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The impact of classroom learning environments on students' motivation

A case study of elementary school classrooms

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Introduction

The following research is part of the pedagogical reflections involving studies in environmental psychology and the psychology of motivation. In particular, this study aims to demonstrate whether the attention and care put into learning environments themselves can generate an improvement in students' levels of motivation. To achieve this goal, a case study was performed wherein two learning environments that differ in classroom spatial organization were compared; these establishments were the Diego Valeri primary school in Padua and the Giuseppe Mazzini primary school in Maserà di Padova. The different design of the classrooms is based on the former institute's adhesion to an educational project conceived by Dr. Maria Montessori.

On the basis of previously analysed literature, a comparison between the two environments was considered relevant to assess a possible difference in the degree of motivation between the students in a Montessori classroom and those in a traditional classroom.

The experimental part of the research aims to answer the following question: does the structure of educational spaces influence a student's levels of motivation?
In order to find an answer, questionnaires were handed out to students between the ages of 9 and 10, in hopes of assessing the levels of both motivation and social interactions within the classroom; an additional goal was to highlight specific similarities and differences between these two methods.

As just described, the following research is divided in two: an initial theoretical part, in which the topics of this study are introduced and the analytical elements used in the second part of this paper, the experimental part, are provided, and secondly an analysis of the results obtained in the experimental half itself.

The first four chapters are dedicated to the description of the theoretical coordinates in which the arguments considered are inserted. More specifically, the first chapter examines studies inherent to student motivation and the role it plays in the educational field; the second chapter introduces the learning environment as a possible motivational factor to be considered during a scholastic journey; the third chapter presents examples of learning environments, both abroad and in Italy, that are viewed as innovative models in order to promote higher quality education; the fourth chapter is dedicated to the description of the

Montessori method and, in particular, to the instructive role of the didactic space created by Dr. Montessori.

The practical part begins with the fifth chapter, in which the research's context is presented in order to showcase and describe the teaching environments of the two schools involved in this experiment.

In the sixth chapter, the research's questions, methods and phases are described. In addition, the questionnaire created to evaluate the students' perception of their school environment is broken down into its components and analysed.

The seventh and final chapter analyses the data collected from the questionnaires and draws some conclusions based off the values assigned by the students regarding their perception of the environment. These results make it possible to identify any environmental factors that can possibly be improved according to needs expressed by the pupils. Lastly, this study identifies any elements that students consider to be relevant in increasing their motivation to learn.

The research paper concludes with the hope that learning environments will play an increasingly significant role in promoting student motivation and that paying attention to students' needs will be considered the starting point to improve the quality of our youth's education.

Chapter I

Motivation: Introduction and Overview

1.1 Motivation's role

Education plays a major role in modern society, especially when one considers that nowadays most employment sectors increasingly require specialist training from future workers. In addition, if we think in terms of Lifelong Learning, every individual needs effective tools that allow them to continue their training once they have finished their studies.

In a perspective of Lifelong Learning, skills acquired during scholastic education can be decisive for the future of an individual, keeping in mind the countless professional and personal challenges of life. Therefore, it can be said that the education one receives since childhood continues to influence them throughout their life. In fact, a person who has acquired skills such as flexibility, problem solving, cooperation, autonomy, planning, communication, and sense of responsibility, will be able to exploit them over time (Bombardelli, 2003).

In order to promote full development of an individual's potential, it's necessary to create the ideal conditions within which such development can be carried out. To proceed in the correct direction toward positive change, a careful evaluation of academic surroundings is required; this includes a reconsideration of environments, equipment, teacher preparation and student needs. After evaluating the existing reality, we need to plan concrete improvements and actually implement them.

It is considered necessary to promote change and innovation in accordance with the data provided by the "Monitoring Report of the Education and Training Sector 2018 Italy", issued by the European Commission. According to this report, Italy presents a varied series of issues such as school dropout, low levels of education and scholastic performance compared to the European average, and poor preparation regarding skills implemented in the workplace (European Commission, 2018). A fundamental goal is therefore to enhance the role of schools in the life of Italian citizens and consider the idea of investing more funds into the renovation of equipment and school buildings.

Returning to the subject of lifelong learning, it is appropriate to analyze the role that motivation plays as a short and long-term success factor and how it is crucial for the development of the subject.

Psycholinguists define motivation as an impulse, a driving force that leads to academic success and consequently must be nurtured in students.

In psycho-linguistic studies conducted in the 1990s, a new orientation emphasized the influence of the learning context on motivation. It was defined as a "situated" trait of motivation (Situated Motivation) that is socially and culturally determined. Therefore, there are multiple dynamics that affect the subject which is learning.

Motivation, in fact, is a complex system consisting of a psychological dimension (which concerns affective, cognitive, and personal aspects) and a socio-cultural dimension (which concerns the context in which individuals act). Therefore, there are several factors that can influence a student's education to help them achieve school success.

Although the relationship between motivation and learning is prominent, we can state with certainty that these two aspects are not directly related, but rather that different variables are involved, which cover a wider range in accordance with educational models and approaches (De Beni, Moè, 2000). This study aims to analyze one of said variables: the relationship between motivation and learning environments, paying particular attention to the care for the environment itself as an integral part of Maria Montessori's educational project for primary schools.

Before proceeding to an explanation on the importance of the aforementioned learning environments, we will introduce some psychological studies in regarding motivation that are relevant for this research.

1.2 Psychology of Motivation

The studies conducted by scientific psychology define motivation as "the orientation activated towards a target object with a positive evaluation" (Rheinberg, 1997, p.14).

To achieve this goal, a subject must make a certain amount of effort, persist, accept the possibility of making mistakes and try again until he can reach said goal.

According to an analysis perspective that explains the behavior solely by the characteristics of an individual, motivation can be interpreted as a drive or push towards a particular need, in which by needs, we mean those essential to survival, such as eating, drinking, resting, (also defined homeostatic needs), but also those that do not concern mere survival, such as the need to discover new places or objects, the need for comfort, etc. A list of these needs can be found in studies by psychologist McDougall. He stated that:

> Every man is constituted to desire certain goals which are common to the species, and the attainment of which goals satisfies and allays the urge or craving or desire that moves us. These goals are not only common to all men, but also…[to] their nearer relatives in the animal world, such goals as food, shelter from danger, the company of our fellows, intimacy with the opposite sex, triumph over our opponent, and leadership among our companions (McDougall, 2015, p. 406).

McDougall uses the term instincts while referring to needs. Regardless of the terminology, the goals that are described can motivate different behavior in an individual (Harold, Miller 2016).

Later, psychologist Henry Murray based his theory of personality on needs and motives. He argued that every individual has needs and they work on an unconscious level. These needs are responsible for shaping people's personalities as everyone has a different level that distinguish one person from another. Murray (1938) made a distinction between primary needs (such as hunger, rest, thirst, etc.) and secondary needs, such as the demand for autonomy, affiliation, and success (achievement) (Harold, Miller, 2016). The importance of secondary requirements is their acquisition during individual development and are therefore determined by learning experiences in a specific context (physical, social and cultural) (Rheinberg, 1997).

In order to explain motivation, an individual's characteristics alone are not sufficient. In fact, behavior is also determined by the interrelations between the individual and their environment or any given situation they might find themselves in.

K. Lewin (1946) is the author of the postulate recognized by the psychology of motivation, which considers both the personal and environmental factors underlying people's behavior. Lewin's equation is B = f (P, E), where behavior (expressed by B), is a function of personal (P) and environmental (E) factors.

The interest in analyzing a particular need, namely that concerning the need for success, is considered useful and necessary for the understanding of the Montessori educational approach that will be introduced in the following chapters. Similarly, starting from Murray's need achievement, it was McClelland (1953) and Atkinson (1957,1958) who studied the conditions of realization in the practice (De Beni, R., Moè, 2000)

It must be said that not all actions carried out to achieve success are motivated by the need to succeed: some may concern the reasons that characterize the extrinsic motivation. The term indicates a type of motivation determined by external factors that involve the learner, such as fear of punishment, approval of others and desire to receive a reward. It is a type of motivation promoted from the outside and, therefore, not dependent on personal choices.

Alternatively, in psychology, the motivation for success is intrinsic and concerns the self-evaluation that individuals make of their abilities, comparing them with the standards of value. This concept explains the motivations that lead individuals to record their own performances and the will to overcome them, or to attempt an exercise until they reach perfection. After every attempt the standard changes, leading the individual to the improvement of their abilities. Consequently, the satisfaction obtained by being able to do something is fixed in ones memory as a positive experience and acts as a stimulus for further attempts to improve. This type of motivation occurs only when the subject is aware that the results obtained have been possible only due to their efforts and commitment.

The results of the aforementioned studies are considered particularly useful to our field of investigation because they have led to the following conclusion: the reason that drives an individual to act is strongly determined by the situation in which they find themselves, only if within that situation they recognize the requirement of a standard set of value (Rheinberg, 1997).

By bringing this explanation back into an educational context, if students recognize that there are standards of value in the school environment, it implies that they will identify opportunities to test and improve their skills; for this to be fulfilled, the following criteria must be met:

- the student recognizes school as an environment in which they can experiment and test themselves;
- teachers must create appropriate conditions to encourage motivation to succeed (attitudes of fear and renunciation do not encourage students to learn; they must therefore be corrected through different educational methods);
- although a stimulating environment allows students to undertake tasks according to their skill level, they should also make personal efforts to accomplish their goals.

Finally, studies by Rheinberg and Krug (1993) support this research, as they confirm that the reason behind success can be significantly influenced by the environment in which the subject lives but also by psychological and motivational factors (De Beni, R., Moè, 2000).

1.3 Learning Motivation

In this section, we will investigate some of the components that influence motivation to learn. The components that have been taken into consideration for this research, were thought useful to describe because they are also found in Montessori educational project.

Motivation to learn is one of the major factors in achieving objectives set.

Studies into motivation have shown that repetition increases the ability of a subject to perform a task (Novello, 2012). For example, it has been noted that a motivated student is more focused on their work and invests a large amount of time into achieving the desired result. In an educational environment, students can learn that attention and constancy are two fundamental qualities that can be used on all occasions throughout life.

When arguing about motivation it’s necessary to make a distinction between extrinsic motivation and intrinsic motivation (Deci and Ryan, 1975). The former is related to some external reward, which means that it is determined by the reinforcements coming from the outside. In this case, students are motivated to commit in order to receive good grades and recognition (positive reinforcement) or, alternatively, by fear of being punished or mocked

(negative reinforcement). The latter on the other hand is determined by a natural interest in a task that is considered pleasant or interesting. The subject is therefore led to act for their own interest, curiosity or challenging aspects the task presents, leading to an internal drive to manage the task effectively and efficiently (Olsson, 2008).

Deci (1975) believes that motivation can change its nature throughout time; for example, a task initially imposed by obligation (extrinsic motivation) can be rediscovered as a pleasant exercise (intrinsic motivation). This can happen in both directions.

