente
  - Creare gruppi di studenti che studiano o svolgono compiti insieme
  - Svolgere lezioni online per il recupero dei debiti
- Avendo a disposizione le opzioni che hai segnato sopra, ti sentiresti più autonoma/o e indipendente nel tuo processo di apprendimento?
  - Sì
  - No
- Secondo te, se avessi a disposizione le opzioni che hai segnato sopra:
  - Le utilizzerei in modo temporaneo, poi ritornerei ai miei metodi abituali
  - Cercherei di integrarle nel mio processo di apprendimento, perché sono convinto/a che siano molto utili
  - Le utilizzerei saltuariamente perché richiedono più tempo del solito
  - Altro …
- Sarebbe più facile per te chiedere chiarimenti o approfondimenti al docente se foste in più studenti (in gruppo) a farlo?
  - Sì, sarebbe un ottimo modo anche per ascoltare i dubbi degli altri, confrontarci e trovare soluzioni insieme con la guida del docente
  - Non mi cambia nulla
  - No, creerebbe più confusione
- Creare gruppi di studio/compiti online:
  - Studiare insieme sarebbe un ottimo modo per ridurre la pressione/preoccupazione delle verifiche/ interrogazioni
  - Fare i compiti insieme (dove possibile) potrebbe essere un ottimo modo per aiutarsi a vicenda e confrontarsi
  - Sarebbe inutile, ci sarebbe solo confusione e non si concluderebbe nulla
- Svolgere i corsi di recupero debiti con la modalità a distanza:
  - Non cambia nulla rispetto al normale svolgimento in aula
  - Svolgerli da casa ridurrebbe il peso e la stanchezza di dover continuare a stare a scuola oltre l'orario ordinario

- Condividi l'espressione "la scuola si fa a scuola”?
  - Sì
  - No

Teachers' questionnaire

1. L'esperienza della didattica a distanza

- Sesso
  - M
  - F
- Età
- Da quanti anni svolge il lavoro di insegnante?
- In questo periodo di emergenza sanitaria sta continuando con le lezioni in modalità telematica?
  - Sì
  - No
- Se sì, quale modalità predilige per le lezioni online?
  - In tempo reale
  - Video registrato
  - Entrambe
- Per quale motivo?
- Se non sta continuando con le lezioni in modalità telematica, cos'ha scelto di fare?
- Quali sono i motivi per i quali non ha attivato lezioni con modalità telematica?
  - Non ho le competenze
  - Trovo la didattica a distanza inutile e poco produttiva
  - Ho difficoltà a raggiungere gli studenti
  - Gli studenti non prestano attenzione
  - Condivido il dispositivo con altri membri della mia famiglia, non potevo garantire ai miei studenti una regolare continuità di svolgimento delle lezioni
  - Altro …
- La didattica a distanza (preparazione del materiale e delle lezioni) la sta impegnando:
  - Più del consueto
  - Allo stesso modo
  - Meno del consueto
- Durante lo svolgimento delle lezioni, gli studenti ricevono un supporto tecnico da parte dei docenti?
  - Istruzioni dettagliate per l'utilizzo dei nuovi media
  - Sessioni di pratica prima dell'inizio delle lezioni
  - Facilitazione della comunicazione con i docenti
  - Scelta di un'unica piattaforma per seguire le lezioni
  - Sono gli stessi docenti ad avere bisogno di supporto tecnico
  - Pubblicazione di avvisi/compiti sulla stessa piattaforma
  - Sono gli studenti che forniscono supporto ai docenti