A different interpretation is given by Rheinberg (1997), who believes it is better to abandon the distinction between intrinsic and extrinsic motivation: he claims in fact that the concept of intrinsic refers to situations so diverse that it would be impossible to unify them in a single term and, therefore, it would be better to analyze them one by one without relying on the concept of intrinsic.

By translating Rheinberg's interpretation into a scholastic context, it would be necessary to analyze the different situations so as not to create motivation through external stimuli, by using grades or punishment, but to seek the internal motivation in each student. Not giving relevant importance to the distinction between the two motivations, we will focus on students' needs, who gradually will begin to know themselves and their own interests. In addition, they will be able to use effective behavior to improve their own learning as they become aware of their own competence.

1.4 Motivational components of learning

As we have seen in the previous paragraphs, motivation is not a unitary process, but represents a set of cognitive and affective aspects that must consider the individuality of the student and the situation.

In this section, some of the components that determine and support the motivation to learn will be explored. Motivational components are a set of cognitive, emotional, and self-perceptive processes implemented by the individual in a learning context (De Beni, Moè, 2000).

The components that will be described are listed as elements that constitute intrinsic motivation, and are epistemic curiosity, effectance motivation, self-determination, and interest. Focusing on the analysis of these motivational components resulted useful to us since they are found in studies by Maria Montessori and in her educational project for kindergartens and primary schools.

1.4.1 Epistemic curiosity

A definition of epistemic curiosity is provided by Berlyne (1960), who identifies it as a drive, or better an impulse towards the need for knowledge. It is a trait that typically occurs in children and manifests itself with the need to touch objects and explore the surrounding environment.

> La curiosità può essere stimolata dalla noia del soggetto e quindi dal bisogno di nuove stimolazioni o dalle caratteristiche strane ed inconsuete dell'ambiente. La noia e la conseguente ricerca del nuovo possono generare una curiosità di tipo epistemico che tende alla ricerca di conoscenza. Le peculiari caratteristiche dell'ambiente o della situazione possono stimolare una curiosità di tipo percettivo e specifico che consente di ottenere informazioni (De Beni, Moè, 2000, p.53)

Therefore, in the epistemic curiosity theory, the environment plays an important role and the richer in stimuli it is, the more it will increase children's curiosity.

By comparing an environment to the Schumann Stimulus Appraisal model (1999) we can identify 5 requirements to define a motivating environment:

- it contains elements of novelty;
- it is pleasant to see and be within;
- it is functional to the student's needs;
- it allows work, adaptability, and flexibility;
- it boosts social and psychological security.

Motivation to learn can be expressed as a need to know how to fill the lack of information or ignorance towards a specific subject. A perfect example of this phenomenon is the psychology behind crime movies, in which the desire to know who is responsible for the

crime makes sure that it is not possible for the viewer to turn off the television until there is no longer any shadow of a doubt.

Another important concept regarding curiosity, is what Stipek (1996) called optimal surprise, a situation in which the environment is motivating, and the child is interested in learning about the environment itself, therefore beginning to explore it (phase of free exploration) (Stipek 1996). When the environment is full of stimuli new to the child but at the same time feasible for them to achieve, a strong sense of wondrous drive will be nurtured (for example, in a classroom the child must be able to open drawers or pull out objects from shelves). Environments which contain either too many or almost no elements of novelty and feasibility will not lead the child to achieving this sense of surprise.

As will be described in Chapter III, using the same method introduced by Bruner (1961) in the educational field, Maria Montessori proposes the creation of environments that are rich in stimuli, where the child is free to explore the surrounding space and materials in it. The aim is to make them feel satisfied in their own discoveries, which would therefore be the result of their own will and not external impositions.

Although curiosity is a motivational component that can generate learning, it has its limits. In fact, curiosity is temporary and therefore supports motivation for short period of time, but it cannot be considered the only resource behind learning.

1.4.2 Effectance motivation

In 1959 Robert White defined the motivational component of effectance. It differs from the need to discover described as curiosity, but it represents a thirst for knowledge and control of the environment; it's fulfilled by the feeling of effectiveness and competence (White, 1959). This type of motivation also occurs in the absence of stimuli given from an adult in fact, as noted by Piaget (1936), is a trait that appears in a child from birth, and it is manifested as a constant interaction with their surroundings.

Harter (1978) elaborates White's studies and proposes a more complete model that illustrates the effects that this type of motivation produces in a child, whether it is sustained or ignored. In addition, he identifies three areas of activity that the child tries to master if supported by the motivation of effectance: cognitive, social, and physical.

Both scholars, Harter and White, reached the conclusion that the relationship between subject and performed task depends on the perception of success in attempts to master said task; the subject therefore compares their multiple performances to classify them as successes or failures.

Harper's model compares the development processes of motivation from two different upbringings: in the first case the child is supported by positive reinforcement and by the approval of an adult during their attempts to master a task, they will develop a self-reward system. According to this system, the child will be less and less dependent on the approval of the adult and will develop their own goals of mastery. Only in these optimal conditions, the child is able to realize their own abilities and test them. The aspect of self-challenge and the sense of self-control lead to a pleasurable learning experience and to an increase in the motivation of effectance.

In the second case, where attempts at mastery are discouraged or disapproved, the child will develop the need for external approval which will tend to increase during their development. Dependence on the outside does not create goals of mastery but needs of approval and fear of incompetence. In this situation, motivation of effectance decreases as any failure will generate anxiety and sense of incapacity.

The second situation described is typical of a controlling environment and is still found in Italian school system. In fact, in many schools, students judge their abilities based on grades, rewards and punishments determined by the teacher. This does not lead to the development of competence but to the fear of failure and therefore to a notable decrease in motivation.

In conclusion, in an environment that promotes independence and autonomy, the student will be able to develop intrinsic motivation; otherwise, extrinsic motivation and dependence on the outside will take over.

1.4.3 Freedom of choice

In addition to the first two motivational components (need for knowledge and feeling of competence), motivation is also linked to freedom of choice. To understand this concept, it is necessary to refer to the self-determination theory proposed by Deci and Ryan (1985). The two psychologists developed a theory of motivation based on the human need for growth

and achievement. In order to achieve these goals, they declare the importance of free choice regarding the actions of the subject: in fact, results obtained from a series of experiments have shown that subjects placed in conditions of free choice are more motivated than those who are imposed to complete a task.

The theory of self-determination shows how important it is to foster autonomy within the subject, so that they can develop an intrinsic motivation that it is not determined by external impositions. Logically, a subject aware of their freedom and therefore not bound by external impositions, carries out tasks with greater commitment and dedication. The theory of self-determination not only concerns the increase of motivation, but also relates to the need for effectiveness and competence analyzed in the previous paragraph, because a self-determined subject is aware of their abilities and finds a motivational thrust within them.

The environment plays an essential role for self-determination of subjects, if it can meet their needs for competence, autonomy and relationship (De Beni, Moè, 2000). This implies being able to act consciously and freely within the environment and obtain approval from those who share the same space. In an academic context, self-determination favors students' needs for achievement.

1.4.4 Flow and motivation

The concept of flow (or "optimal experience") was defined by the psychologist Csíkszentmihályi in his flow theory. Applied to the field of education, it is defined as a situation of full involvement experienced during an activity that it is considered pleasant by the subject. In this ideal situation, the subject focuses their attention on the task they are carrying out, rather than on achieving a result, and does not let themselves be distracted by external factors (Csikszentmihalyi, 1990). This type of motivation is characterized by the successful management of the task and its implementation.

The “flow” experience is also characterized by some elements such as an adequate balance between the perception of difficulty of a task and the perception of one’s level of ability, the definition of clear goals and the perceived feedback of their skills. A subject in a state of flow is highly concentrated because they find the task stimulating to perform and don’t care about the time it takes to be completed. In addition, they are a subject in control of their own

actions and abilities. For example, Csíkszentmihályi adds that the reason behind the appreciation a specific activity doesn't lie with its previous recording in the nervous system as a pleasant experience, but rather generates from the encounter with something new that stimulates interest (Csikszentmihalyi, 1993).

In an example proposed by Csíkszentmihályi there is a subject that is initially disinterested or bored by a particular activity, such as listening to classical music. The subject's perception will begin to change from the moment he finds real opportunities to pay attention and discover the pleasure of listening.

The example aims to highlight how the discovery and subsequent role of emotions is able to promote changes in personal tastes or interests and consequently create a type of essential motivation that can promote the flow experience (Pace, 2014).

1.4.5 Interest

There are many studies regarding interest and different applications of this concept. Initially considered in the '90s as a fundamental component for learning, it was subsequently re-assessed in different theories.

Whilst trying to define "interest", one must consider that it includes aspects of different nature: individual aspects, related to personal interests; environmental aspects, which include the degree of attractiveness of an object, task, or activity; and finally social aspects, which determine interest based on a specific social context.

As far as contextual learning is concerned, Krapp, Hidi and Renninger (1992) identify interest as an effect of the interaction between individual preferences and the characteristics of the material and the situation. At the cognitive level, interest leads to a greater commitment and persistence in the performance of a task, while at the emotional level, it stimulates pleasure and increases satisfaction (Reber, Canning, Harackiewicz, 2018).

It is important to clarify the difference between curiosity and interest, as they might be considered synonymous. Curiosity appears at an early stage, where it prevails over the need to understand the environment; subsequently, interest is developed as a constant element in the interaction between an individual and the material that they consider interesting.

Therefore, if maintained over time, interest represents an element of strong intrinsic motivation (Reber, Canning, Harackiewicz, 2018).

One of the educational challenges of this century is to train students on how to be motivated.

In school, promoting interest in students is essential since it improves learning and persistence during studies and therefore has an important role in creating motivation. In order to achieve these goals, scientific research has identified the advantage derived from the customization of each learning experience.

Research conducted by the psychology department of the University of Oslo examined a series of intervention proposals to personalize education. The term personalized education has been reinterpreted by the medical term “personalized medicine”, which consists in customizing medical treatments based on the biological characteristics of the patient. Similarly in personalized education, interests, values, and preferences of each student are taken into account, so it can become possible to create unique learning paths. Predisposition to participate in activities that provide pleasure and satisfaction and have an intrinsic value for the student is defined as "individual interest" (Reber, Canning, Harackiewicz, 2018).

The suggestion to customize education takes into consideration three areas of intervention: context personalization, the possibility for students to choose which materials to use (learning choices) and active participation in the personalization of content (active personalization).

First, customizing the context means providing students with a quantity of materials carefully chosen based on their interests. Therefore, the contents and tasks will be based on students' tastes so that they can be directly and personally involved in the activities. Based on studies by Hoheim & Reber (2015,2017), Ku, Harter, Liu, Thompson, & Cheng (2007), Bernacki & Walkington (2018), we to say that the personalization of the context increases interest in tasks and involvement of students.

Secondly, studies have shown that the possibility to choose between different tasks increases students’ interest in performing the task. Høgheim & Reber (2015, 2017) and Reber, Hetland, Chen, Norman, & Kobbeltvedt, (2009), further expanded the field of investigation, testing an approach defined “example choice”. This approach consists in connecting learning materials with the personal interests of students; therefore, it is not only a matter of being

able to choose, but to make a meaningful choice for the student who will consequently be more involved in the performance of the task they have chosen. Although new research is needed, it can be said that personalization of choice is an excellent strategy to promote interest.

Finally, active participation is the students' contribution, that is responsible for providing a relation between the study material and their interests, preferences, or future aspirations.

The active participation's efficacy can be found in studies by Canning and Harackiewicz (2015), which consider the usefulness of an external intervention that is able to make students aware of the value carried by the contents they study. The intervention can take place in two ways: non-personalized and personalized.

In the former, students are passively informed about the potential usefulness of learning materials for success in their professional and personal life. In the latter, students are asked to write an essay in which they must identify the usefulness of educational contents that have a value in different aspects of their personal lives. Results have shown that personalized intervention promotes interest in students with low levels of self-esteem, while non-personalized intervention promotes interest in those with high levels of self-esteem.

Further studies by Canning (2018) have shown that personalized interventions are able to bring out long-term individual interests and not only situational interests in students. Other types of intervention that have been tested for specific school subjects, such as mathematics and science, concern the possibility of merging students' interests with the topics at hand. One way to do that is by using different paths, such as storytelling, asking question or solving problems. Further research is needed to validate the effectiveness of these techniques and extend their use to all school subjects.

Research on personalized education has highlighted the importance of stimulating materials that should be based on students' interests.

In order to promote the aforementioned interest, there are some criteria for the choice of materials, which are novelty, clarity, presence of paratextual elements and connection to reality.

The combination of these elements contributes to helping students in the learning process, creating conditions in which attention and commitment can be maintained without requiring too much effort and a loss of motivation.

1.5 New developments in motivation studies

Contemporary research on motivation is investigating the complexity of motivational processes by considering student's life in their "dynamic interactions with a multiplicity of internal, social and contextual factors in our modern and increasingly globalized world" (Dörnyei, 2014). Dörnyei refers to a particular type of motivation, which is the drive towards learning a second language, however, the aforementioned can also identify motivation in general by pointing out the importance of considering the "ongoing multiple influences between environmental and learner factors" (Dörnyei, 2014) as key elements in an integrative approach that looks at students' motivation.

The first three decades of motivation studies ('60-'90) saw the development of almost only structuralist theories, whose aim was to analyze the functioning and the constituent factors of motivation through psychological studies. However, these theoretical approaches had no use to the practice of education (Cucinotta, 2018). A change of perspective occurred when scholars took a step forward deciding to investigate motivation as an educational tool that can be used to improve learning.

Over the past 20 years, the quantity of research on the practical aspects of motivation has been increasing. Recent studies have explored how motivating behaviours impact the classroom. As a result, a large number of motivational strategies have been studied and put to the test in different learning environments in order to provide teachers with effective methods to improve drive in their students and, consequently, to promote their academic success (Cucinotta, 2018). Since Dörnyei's (1994a) list of motivational strategies, research has started to spread all over the world, adapting to different cultural settings. Although the creation of evidence-based practice is still low in numbers and needs to integrate new cultural and social milieus, future research should also generalize the use of motivational strategies to make them useful in every learning context.

Moreover, results have shown that motivational strategies are context-dependent; there are however some strategies, such as those related to teachers' attitudes and positive learning environments, that are cross-cultural (Cucinotta, 2021).

As we cannot separate the student from the environment, we might consider this relationship as another dimension to be considered among motivational components. Dörnyei pointed out that there are studies which confirm that student's motivation comes not only from internal or external factors, but also from a successful learning experience (Dörnyei 2014). To create the conditions for said learning experience, we should include both individual and group dynamics. Moreover, the use of motivational strategies promoted by teachers are essential during the entire learning process.

According to Dörnyei's framework of motivational teaching practice, a pleasant and welcoming environment aims at creating the basic motivational conditions in the classroom, however, teachers need different strategies to maintain and protect motivation in the long term (Dörnyei, 2001). For example, using motivational strategies that promote cooperation among the learners.

1.6 Successful learning experience: group dynamics

It has been previously affirmed that motivation should been maintained over time. A successful learning experience can be enhanced by promoting cooperation amongst students. Research in social sciences has shown that a group learning the same subjects has a powerful influence over the single member as it might help less motivated students to cooperate in order to obtain success as a group. According to Dörnyei, group dynamics can make a classroom more creative, well-balanced, and cohesive, all elements that have an impact on motivation.

Group cohesiveness and group norms form the two areas of group dynamics. Group cohesiveness is represented by the degree to which students support each other (Amiryousefi, Amirian and Ansari 2019), while group norms regulate the life of learners in the classroom in order to maintain a positive and supportive environment.

In order to promote group cohesiveness, it is important that students cooperate towards common goals. Alongside group activities, a significant role is played by three elements that

enable students to cooperate: proximity, contact and interaction. The physical distance between students, their communicative contact and their interaction are “effective natural gelling agents” (Dörnyei, 2014) that define a cohesive classroom.

Regarding the correlation between motivation and cooperative classroom atmosphere, it was considered appropriate to explore this relationship in the research part of the thesis. Thus, it will be investigated whether the classroom’s environment encourage interaction between students and, consequently, whether it will improve their motivation.

This chapter has analyzed the concept of motivation as defined by psychology studies; it has been described as the relationship between motivation and learning and then examined in order to promote students’ success in a scholastic environment.

Of great interest for this research is the role played by the environment itself, as it is an initiator and promoter of motivation in school; this will be analysed in the next chapter.

Examples of innovative and functional learning environments present in different European schools will also be described, along with the decision to consider other models than the one specific to this research (Montessori school), that is justified by the intention to expand the field of research by providing a greater number of good practices.

Chapter II

Learning Environments

2.1 Learning Environments as a motivational factor

The term *learning environment* refers to the space the learners live together with peers and teachers. After their home, it is the second place where they spend most of their time and where they are formed as citizens of a community. Therefore, the school is an inhabited place and as such "must present the same standards of well-being and habitability as public and private structures used for citizenship" (Borri, 2016, p. 7). Maria Montessori also embraces this concept of "school as a home" in her educational project aimed at the Children's Homes (schools for children between the ages of 3 and 7).

In recent years, studies on learning environments have shown how the reorganization of school spaces can influence students' motivation (González-Zamar, Jiménez, and Sánchez Ayala, 2021). Indeed, the classroom and the whole school are no longer understood as mere architectural structures and places of knowledge but as spaces where relationships and affections are built, and where the skills needed to become a citizen of a community are developed.

Continuous advances in technology and the introduction of new pedagogical strategies created changes in the education system, which is welcoming technological equipment as an ally of modern teaching, as it can be reorganizing spaces based on the students' needs.

Adapting the educational ecosystem to the needs of students leads to a rethinking of spaces, which must therefore be structured to promote student well-being and make them feel valued and integrated (Maxwell, 2016). Research has shown that students' perceptions of the structure and condition of spaces affect their performance and motivation (Castro-Pérez, M., Morales-Ramírez, 2015). In addition, when considering the social aspect, the design of spaces must be able to encourage exchange, interaction and collaboration between students. Numerous studies confirm the relationship between the student well-being and the functionality of spaces. Based on this link, the learning process is favoured by the positive conditions promoted by the environment. (González-Zamar et al., 2021).

Referring to the classroom environment, Johnson & McClure include both psychosocial and physical aspects. By physical aspects we mean those concerning classroom objects, such as lights, colours and technological equipment. While by psychosocial aspects we intend the relationships between peers and between students and teacher (Johnson, McClure, 2004). This research will examine these aspects, excluding the relationship between students and teacher, with the aim of identifying their motivational value.

According to environmental psychology studies, didactic planning aims to foster the interaction of the learner with the environment. The didactic space, moreover, must provide the students with the tools that promote their independence and autonomy (Maugeri, 2014). For the realisation of such, it is necessary to create the optimal conditions to make the student's learning experience comfortable, and thus lead them towards the awareness of their need to learn.

Research affirms that, to give value to the learning experience, "it will be fundamental to take care of the organisational aspect of the space in order to facilitate the story of all the socio-cognitive and emotional passages of the student" (Maugeri, 2014). In fact, the methodological choice of teaching depends on the type of spatial organisation. Therefore, if different layouts correspond to different methodologies, is it possible to identify a type of design that promotes student motivation?

A plausible answer can be found in the comparison between two visions and uses of the classroom and the importance that both assign to the role of the student.
The first educational environment, the one that can be defined as 'traditional', is characterised by being an unchanging, static space with essential furniture. Because of its static nature, there is no movement of neither furniture the objects nor the students, so there is no relational, or dialogical relationship, and knowledge is transmitted in a one-way manner.
This type of organisation contemplates desks arranged in neat rows facing the teacher's desk: the teacher is the holder of knowledge, and the student plays a passive role, as his learning is based on repetition, fixation and memorisation.
According to this approach, space does not play a relevant role in the learning process, but only serves to contain a certain number of students. This type of environment turns out to be immobilising as it not only limits the movement of the student, but also the possibilities of activating creative and explorative processes.

Maugeri (2014) identifies the values that characterise a traditional teaching approach, observed in the Technical Institute of Culture in Tokyo, corresponding to: low enthusiasm, low confidence, individual work, isolation, few alternative resources to the teaching manual, demotivation, little attention to the cognitive development process of the learner and denial of others. These values can still be found in Italian schools that base their teaching on traditional approaches which, as already mentioned, are not able to meet the needs of the students.

On the contrary, the second type of educational environment, based on the humanistic-affective theory, promotes the interaction of the individual with the environment. This interaction favours the movement of the subject who relates to others and to his surroundings, favouring his creative freedom. Therefore, the importance of these environments is represented by the experiential dimension of the student who is placed at the centre of the learning process. A "student centred" design model is based on the attention paid to the following four dimensions: spatial, social, didactic and learners' (Maugeri, 2014):

- the spatial dimension concerns the conformation of the environments and of all the elements present in them. It plays an important role in the motivational process because of the emotional impact it provokes in the student. In fact, elements such as light, colour and dimensions of the classroom, enter the student's perceptive system and can promote or not his motivation;
- the social dimension concerns the type of relationship between the organisation of spaces and social relations. For example, a horseshoe arrangement of desks will encourage group discussions, while an organisation of desks grouped in islands will promote the collaboration of small working groups;
- the didactic dimension considers the methodological choices made by the teacher on the basis of spatial organisation, course objectives and students' needs;
- the learners' dimension pays attention to the explicit or implicit demands of the students concerning the improvement of their learning experience.

In the modern vision that promotes the knowledge society, as opposed to the obsolete industrial society, the active involvement of the student and his freedom of action are the elements that the school must define in its educational plan (Borri, 2016). Moreover, the new school does not only represent a place of study but must be an "inhabited" place where the

student experiences himself and others, and therefore a place where emotional and relational dynamics come into play. The elements just described reveal the need to review learning spaces, indeed:

> The traditional setting with lined-up desks is obviously no longer functional to support teaching methods that provide for an active involvement of the students, limiting their possibilities to a single use: frontal lesson. The learning environment, flexible and multifunctional, designed to meet different needs and facilitate diversified teaching activities, therefore becomes a functional space for the needs of each student and the curriculum (Borri, 2016, p. 20).