- Altro …

- Ha dovuto modificare il suo tradizionale modo (stile e strategie) di fare lezione?
  - Sì
  - No
- Se sì, in che modo?
  - Differenti modi di interazione per mantenere alta la motivazione
  - Maggiore qualità dei materiali di apprendimento
  - Differenti modi di presentare l'informazione
  - Cerco di mantenere il contatto verbale con i miei studenti più frequente
  - Vario di più gli esercizi e cercavo di stare attorno ad ogni studente per compensare la mancanza di gesti
  - Creo attività di gruppo ben progettate e incentivo l'interazione fra studenti
  - Ho cercato di ridefinire le mie abilità di gestione della classe
  - Da insegnante, ora mi vedo come facilitatore
  - Consulto i miei studenti più frequentemente per risolvere i problemi, in modo che non si perdano nel programma
  - Cerco di essere più flessibile a trattare con gli studenti riguardo ai loro bisogni (tempi, date, verifiche di recupero)
  - Altro …
- In questo periodo di sospensione delle lezioni, sta utilizzando strumenti di verifica?
  - Sì
  - No
- Che formato di verifica predilige?:
  - Verifiche scritte
  - Verifiche orali
  - Entrambe
  - Altro …
- Pensa che l'aspetto "valutazione" nella didattica a distanza abbia perso valore?
  - Sì
  - No
- Se sì, cosa suggerisce per migliorare questo aspetto?
- Quanto si ritiene soddisfatto/a dell'esperienza della didattica a distanza?
  - Per nulla
  - Poco
  - Abbastanza
  - Molto

2. Risorse digitali

- Quale/i dispositivo/i utilizza per seguire le lezioni?
  - Computer fisso
  - Computer portatile
  - Tablet
  - Cellulare
  - Altro …
- Ha dovuto acquistare un dispositivo più adeguato per seguire le lezioni?
  - Sì
  - No
- Il dispositivo che utilizza per seguire le lezioni, viene condiviso con altri membri della sua famiglia?
  - Sì
  - No
- Se sì, questa condivisione influenza il so modo di fare lezione?
  - Sì
  - No

Competenze digitali

- Secondo lei, le sue competenze sono necessarie per svolgere le lezioni in modalità telematica?
  - Sì, avevo già le competenze necessarie
  - Abbastanza, qualche volta chiedo aiuto a studenti/figli/colleghi a causa delle mie limitate competenze digitali
  - No, ho dovuto seguire webinar e informarmi autonomamente per imparare ad usare le piattafrome
- Quali sono le attività che svolge abitualmente su internet?
  - Chat, forum, piattaforme
  - Social networks
  - Inviare e-mail e e-mail con allegati
  - Ricerca informazioni varie
  - Acquisti online
  - Gestione di un sito web o blog
  - Servizi (banche online, biglietti treno/concerti/cinema, orari, prenotazioni mediche…)
  - Installazione software o app per migliorare l'efficienza dei miei dispositivi elettronici
  - Creazione di materiali didattici
  - Accesso a librerie online
  - Download di file da Internet
  - Uso abituale di file PDF (download, lettura, invio)
  - Uso abituale di Google Drive
  - Altro …

3. Impatto psicologico della didattica a distanza

- Con la didattica a distanza:
  - Gli studenti sono più motivati Molto - Abbastanza - Poco - Per nulla
  - Gli studenti sono più indipendenti e autonomi Molto - Abbastanza - Poco - Per nulla
  - Partecipano molto di più, anche studenti che in classe preferiscono non parlare Molto - Abbastanza - Poco - Per nulla
  - Gli studenti sono più distratti Molto - Abbastanza - Poco - Per nulla
  - Il processo di apprendimento è meno efficace rispetto alla didattica tradizionale Molto - Abbastanza - Poco - Per nulla
  - Molti studenti soffrono la solitudine Molto - Abbastanza - Poco - Per nulla
  - Le abilità tecnologiche degli studenti e degli insegnanti sono migliorate Molto - Abbastanza - Poco - Per nulla
  - Gli studenti sono provati dalle molte ore passate davanti al computer Molto - Abbastanza - Poco - Per nulla
  - Fare lezione da casa è più comodo Molto - Abbastanza - Poco - Per nulla
  - Gli studenti non reagiscono più agli stimoli Molto - Abbastanza - Poco - Per nulla
- Confronto fra didattica frontale e didattica a distanza
  - Preferirei fare lezione solo attraverso la didattica a distanza
  - Utilizzerei la didattica a distanza come mezzo di supporto
  - Non utilizzerei affatto la didattica a distanza

Interazione tra docente e studente

- Secondo lei, il rapporto tra studente e docente è cambiato con la didattica a distanza?
  - Sì
  - No
- Se sì, in quale modo?
  - C'è minore interazione tra studente e docente dovuta alla distanza fisica
  - Non riesco più a farmi comprendere dai miei studenti
  - Ho cercato di aumentare il dialogo tra studente e docente per mantenere vivo questo rapporto
  - Gli studenti conducono più autonomamente il loro processo di apprendimento
  - Il controllo che esercitavo su di loro in classe si è ridotto con la didattica a distanza
  - Ho cercato di rendermi più disponibile e comprensivo/a nei loro confronti
  - Ho sentito che il legame con gli studenti si è affievolito molto
  - Altro …