An environment that responds to the relational and experiential needs of the student must be aesthetically pleasing to increase motivation to be in the classroom: it must be a welcoming and comfortable place to encourage study and concentration, the elements must be arranged in such a way to encourage communication (the environment must be configured as an interactive and easily reconfigurable environment); it must instil confidence aiming to not compromise the student's image. A learning environment structured in this way aims to promote the well-being of the student and therefore to make being at school a pleasant experience (this is the objective of the Montessori educational project).

In contrast to the traditional classroom, the student-centred learning environment is a reassuring environment that enters the emotional and sensory sphere of the student and conditions their positively to put themselves at stake and experiment their skills. According to this vision, the classroom should no longer be understood as a place of anxiety, where there is fear of the judgement from the teacher and peers but should represent a place of sharing knowledge and collaboration between students.

In conclusion, to take up the question, whether it is possible to identify a type of design that promotes motivation, the answer is: yes, for those learning environments that provide an effective and flexible spatial organisation, and that are presented as well-kept and engaging environments capable of transmitting positive feelings to those who inhabit them. Therefore, it is important to stress the importance of spatial reconfiguration combined with factors that can stimulate the perceptual and sensory spheres, in order to promote students' motivation and creativity (Maugeri, 2014).

2.2 Learning Environment: Third Teacher

The physical and social environment is an essential factor in the development of an educational project and is often referred to as the "third teacher" (the metaphor of space as a third teacher is due to the pedagogue Loris Malaguzzi). In fact, the environment does not only play a functional role, but represents a cultural tool that collaborates, together with the teacher, in the transmission and interpretation of knowledge (Tse et al., 2015).

The need to make school environments functional for learning was highlighted in the 2013 school building guidelines published on the Miur website, where the problem of "anaesthetising" classrooms that characterises many Italian schools (classrooms that are all the same, single colour, bare, sad) is highlighted. There is a clear need to intervene in order to make environments habitable and flexible, capable of accommodating the people in the school by offering functional, comfortable and welcoming spaces.
Flexibility is a key concept in the rethinking of spaces since it is aimed at encouraging students' autonomy. Indeed:

> [the new spatial configurations] are based on a principle of autonomy of movement for the student that only a flexible and multifunctional space can allow. Thus, the space in which the teacher initiates activities or gives directions to students will become, in the next segment of the teaching activity, a space organised for collaborative activities between students, in which each may have an individual task that also makes sense within a group. It is a way of working in which the peculiarities and different skills of each individual are valued and included in view of a common result. In this environment, the teacher does not have a 'fixed' position, but moves between the various tables, offering his irreplaceable role of support and facilitation to the learning that takes place within each group. (Ministry of Education, University and Research, 2013)

Thus, space defines the learning context and takes various forms. A one-way learning mode (typical of formalistic and structural approaches) is limiting, as there are multiple ways of knowing and learning of students and, therefore, different must be the learning spaces: the classroom, the garden, the laboratory, the desks, the floor, the mattresses, in large or small groups and individually (Infantil et al., 2017). In modern learning environments, the introduction of technological equipment and the flexibility of communication and interaction encourage the negotiation and sharing of ideas, unlike traditional learning environments, which are based on receiving information only.

In addition, a flexible design of spaces allows the development of multiple intelligences, as theorised by Gardner. In fact, a didactic approach in which activities and spaces are diversified makes it possible to enhance the potential of each student and to encourage different learning processes. In contrast to what happens in a traditional classroom, where education is standardised, the same for everyone.

According to pedagogist Carla Rinaldi, during childhood (a period that also includes boyhood) the relationship between the child and space manifests itself as a need (Rinaldi, 2011). Space has a language that the individual tries to translate and understand.
Since the perception of space is subjective and holistic, each individual understands the environment differently through the five senses. Therefore, the environment also teaches in a form that helps the child to experience their senses, so that they can use them to understand their surroundings.

In addition to the flexibility of spaces and functional furnishings, there is also the importance of the aesthetic dimension, which is an essential quality in the design of learning environments, as it is part of the plurality of languages that make up knowledge (Infantil et al., 2017). Attention to aesthetics is aimed at improving visual comfort (colourful, bright spaces), acoustic comfort (acoustic quality and insulation), climatic comfort (temperatures that promote physical well-being), ergonomic comfort (comfort of desks, chairs, workplaces) and organisational comfort (Maugeri, 2017).

A learner who is placed in an environment that is also pleasant at a sensory level will be stimulated to participate with greater motivation and interactivity, and consequently be supported in his or her learning. Research conducted by the University of Salford has shown that the quality of learning environments influences the quality of the way people learn. The project, which involved 27 primary schools in England, identified environmental factors that impact on student learning. From the data collected, the area that has the most influence on students is called Naturalness (as opposed to Individualisation and Stimulation) and includes the quality of light, temperature, and air. Colour and the complexity of the space are also factors that need to be considered. Thus, a pleasant environment is also an effective environment (Barrett et al., 2015).

In conclusion, future design and reconfiguration of spaces should take into account the elements of flexibility and multifunctionality of spaces and promote the aesthetics of beauty.

2.3 Innovative Environments

In this section we will discuss innovative environments as a key element in terms of improving learning. Modern school environment design must be responsive to the needs of new generations and social change. In fact, the modern generations "are called upon to know and interpret new languages, deal with innovative learning experiences, engage their brains and bodies in cultural, sporting, linguistic and artistic activities that prepare them for a much more competitive and global reality" (Dossier Tuttoscuola, 2013). The need to rethink learning spaces supports the development of modern didactics, based on the relationship between the individual and the lived environment and centred on the student, in order to create new organisational models based on the needs of those who live in the school. The search for new solutions concerning school architecture and furnishings must be functional to an immersive type of education (use of technology as a tool to support teaching and learning) and the promotion of active student participation.

An innovative school has the role of integrating three different types of education: formal education, based on school curricula, non-formal education, which has educational principles but is not part of the formal system (e.g. language courses, computer courses, or other skills), and informal education, which takes place in everyday life and relationships. In Italy there are still few schools that have understood the importance of integrating these three dimensions, unlike Northern European countries which are achieving better results in terms of formal learning by combining normal education with non-formal and informal education opportunities.

Research by the OECD (Organization for Economic Co-operation and Development) confirms that an "innovative learning environment framework will have...a rich mix and diversity of pedagogical practices with highly visible personalised approaches" (OECD, 2015, p.13). In order to promote personalised learning, there has to be a shift from a teacher-centred to a student-centred scenario. In line with this change, new spaces should be designed to foster learner autonomy and guide learner learning. Personalised learning is flexible, involves students in defining their goals and organising their study work, and is also collaborative learning between students and teachers (Cardno et al., 2013).

The access and the understanding of technological equipment is another point in favour of personalised learning, as it supports student learning and a different way of learning that is just as stimulating as traditional teaching.

According to a study conducted by the Centre for Educational Research and Innovation, learning spaces and digital resources are the elements that must be considered in a school innovation plan (OECD, 2013). They fall into the Resources category and are closely related to a system that includes Learners, Educators and Content. Considering all these elements for the creation of innovative practices, it has been shown that innovation is closely linked to the social and local context. Indeed, innovative practices can hardly be called universal, but have a context-specific nature. An educational institution wishing to innovate its school has to take into account which approaches and practices are best suited to the social and cultural context of the place. New designs will be based on a dialogue between school leaders, teachers and people in the community. Dialogue between people inside and outside the school is essential to create the continuity that will foster students' social inclusion once they leave school (OECD, 2013).

2.4 Innovative use of space

The 21st century, characterised by globalisation and unpredictable social and economic events, is an indicator of which key aspects education must support, i.e. preparing new generations for an uncertain and always changing future. Modern education must focus on the development of skills such as adaptability, creativity, collaboration, but also autonomous decision-making (Atkin, 1999). These skills are not simply taught (learning by studying) but learned by doing in environments that allow them to develop. These are environments that inspire creativity, active participation and the development of a personal view of things. In this way, learning becomes motivating for students who recognise its effectiveness. In her Compendium of Exemplary Educational Facilities, Julia Atkin argues that the educational experience should facilitate personalisation over institutionalisation, integration over segregation (OECD, 2011). Integration can be understood as the relationship between the internal and external environment, but also as social and cultural integration.

Atkin draws up the following list of characteristics that must distinguish innovative environments:

- promote the learning of students and the whole school community through collaboration, interaction and research.

- to support different learning and teaching strategies through direct and indirect methods;

- to support interdisciplinary teaching activities;

- to expand the concept of flexible space, creating multifunctional spaces for active and dynamic workers;

- support individual learning, in small and large groups;

- be appropriate to students' age and cognitive development;

- facilitate learning in any place and at any time through access to ICT and other accessible resources in the spaces;

- make outdoor spaces accessible, using natural environments for learning;

- promoting community responsibility and participation;

- making buildings, building design and outdoor spaces, tools for learning (OECD, 2011).

From these indications it can be deduced that effective learning must be fostered by a wealth of resources, settings and teaching. Didactics must increasingly integrate strategies that include the use of ICT, but also the contribution of spaces outside the school and those that do not strictly belong to the "classroom" system, such as corridors, stairs, halls. As environments are promoters of knowledge, they must be designed and prepared by a team of specialists, including not only the teaching staff, but also architects, interior designers, urban designers, educators and public authorities. Through collaborative work, school spaces can be improved to support student learning and motivation (OECD, 2013).

Chapter III

New school planning in Europe and Italy

3.1 Perspectives on quality education

Improving the quality of education has been a topic of debate in Italy for many decades. The pedagogical activism finds its roots in authors such as Don Milani, Montessori, Dewey, Freinet, Malaguzzi, and nowadays it seems to be influenced by educational innovations at European level. The drafting of the National Indications (2007, 2012) promoted by the Ministry of Education (MIUR) has led to the outlining of a profile based on competences that allow the new generations to "exist" and "operate" in a complex society (National Indications, 2012). Therefore, schools must promote and train active citizens capable of implementing democracy (National Indications, 2012). The methods expected for achieving these objectives can be summarized as follows:

- promotion of lifelong learning for social, individual, economic, and cultural development;

- educating young people to be intelligent, creative, competent to live in a complex and multicultural society (Nussbaum, 2012);

- improving the quality of education to cope with early school leaving.

Learning modes have also been the subject of analysis. Neuroscience has shown that cognitive modification is the result of a process of continuous interaction between people, objects, and facts in context (Dumont et al., 2010). This emphasises the possibility of improving learning processes through the influence exerted from other individuals and by the environment in its broadest sense.

Research has also shown that learning is more effective if it is shared. Learning understood as a social action (Bandura, 1997) is constructed through the processes of interaction, debating of meanings and cooperation with others. In addition to this, there is deeper learning when the students are engaged in activities that require a higher cognitive effort, activities

that aim to the re-emerge of prior knowledge and that possess a value attributed to the social context (Bransford et al., 2000).

Ellerani recover the socio-constructivist theory, according to which knowledge of the world occurs through the subject's experience and emphasises the importance of experiencing as a way to transform one's inner world and perspectives. Moreover, experience is not only individually constructed, but is an interactive process.

To sum up, the contexts in which it is possible to develop competences and have meaningful learning experiences are characterised by environments that actively involve the learner in the construction of his/her own learning experience. These are collaborative environments, where work in groups or pairs is encouraged (Ellerani, 2013). The ability to learn is also supported by the students' reflection on their own experience. The development of metacognitive thinking allows the student to abstract the concepts learned from experience and reuse them in new contexts. The last but not least element that needs to be mentioned is the involvement of emotions in the learning process. Emotional implication plays a fundamental role in favouring or rejecting external stimuli and, therefore, new learning possibilities. Ultimately, experience is composed of practical, intellectual, and emotional elements (Ellerani, 2013).

Based on these considerations, the context in which the student is placed provides a climate of mutual acceptance and trust, it is intellectually challenging and stimulating, and it can foster motivation to learn. In addition, the place of learning is functional to active learning based on experience and co-construction of knowledge.

The practical implementation of the above will be discussed in section 3.4.

3.2 Construction of new educational spaces

The design of new classrooms and school environments originates from the need to create a type of didactics capable of responding to changing educational contexts. The educational function of space has long been the centre of pedagogical discussions, with educators such as Maria Montessori, Freinet and Malaguzzi, to name a few, playing a leading role. A point of reference for educational research in Italy is the Istituto Nazionale di Documentazione,

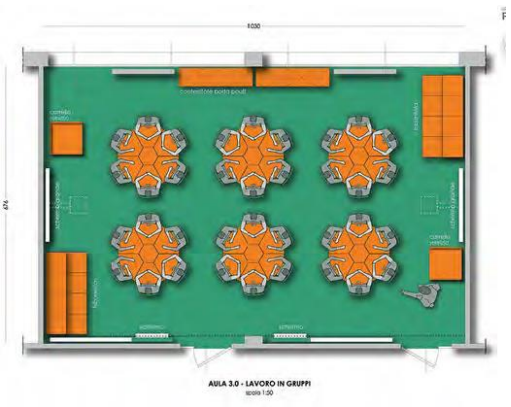
Innovazione e Ricerca Educativa (Indire), which has been working since 1925 promoting school improvement and innovation.

The new way of imagine environments highlights a shared participation between those who design schools and those who live in them. The sharing of ideas must be based on dialogue between different professionals who are able to respond to the needs of school users and society. Whether it is a new design or the conversions of existing buildings, the aim is to create schools with a variety of integrated and complementary environments in which students can experiment, discuss, confront, create, and reflect independently and in a shared way. Because of this, it is necessary to claim unused spaces, such as corridors and underused classrooms, and transform them into places of learning.

Indire's 1 + 4 educational spaces manifesto suggests the reorganisation of physical environments designed to create wellbeing, improve students' quality of life, and nurture an aesthetic sense. The model presented in Germany at the international conference "Environments for training. Learning Environments" is the result of several analyses concerning innovative schools at European level, analyses of educational policies and studies of technical regulations for school buildings.

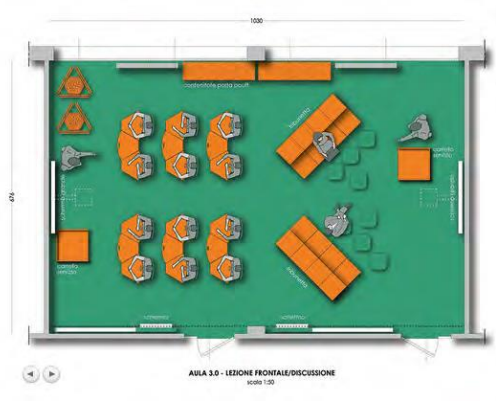
The model for educational spaces proposes a classroom layout that differs from the traditional model of closed and separate blocks and provides a multifunctional environment where the class group has the possibility to carry out different activities. This is guaranteed by the possibility of reconfiguring the desks to differentiate activities.

Debate mode.



Group work mode.

Group discussion mode.



Lecture/discussion mode.

Project review mode.

Verification mode.

Figure 1 Examples of classroom settings organised according to function. https://www.pacioli.edu.it/

In addition to this space, there are four complementary spaces: the agora, the exploration space, the individual space, and the informal space.

The agora is the meeting place of the school community, where daily activities or collective meetings can be organised. It is characterised by a large space, often equipped with projectors, tables and chairs to accommodate a large number of people.

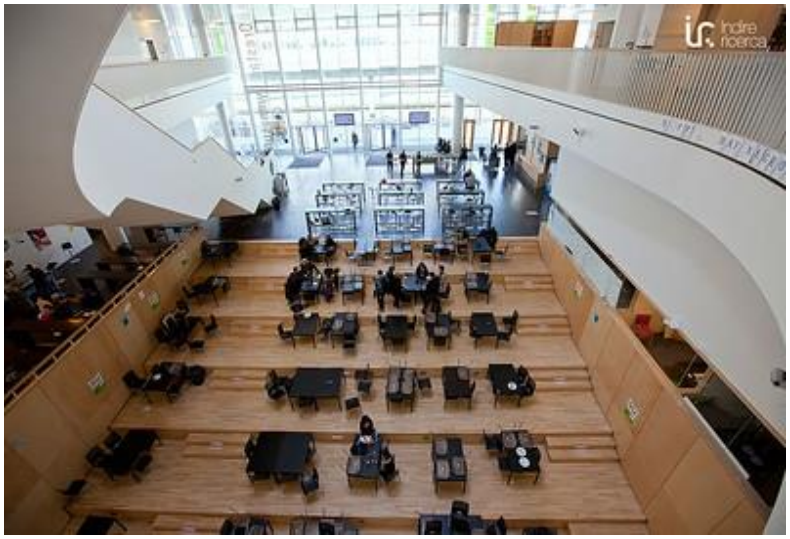


Figure 2 Ørestad Gymnasium - Copenhagen, Denmark. https://www.indire.it

The exploration space is the place of discovery, where the student learns by doing. It can be a computer lab, a chemistry lab, or a music lab. It is the place where the student uses dedicated tools to create, manipulate and experiment and therefore, develop problem solving skills, application strategies and observation.

Figure 3 Vittra TelefonPlan - Stockholm, Sweden. https://www.indire.it

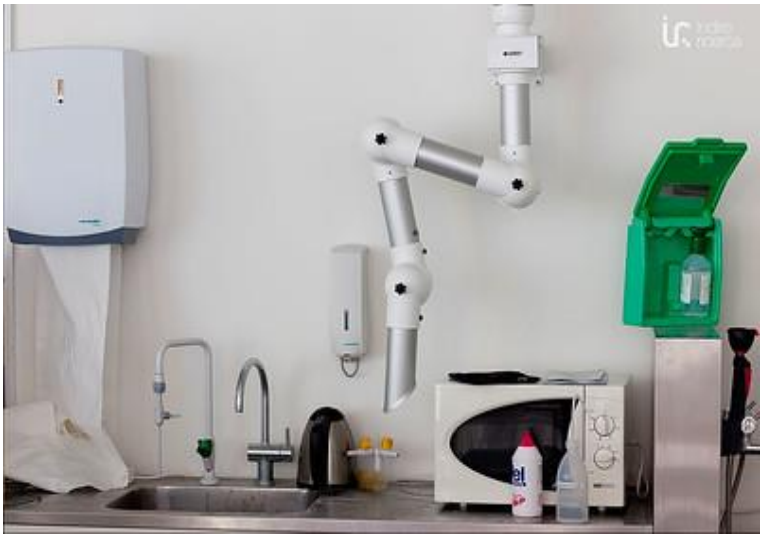


Figure 4 Ørestad Gymnasium - Copenhagen, Denmark. https://www.indire.it

The individual space is the place where students can manage themselves, deciding on work schedules, activities, and reorganising ideas. It is a cosy and quiet environment to promote concentration. In this space, resources and technological tools are available for free use, and it is a suitable place for the development of each student's autonomy and responsibility.

Figure 5 Vittra TelefonPlan - Stockholm, Sweden. https://www.indire.it

The last place is called the informal space and is characterised by comfortable furniture (cushions, sofas, ottomans, soft lighting). It is the place to rest, used during free time and breaks between classes, where the student can be alone or in a group.

Figure 6 Ørestad Gymnasium - Copenhagen, Denmark. https://www.indire.it

Figure 7 Library CFZ - Venice, Italy. https://www.unive.it

3.3 ILE framework for learning environments

Renewing teaching practices means considering all the elements that make up the training event (Castoldi, 2019), first of all the environments. According to this perspective, the design of environments should be thought based on the educational intentions of the school. The current learning objectives are summarised in the expression CSSC learning (De Corte, 2010). The acronym represents the four hallmarks of effective learning: constructive, self-regulated, situated and collaborative.

Constructive learning is acquired through the exploration of concepts and objects of study and the reworking of prior knowledge, combined with newly acquired knowledge. This type

of learning is achievable if self-regulated, where the subject is the protagonist of the knowledge process. In fact, the subject manages and monitors the acquisition processes, the student has expectations and he is guided by the reflection on the results obtained. Regarding the situated learning, it is important that what is learned is placed in a context. This is the 'theory of action', in which the subject acts within a social and operational context, and therefore becomes the protagonist of the learning experience. Finally, collaborative learning is oriented towards the construction of knowledge based on the interactions between subjects who, through communicative exchange, can co-construct shared knowledge (Castoldi, 2019).

Similar to Da Conte's studies, Instance and Dumont have identified seven key principles for the development of effective learning (Dumont et al., 2010). To be defined as innovative, a 21st century environment must:

- place the learner at the centre of the learning process, encourage active involvement, and develop awareness of the learner's role;

- build on the social nature of learning and encourage group work and co-operative learning;

- entrust professionals with the role of supporting students' motivation and emotions, to promote their personal and academic improvement;

- consider the individual differences of students, based on their different intelligences and prior knowledge;

- present programmes that are challenging and require hard work from students, but do not overload them;

- operate with clear expectations and employ assessment strategies in line with expectations; feedback should support learning;

- promote horizontal connectedness between subjects, but also with the community outside the school.

The presence of all these principles is aimed at defining an innovative environment based on an analysis carried out on already existing and performing realities that present themselves

as a guide to change for any school that wants to promote innovation in its environments (OECD, 2013).

3.4 Renewal of the educational space in Italy

Based on what has been described so far, this paragraph will present Italian school realities that have been able to accept the challenges of modernity and propose effective solutions for the creation of environments able to promote "well-being, welcome, flexibility, identity, but also sociality" (Donato et al., 2017, p. 11).

The schools that will be described are part of the Avanguardie Educative project promoted by Indire. The project has turned into a real Movement, established on 6 November 2014 in Genoa, and open to all Italian schools. Currently, 1350 schools participate in the project (in Veneto there are 71 schools adhering), which have the opportunity to adhere to a series of operational proposals ("Ideas for Innovation") promoted by the Movement, but also to experiment with new ones, so as to increase the "Gallery of Ideas" for the revolution of educational organisation.