Interazione tra studenti

- Secondo lei, la didattica a distanza ha cambiato il rapporto tra gli studenti?
  - Sì
  - No

- Se sì, in quale modo?
  - Comunicano più spesso
  - Scambiano più idee e opinioni
  - Collaborano e si aiutano più spesso
  - Sono a conoscenza dell'organizzazione di incontri online tra di loro per svolgere i compiti insieme
  - C'è più partecipazione durante le lezioni online
  - Le lezioni online si stanno dimostrando più divertenti e noto un grado più elevato di soddisfazione nei miei studenti
  - I contatti tra di loro stanno diventando più radi
  - Durante le lezioni online interagiscono molto poco anche fra di loro
  - Altro …

Interazione con il contenuto

- Secondo lei, il tempo che impiegano i suoi studenti per le lezioni online, le attività/compiti e studio rispetto alla didattica tradizionale era:
  - Più alto
  - Più basso
  - Impiegano lo stesso tempo

Apprendimento collaborativo

- Secondo lei, la didattica a distanza incentiva l'apprendimento collaborativo tra gli studenti, ovvero la costruzione attiva di nuove conoscenze attraverso l'interazione di discussione tra pari?
  - Sì
  - No
- Attraverso il modello dell'apprendimento collaborativo, creerebbe lavori di gruppo online in modo che gli studenti apprendano le tecniche, le competenze che applicherebbero poi anche nella didattica frontale?
  - Dovrei informarmi di più
  - Sì, penso che sia un'ottima idea per migliorare la loro autonomia
  - No, comporterebbe un dispendio di lavoro troppo elevato
  - Altro …

4. Didattica a distanza come strumento di supporto

- Utilizzerebbe la modalità della didattica a distanza con le seguenti opzioni?
  - Registrare le lezioni e renderle quindi accessibili agli studenti che sono assenti Sì / No
  - Organizzare gruppi online di studenti che vuole approfondire o chiarire un argomento con il/la docente Sì / No
  - Registrare le lezioni per permettere agli studenti di riascoltare un argomento o un passaggio poco chiaro Sì / No
  - Incentivare la creazione di gruppi di studenti che studiano o svolgono compiti insieme Sì / No
  - Svolgere lezioni online per il recupero dei debiti Sì / No

- Secondo lei, le opzioni alla domanda precedente, renderebbero gli studenti più autonomi e indipendenti durante il loro processo di apprendimento?
  - Sì
  - No
- Secondo lei, gli studenti farebbero buon uso delle opzioni elencate precedentemente?
  - No, sarebbe una cosa temporanea
  - Si, incentivando il loro uso, potrebbero modificare e rendere il loro processo di apprendimento più efficiente
  - Le utilizzerebbero solo in momenti di necessità, senza mai integrarle appieno nel loro processo di apprendimento
  - Altro …
- Sarebbe disposta/o a svolgere lezioni di recupero dei debiti attraverso la didattica a distanza?
  - Sì, perché sono consapevole che gli studenti da casa sarebbero più rilassati e concentrati
  - No, sarebbe un dispendio di tempo troppo elevato
  - Si potrebbe provare
  - Altro …
- Riguardo ai gruppi di studenti che studiano e fanno i compiti insieme, cosa pensa?
  - Penso che gli studenti potrebbero mettere in secondo piano studiare e fare i compiti
  - Penso che fare i compiti insieme sarebbe un ottimo modo per loro per confrontarsi e aiutarsi a vicenda
  - Penso che studiare insieme potrebbe aiutarli a ridurre la preoccupazione/pressione delle verifiche/ interrogazioni
  - Altro …
- Sarebbe disponibile ad organizzare incontri online con gli studenti per approfondire o chiarire degli argomenti?
  - Sì, se opportunamente organizzati gli studenti possono imparare molto da questa esperienza
  - No, sarebbe un dispendio di tempo troppo elevato
  - Si potrebbe provare
  - Altro …
- Condivide l'espressione "la scuola si fa a scuola”?
  - Sì
  - No