Many of these ideas promote a transformation of the traditional learning setting and the possibility of a new use of space. The ideas of interest in the above research are those defined by the Movement as: Disciplinary Laboratory Classrooms, Flexible Classrooms (Classroom 3.0), and Differentiated Learning (Schools Senza Zaino).

3.4.1 Disciplinary laboratory rooms

The laboratory rooms are spaces set up and reorganised according to the discipline being taught. The classroom space is completely revised, as it is not the teachers who move from one classroom to another, but the students who rotate according to the various activities of the day. The classroom setting is functional to the specificity of the discipline, so furniture, books, instruments, materials, and devices are prepared and diversified for each environment.

It is not only space that is reorganised, but also time. In fact, the hours of the day's lessons can be organised according to related subject areas to build shared paths and projects and avoid the fragmentation of knowledge.

The methodologies adopted in these classrooms are those presented in the Manifesto of Educational Vanguards: cooperative learning, scenario-based teaching, public speaking, flipped classroom, project-based learning, MLTV (Making Learning and Thinking Visible).

The active participation of the student, together with the new organisation of space-time and the use of appropriate technology, generates involvement and motivation towards the study of disciplines; the better if the knowledge learned in one area can be transferred to other learning contexts, so that we can overcome the fragmentation of knowledge in favour of a knowledge capable of grasping global problems and objects in their entirety (Morin, 2001).

In the laboratory classroom, the furniture, technology, time, space, and materials are designed to promote the development of competences. The necessary objects for these classrooms are: interactive projectors, desks arranged in islands, devices for the students (tablets, notebooks, smartphones), a device used by the teacher (interactive whiteboard, tablet, notebook, etc.), and a communication system between the devices. Technological resources are essential in this type of environment, which must be versatile to enable the implementation of different teaching methods.

Classroom laboratories foster the development of competences through direct and indirect learning. The possibility of using acquired knowledge for the creation of products and solutions has a motivating effect on the student (Ellerani, 2013). Not only that, but students also learn to negotiate, share, and produce work in collaboration with others, helping each other in the pursuit of a common goal.

Another type of workshop designed for creative and collaborative activities in which students are the creators of their own work is the Makerspace. This is a structured environment for practical activities and therefore represents a space that can be integrated with those already present for teaching. Makerspaces can be located inside or outside the school; in the first case, they can also be used by outsiders during extracurricular hours or shared by several schools.

In this space, possible activities concern the analysis, experimentation, and creation of objects (electronic, mechanical, computer). It can also be used to develop interdisciplinary projects, as a practical integration of theoretical concepts. For example, the creation of musical instruments in relation to the study of music history; but also, the creation of architectural models with various materials or with the use of 3D prints (Attewell, 2021).

The activities are numerous and have several benefits:

- they support interdisciplinary learning;
- they encourage collaborative and active work;
- they support the acquisition of practical skills;
- they increase students' motivation, self-confidence, and self-esteem;
- they help students who have difficulties with traditional learning methods;
- they make study topics more interesting.

Makerspaces are safe, versatile, and comfortable environments. They need to be spacious places that allow group or individual work in which students can move around safely. Since the activities may involve several phases (e.g., design, implementation, testing), it is important to indicate the positions of tools and the rules of use. It must be a well-lit environment to allow a correct view of the instruments used. Electrical cables must be positioned so that they do not obstruct passage. Floors, walls, and furniture can be highlighted in different colours to indicate specific and easily recognisable areas.

The furniture that makes up the Makerspace is flexible and can be made up of easily movable tables and chairs, shelves for storing materials, large surfaces for creating materials, comfortable areas with carpets, cushions, and sponge cubes for discussion. In addition to this space, there are also areas for storage and positioning of tools and materials (Attewell, 2021).

Figure 8 Material from the Makerspace Istituto Comprensivo Lucio Fontana, Rome, Italy. https://icluciofontana.edu.it

Figure 9 Makerspace Istituto Comprensivo Lucio Fontana, Rome, Italy. https://icluciofontana.edu.it

3.4.2 Flexible spaces in Classrooms 3.0

Classroom 2.0 was introduced in 2009 by the Digital School Plan promoted by MIUR and envisaged the integration of digital technologies into teaching. Classroom 3.0 was born as an idea of innovation promoted by the schools themselves, which highlighted how the full use of technology can only be achieved in an active type of teaching, and therefore in a student-centred learning environment. The need to include, not only new equipment, but also a flexible type of furniture that gives rise to the multifunctional classrooms (Mosa & Tosi, 2016).

The reconfiguration of the setting is aimed at fostering student-centred teaching methodologies, e.g., learning by doing, problem solving, e-learning, but above all, peer-to-peer learning is encouraged, which brings students together.

An example of a 2.0 to 3.0 classroom transformation can be found at the Embriaco School in Genoa. Participation in the 2009 MIUR call for proposals enabled the school to equip a classroom with interactive whiteboards and tablets for each student. The innovation project continued until 2015, when the 3.0 classroom was inaugurated. It involves a reorganisation of the space, which is now open, without a desk, and designed to encourage interaction.

Embriaco's 3.0 classroom presents a dynamic and flexible environment, with circular workstations designed for collaborative work and communication between students. The teacher becomes the facilitator who moves around the space and has to stimulate reflection, encourage and inspire students. In addition, the classroom has areas structured by activity; there is a reading corner, a music corner, and a painting corner. The concept of student freedom and autonomy in the choice of work is reinforced.

Figure 10 Aula 3.0 furniture of the Embriaco School, Genova, Italy. Image from the article: Pozzi, N. Sugliano, A.M., Fra ricerca, innovazione e didattica: le Aule 3.0 del Comprensivo Centro Storico di Genova, p. 3.

Figure 11 Decomposable tables at IIS L.Pacioli, Cremona, Italy. Image from the article: Mosa, E., & Tosi, L., Ambienti di apprendimento innovativi – Una panoramica tra ricerca e casi di studio. p. 16.

Flexible space is not only limited to the classroom but can also include school corridors that are often not used. Since it is available space, modifications can be made to make it functional and usable during informal and formal moments of school life. The purpose of

these places is to improve student well-being and increase the overall quality of the school service.

The creation of such environments must be based on an analysis of the needs identified by the students. In general, they are characterised by being social spaces for living together and confrontation, where there is the possibility to read, relax and meet. For these characteristics, comfortable and colourful spaces should be created that convey a sense of welcome and security.

The settings can also have a didactic value, for example by providing tables, chairs, and Internet stations to facilitate individual or group work that would normally be done at home. Not only indoor but also outdoor spaces can be designed for informal activities.

Figure 12 Soft corner in the corridor of San Pio X Primary School, Perugia, Italy. https://www.indire.it

Figure 13 Library of the Istituto Comprensivo Statale di Cadeo e Pontenure, Piacenza, Italy. Image from the article: Mosa, E., & Tosi, L., Ambienti di apprendimento innovativi – Una panoramica tra ricerca e casi di studio. p. 18.

3.4.3 Differentiated Learning in the School Senza Zaino

The first SZ classes were created in Lucca in 2002 on the initiative of headmaster Marco Orsi. Orsi, based on the Montessori slogan 'Teacher teach us to do it ourselves', led to the creation of a type of school based on three key values: hospitality (as a pedagogical value of the environment), responsibility (for personal growth) and community (collaboration and sharing between subjects). From a project to a model, today there are more than two hundred Comprehensive Institutes in Italy, included in the innovative practices proposed by INDIRE.

The SZs are promoters of the innovative idea of "Differentiated Learning" which recognises as a primary value the enhancement of individuals' diversity. This is a cultural approach aimed at creating a community that recognises the talents and differences of its members. Values such as tolerance, respect, non-violence, and freedom are part of the educational programme and are put into practice during teaching activities.

The implementation of differentiated learning involves the rethinking of space, time, and didactics. The environment is designed such that several activities can be carried out at the same time; therefore, students distribute themselves in the space to carry out the different tasks organised by the teacher.

According to the SZ model, space conveys actions and is the protagonist of learning, so the monolithic structure of desks arranged in a row in front of the desk cannot be functional in

a type of environment that favours cooperative methodologies and the use of multiple teaching tools.

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Going back to the first founding value of the school, hospitality is based on the creation of comfortable and aesthetically pleasing environments. The preference is for liveability, which translates into safety, well-being, and health for the student. In the latter case the external environment acquires an important value for the healthy development of the student. In fact, the school can have a green area where students can grow vegetables and plants and create activities for the care of these spaces. In addition to this, ecology and respect for the environment are other elements to be considered when teaching life outside school.

The classroom has a flexible "atelier" conformation (with tables, thematic stations and differentiated materials), structured by thematic areas. Attention to aesthetics and the use of colour serve to give a sense of hospitality and create an emotional bond with the environment, so to promote care for it. Stationery materials are placed on the worktables to give the idea that objects belong to "everyone" and should be shared in a community. The remaining materials are placed on the shelves inside the classroom and are designed for the development of multiple languages (sensory, verbal, written, body).

Figure 14 Example of classroom organization in the School Senza Zaino. https://www.senzazaino.it/

Figure 15 Senza Zaino classroom at Marconi Primary School, San Bernardino, Italy. https://genitorisenzazaino.weebly.com

In this chapter we have shown some, even if limited, examples of innovative classrooms in Italian schools. Starting from examples of European excellence, we have described types of environments that most frequently tend detach from the model of the traditional classroom in favour of a rethinking of space for active and collaborative teaching.

The following chapter will describe the educational system that has had great influence in the field of pedagogy and didactics: the Montessori Method.

Chapter IV

Learning Environment in Montessori School

4.1 Introduction

The decision to compare a traditional learning environment with a Montessori environment was deemed opportune after research aimed at identifying innovative environments in the territory of the province of Padova. This research led to few results, since there are not many schools that offer innovative approaches and provide learning environments similar to those analysed in chapter 3. With reference to the Italian territory, the AES data (Anagrafe dell'Edilizia Scolastica) of the MIUR show that two out of three buildings were constructed before 1976: in fact, a large boom in the construction of schools took place between the 1970s and the 1980s and then fell dramatically leading up to the present day. With the exception of a few cases, most Italian schools are old and do not meet the requirements of modern-day students. Focusing on the schools in the province of Padua, one can find a limited number of Montessori preschools and primary schools, and some Senza Zaino schools.

Essential for this research was the identification of an educational reality that distinguished itself for a specific type of spatial configuration that differs from tradition and that promotes a different didactic approach. The identification of the primary school using the Montessori method in Padua proved to be the best choice for developing the comparison. In fact, as will be described in this chapter, the Montessori environments present characteristics that distinguish an educational method based on the relationship with the materials and on the relationship between students and their learning environment. The following chapter presents the history of this method and its inventor, Dr. Maria Montessori. A significant part of the chapter is dedicated to the study of the developmental environment and materials and concludes by discussing the validity of the educational proposal.

4.2 Biographical Information

Maria Tecla Artemisia Montessori was born in Chiaravalle, a town in the province of Ancona, on the 31st of August 1870. A very capable student, she enrolled in the Faculty of Medicine at La Sapienza University, where she graduated with a specialisation in neuropsychiatry. Her studies in child psychiatry and her experience in a psychiatric clinic brought her closer to the experiments with pedagogical models of education that were spreading in Europe because of doctors such as Jean Marc Itard and Édouard Séguin.

In the following years, Maria deepened her knowledge of pedagogy, decided to enrol in the Faculty of Philosophy and joined the Theosophical Society. Her choices of study and life would influence her operative choices and ideological position in the years to come.

In 1907 she founded in Rome the first school for children, La Casa dei Bambini, where she experimented with her educational method based on the principles of Scientific Pedagogy. Montessori used her skills as a scientist and researcher to develop a method based on observation and on the constant adjustment and improvement of her educational proposals through tests and viability checks. Her experience and projects on pedagogical experimentation at the Roman school are documented in the book “Il Metodo della Pedagogia Scientifica applicato all'educazione infantile nelle Case dei Bambini”. The book was translated into several languages and received with enthusiasm all over the world.

In the years to come, the success of the method was recognised and used in schools in different countries such as the United States, Holland, Sweden and Germany, which reformed their school systems by adopting the materials and approaches indicated by Montessori. Unfortunately, in Italy Montessori faced opposition from Mussolini and her schools were closed during the Second World War. The same happened to German and Austrian schools under Hitler. But despite this temporary opposition, Montessori continued to give lectures and open new schools abroad. She was also nominated for the Nobel Peace Prize three times. Maria Montessori died in 1952 in Nordwijk am Zee in the Netherlands, leaving behind a unique pedagogical legacy.

4.3 Montessori Schools

Today there are 60,000 Montessori schools in more than 110 countries (corriere.it, 1 September 2020) and the number is constantly increasing. These are both public and private schools, of different levels (although preschools are the most widespread). In Italy there are currently 244 Montessori schools (operanazionalemontessori.it). Relatively few if compared to those of other countries: 800 in the United Kingdom, and 1100 in Germany, a third of the Dutch schools.

One of the reasons that slowed down their spread has to be found in the advent of fascism. Although Mussolini had initially put his faith in Montessori's ideas to reduce illiteracy in the country, the principles of democracy and equality of Montessori's ideas did not fit the Duce's policy. A further reason that slowed the spread of the schools was the economic one: the cost of materials, furniture and teacher training would have required the state to invest heavily in the project.

In Italy interest in pedagogy and the Montessori method is growing in both the academic sphere and the parents, that are now seeking alternative educational experiences for their children. The need of some families to look for an educational environment capable of preparing the child for the demands of modern society has found support in the Montessori experience because of its attention to the uniqueness of each child, to the different organisation of time based on personal rhythms and to the care of the environment in which the child is placed. In addition, parents seek a school where knowledge is not simply transmitted but it is the result of the child's interest and discovery. They look for "a democratic, non-authoritarian and competitive school" (Trabalzini, 2013).

As far as interest in the academic sphere is concerned, contemporary psychology confirms the validity of the method. An example of this is the research that shows how the possibility of choice and freedom, if included in an organised educational context, are factors that improve learning. In addition, neuroscience confirms that meaningful learning is related to direct, lived experience of interaction with others and the environment.

4.4 Educational Approach

Montessori's idea of education is based on the notion that development cannot be taught. Based on this recognition, the role of the adult is to help the children by creating the conditions for their development. Montessori, even before the 1930s, had identified the changes that occur in the phases of a person's growth and how these changes are related to specific needs. She came to define four “developmental plans” - 0-6 years old, 6-12 years old, 12-18 years old, 18-24 years old - to which corresponded four educational plans, based on the various responses to the needs of each period. The first two periods were defined as sensitive, since "they are as many internal guides as possible for development, directed at fixing the characters necessary for survival and communication" (Fresco Honegger, 2017, p. 84). Specifically, the second plane of development - 6 to 12 - has moral and intellectual needs, supported by a great desire to know.

Although each plan has different needs, Montessori proposes general criteria that apply to each level, for example: free choice, a prepared environment, abstaining from judgment, are just a few. An ever-present factor is the relational climate between children and between children and adults. According to Montessori, it is not relevant to divide groups according to age, but rather everyone can share and learn with others.

Montessori creates an educational environment characterised by scientifically researched organisation and rich stimulation. Considering the developmental processes and the active role of the child, the educational context is constructed in such a way as to provide stimuli that foster interest and curiosity and that assist the development of those skills that are useful for the stage of development in which the child is at that moment.
During a conference in India, Montessori states that:

> Scientific observation has also established that true education is not the one imparted by the teacher: education is a natural process that takes place spontaneously in the individual, and is acquired not by listening to the words of others, but by direct experience of the world around one. The task of the teacher will therefore be to prepare a series of cues and incentives for cultural activity, distributed in an expressly prepared environment, and then to refrain from any intervention that is too direct and intrusive (Montessori, 1935).

The child is considered to be a fully-fledged individual who is able to learn according to his needs and requirements. Instead of the teacher passively transmitting knowledge, the child

is able to discover through the use of sensory materials made available to him. These materials are designed for the child's self-learning and self-correction. In addition to the use of materials, during the primary school years social participation and tasks aimed at empowerment are encouraged. This includes, for example, looking after the garden or vegetable plot, but also cleaning and tidying up.

The educational medium for Montessori is the context of freedom in which the child moves and experiences stimuli from outside. For every age, the rooms are organised on a child-friendly basis and objects are always available thanks to the presence of open shelves and furniture. Once the material to work with has been selected, the choice of place, time and companions is determined by the child. In addition to this, there are rules that need to be learned: tidying up objects, waiting times if a tool is not available and respect for the work of others. These characteristics are fundamental in the child's life because they teach him from an early age to be responsible and aware (Fresco Honegger, 2017b).

The adult stands in favour of this freedom, not letting the child do whatever he or she wants but providing him or her with the tools and possibilities to meet vital needs. Montessori notes that under these optimal conditions the child shows an attitude of respect towards others, as he does not act only for himself, but understands the wishes and needs of those around him. It is about developing a moral sense and an ability to listen that will benefit the individual throughout his or her life because it is the condition for living in a community (Montessori, 1992).

Another important aspect according to Montessori is spontaneity, understood as a characteristic that must be maintained in the child. Spontaneity does not mean uncontrolled behaviour, but the child's ability to act according to the principles of order and respect to which he is accustomed, but in a voluntary manner. This freedom may be confusing at first, but with time he will learn to self-regulate his behaviour and actions according to the logic of his environment. Montessori speaks of education for independence to describe the marginal role of the adult, who, although present, acts as a facilitator for the child who must learn to do things for himself.

The importance of independence and free choice are essential conditions for the development of the personality. Indeed, true transformation and maturation of the individual occurs when he or she is aware of self, interests and needs. A motivated child is an

independent child who is aware of his or her own actions (Fresco Honegger, 2017a). Independence is made possible by the type of Montessori environment that will be presented later in the chapter.

4.5 The Method

Even though Montessori herself did not want to call her educational proposal a "method", in 1912 the work of publishing her writings began in America and the translation of the treatise “Il Metodo della Pedagogia Scientifica applicato all’educazione infantile nelle Case dei Bambini”, book published during 1909, was abbreviated and then known worldwide as “The Montessori Method” (Schwegman, 1999). Montessori said: "This work has called itself a method, which I have not done. I have only proposed a method for scientific pedagogy, and the method is part of science; so, I have referred to it as the scientific pedagogical method applied to the education of children" (Scocchera, 2005, p. 234).

The Montessori method anticipated some concepts of modern pedagogy. First and foremost, she placed the educated subject at the centre of the educational system. Recognition of the unique needs and personalities of each individual are elements that must be embraced and promoted by the teacher. The essential objective of the method is to set the child free. The child's ability to choose, to act and to think independently are the cornerstones of the Montessori education system (Montessori, 2008).

Seven years after the publication of “Il Metodo”, the work “L’autoeducazione nelle scuole elementari”, which is a continuation of it, was published in 1916. Montessori observes that, in contrast to children in the nursery school, primary school children are interested in understanding the world and the laws that govern it. She calls this stage - corresponding to the second level of development - determined by curiosity, by the development of the moral and intellectual sphere. The expression "Help me to do it by myself" is complemented by the expression "Help me to think by myself". Montessori responds to this need of the child with the formulation of cosmic education. This type of education allows for the discovery of life in the fields of astronomy, geology, geography, meteorology, chemistry, physics, ecology, biology, and botany (Montessori, 1970a). The child responds to his need for knowledge by starting from the origins of the universe. One starts from the whole in order

to know the detail, in an approach where interdisciplinarity and specialisation of knowledge are integrated.

4.5.1 The environment

The realisation of the child's freedom takes place within the Montessori environment. The classrooms for the primary school, unlike those of the traditional school, do not have the classic desks arranged in rows or even a desk itself. They are replaced by tables and chairs arranged in a functional and non-rigid way, so that there is always the possibility of changing the setting for different types of activities. The desk is replaced by a small table placed at the side of the room. Given the non-centrality of the teacher in the learning process, the presence of a desk is not necessary, being the teacher’s desk a symbol of power and control over the students. In fact, the teacher, after presenting the learning materials to the class in a few precise words, must let the children get on with their work. His other tasks consist of keeping the educational environment tidy and observing the child as he interacts with the materials and the other students. Paying attention to each student allows the teacher to understand what materials to prepare and present in class, since students are not all at the same level in the classroom. According to the Montessori method, the learning times of children are different and must be respected. It will be the task of the teacher to prepare the appropriate materials so that the activity is not too simple and therefore the child risks getting bored, but also not too complicated, if the child is not yet able to process the information completely. A teacher understands that they have prepared the right materials when the climate in the classroom is calm, and the children are focused on their work.

The environment is presented as a well-prepared and well-kept space, in which "the organisation of spaces translates the functions of a service, communicates and implicitly conveys the assumption of habits and rules of coexistence" (Morgandi, 2015, p.6). Aesthetics is another key factor in the Montessori environment, as it is aimed at fostering emotional attachment. According to studies in Environmental Psychology, attachment to places and a sense of place create a positive emotional bond like the one someone may feel for home. The concept is resumed in the Montessori environment, which should be experienced as a second home, a space where the child feels welcome and safe (Morgandi, 2015). Knowledge of the place generates a sense of tranquillity and familiarity, which are fostered by the order and organisation of spaces. Piaget states that knowing how to orient

oneself in space is a sign of cognitive development in the child (Piaget, 1967). Honegger states that the environment is like a mirror of life: one feels a sense of unease in the midst of strangers, one feels calm among people he knows, and one moves with confidence in places he knows. Knowledge of objects also gives security, which is why there should be nothing closed or mysterious in the child's environment. A child working in an open environment can look around and recognise the arrangement of objects; this creates a reassuring condition and a state of calm and well-being (Fresco Honegger, 2017a).

According to the doctor, the environment should have ample space, light, simple furnishings made from natural materials such as wood; the developmental materials should be beautiful, well-kept, and attractive "because beauty invites activity and work" (Montessori, 2000, p. 84). The doctor had shown that a scientifically prepared and cared-for environment is able to increase the child's spontaneous interest, since the child is at a stage of life where the natural impulse to know and discover the environment and surrounding objects prevails (Fresco Honegger, 2017a). The self-education of which Montessori speaks is realised in the characters of interest, commitment and constancy that gradually become part of the child's work system. The child's "culture" is the result of his free work through his personal experiences.

In order to guarantee freedom of action, the furniture must be child friendly. Looking at a Montessori classroom, one can see shelves and furniture without doors against the wall. The working material is visible and available for when it is used during the day. In addition to the furniture, the room can also be equipped with a washbasin for cleaning materials, for example after artistic work. The child's independence and responsibility are formed in the classroom by this willingness of the room to serve the child's education. The environment can be provided with carpets, armchairs, and cushions where children can sit or lie down. The child's well-being is also important in terms of how are in the space; therefore, they have the freedom to decide where to work in the way they most feel comfortable.

The classroom space also extends outside: into the corridors where stations are set up for individual work, into the garden, and into the library. Usually, a Montessori classroom has a small library inside, which can be created by the students themselves who decide to share their personal books with the class. Plants can be added to the classroom; making children aware of the importance of caring for nature is a fundamental value for correct environmental education.

It should be stressed that not all these characteristics are always found in a Montessori classroom; much depends on the availability of space in the school, especially if one considers the school buildings already present in the area that are subsequently organised for Montessori education. This is not the case with newly constructed buildings, where the architectural design is based on the indications for the construction of Montessori environments, and it will not be necessary to adapt the spaces.

4.5.2 The material

The materials were developed by Montessori with methodological rigour based on her own observations and feedback from the children. They can be defined as true scientific materials because they allow to train independently certain cognitive processes. In this regard, Montessori stated that:

> Our material for the development of the senses has a history of its own. It represents a selection, based on careful psychological experiments, of the material used by Itard and Séguin in their attempts to educate deficient and mentally handicapped children, of objects used as tests in experimental psychology and of a series of materials designated by me in the early period of my experimental work. The way in which these different means were used by the children, the reactions they had, the frequency with which they used these objects, and above all the development they made possible, gradually offered us trustworthy criteria for the elimination, modification, and acceptance of these means as material in our schools. Colour, size, shape, in short, all their qualities were experimentally established (Montessori, 1970b, p. 109).

The materials were further validated by various exponents of Scientific Pedagogy and tested with children of different nationalities, socio-economic backgrounds, and languages.

Montessori believed that true knowledge comes through the manipulation of objects, therefore the true protagonist of this knowledge process is the hand: "One grasps with the hand to grasp with the mind". Touching and handling objects is part of that direct experience that is transformed into knowledge and competence in the child.

In Montessori classrooms, students do not use real textbooks or have a notebook for each subject but work directly with developmental materials (sensory and non-sensory). Through the materials each student builds up their own knowledge, refines intelligence and

sensorially, while maintaining a context of free choice and autonomy thanks to the possibility of self-correction, and thus avoiding the fear of judgement from others. In fact, many of the materials include the possibility of checking whether the execution is correct, or something has gone wrong. This allows the child to try again until they are fully competent with the instrument.

Sensory materials tend to decrease during the growth phase, which involves the transition from concrete to abstract concepts. The teacher supplements or replaces the materials with book, research in the environment or materials prepared by them. The materials are not intended to explain, but, instead, to respond to the child's questions and needs. The child's desire to discover the world is innate but must be constantly stimulated.

The classroom environment is stimulating and rich in materials. The teacher presents the use of the materials individually or collectively, to avoid misuse. In this phase, the teacher plays a decisive role: as the pupils should be captivated by the materials, the teacher should present them in a passionate and lively way, to convey the same emotional reactions to their pupils. Afterwards, the child has the possibility to move freely in the space and to choose which material to practise with, among those that have been presented. In addition, he can choose whether to work alone or with a companion, he can decide how long it takes to complete the activity and where to do it.

A rule that is taught from the start is to tidy up the materials. The importance attached to tidiness and cleanliness also has benefits for the development of organisational skills. In addition, the materials in the classroom are kept in limited quantities, i.e., there is only one copy of each material. In this way, children are taught to take their turn and respect the time of others.

In conclusion, the material of the Montessori method accompanies the child towards self-education. The child becomes acquainted with reality through experience and the use of objects, is aware of his mistakes thanks to the self-correction mechanism and, finally, learns concepts by moving from concreteness to abstraction. The materials are present for all school subjects, where they are divided into specific areas of the classroom: the language area, the mathematical thinking area, the cosmic education area, the reading area, the green corner, and the art corner. Providing diversified activities adapted to each student's abilities creates

a positive, non-competitive climate, in which the teacher is the observer and guardian of the environment.

4.6 Confirmation of the validity of the educational proposal

Dr. Montessori's studies have been taken up in various fields of knowledge and have now been confirmed by research in the fields of psychology, education, anthropology, ecology and recently also by neuroscience. Neuroscience has shown that the acquisition of knowledge takes place through the mind-body relationship; this leads to a type of learning based on a holistic experience that unites brain, body, and emotions. Montessori had already this idea and she developed a method based on free movement, emotions, and sensory experiences. Since the child's intelligence is built through movement, Montessori set up an educational context that fostered the child's intellectual, perceptive, and creative development ("La Mente Del Bambino: Maria Montessori e le Neuroscienze", 2020).

The scientific confirmations were based on the use of technological tools that were able to show the relationship between motor skills and senses. It was seen that, following tactile and motor experience, certain areas of the brain, that are responsible for language and complex thinking, were activated.
As described in the previous section, Montessori's solution to make more efficient the learning experiences is the use of developmental materials.

Further confirmation from neuroscience that demonstrate the validity of the method, are based on research concerning mirror neurons, which explain the mechanism of activation of a neuronal area in the brain that occurs both when a subject performs an action and when that action is observed but performed by someone else. In Montessori's educational proposal, it is the collaborative approach and learning through manual dexterity that help the child to reproduce patterns of behaviour and action, as indicated by the study of mirror neurons ("La Mente Del Bambino: Maria Montessori e Le Neuroscienze", 2020).

Considering the field of study of general education, Montessori anticipated the importance of the environment as a promoter of education. The environment is taking, in modern didactics, an increasingly relevant role in the educational field (Maugeri, 2017). Space is investigated from three main perspectives: firstly, as an organised environment, of which the

Montessori environment is an example; secondly, as a natural environment for immersive and integrated learning; finally, as a place for socialisation, where democracy can be experienced.

In the first case, it has already been described in Chapter III how some schools have succeeded in making the environment an element to be valued and an important ally for teaching. Recognition of the role of the environment as a third teacher has made it possible to experiment with innovative teaching methods, as opposed to the traditional frontal lesson. Much is owed to Dr. Montessori who influenced modern methodologies, creating a model based on the valorisation of individual freedom and responsibility.

As for the second case, several studies have confirmed the value of immersive learning in nature. The latter, not having been the subject of this research, will only be mentioned. Suffice it to say that some of the positive effects found in children who experience teaching in a prepared natural environment are increased concentration, motivation, and attention (Rathunde, 2001).

Finally, Lillard (2005) confirms that the Montessori environment deals from early childhood with the formation of individuals placed in a context of sociality, where respect and individual and group responsibility prevail. These elements, if learned from an early age, support the growth of an individual who will be able to play the role of a citizen in a democratic society.

Chapter V

Context of research

5.1 Schools involved in the research

The experiment entailed the participation of two schools belonging to different comprehensive institutes within the province of Padua. The former is the "A. Vivaldi" comprehensive school, composed of two secondary and four primary schools where, in the "Diego Valeri" state primary, the research was conducted; this building is located just inside the 16th century walls, within Padua's "Quartiere n.1".
The latter is the "Giorgio Perlasca" state primary school, located in the southern province of Padua; this institute includes two primary schools and one secondary school, and their side of this research was carried out in "Mazzini" primary, located in Maserà di Padova.

Three fourth year classes participated in this research, two of which belong to the "Mazzini" institute and the other to "D. Valeri" primary school. The research involved a total of 63 students between the ages of 9 and 10, each of whom was asked to fill in a digital questionnaire aimed towards discovering the student's level of motivation in relation to their learning environment. The questionnaire only refers to the classroom space; other spaces in the school, such as corridors, halls, garden, stairs, etc., were not considered in this study; this decision was made on the premises that the Valeri school does not have any areas outside the classroom that are relevant to the Montessori method, therefore a comparison was not deemed necessary. In fact, the aforementioned school had to adapt the environment set by Montessori to the already existing spaces within the building. As previously mentioned, this reorganization did not involve spaces outside the classrooms, except for the addition of a few desks arranged along the corridors to work as individual or in pairs. That being said, it was deemed best to only consider classrooms themselves.

5.2 Educational project: Mazzini school

Both of Mazzini School's fourth year classes are located on the first floor of the building and consist of 21 students each. The difference between the two classes lies in their school

schedule: one class attends with “normal” hours, which foresees attendance from Monday to Saturday from 8.05 to 12.55, while the other “full-time” class stays at school from Monday to Friday, from 8.05 to 16.05. During the analysis of data obtained from the questionnaire, the two classes will be kept separate even though their environments are very similar; this separation is intentional, as it is important to spot possible differences in the data collected between students with differing timetables.

Within this research, the Mazzini school classes are representative of a traditional approach to education. It is relevant to present some points made in the Three-year Educational Offer Plan (2022-2025) prepared by the school itself. The Plan represents the complete program according to which they structure curriculum, activities, organizational logistics, methodological-didactic approach, use and enhancement of human and non-human resources; it therefore represents how the school intends to pursue its objectives.

The Plan is mentioned to show the general and educational objectives determined at both national and regional levels, based on cultural, social and economic needs of each local reality. There are also visible similarities with some key elements of Montessori's thinking; this confirms that her principles are recognized and accepted even in some national educational programs and not only in her schools. It is possible to consult the Educational Offer Plan on the school's website (www.icsmasera.edu.it), where there are objectives listed, such as:

- the central role of the pupil: following the pandemic, the emphasis is placed on the need for pupils to be at the center of the scholastic experience, by accommodating their old and new educational requirements and rethinking aspects concerning educational time and spaces in order to improve the psycho-physical well-being of each student;
- rethinking the school’s role: it’s known as a "Learning Community" that relates the school itself to the territory in which it is located, therefore there’s a need for a stimulating, reassuring and constructive environment for both pupils and teachers;
- continuous innovation: embracing the culture of self-evaluation leads the student to be the protagonist of their own training and growth, thanks to an educational system that respects the rhythms and learning styles of each individual. The quality of this educational proposal is above all based on innovative, differentiated and workshop-based teaching;

- improving the quality of the environment: caring for the student's surroundings in terms of space management, equipment and materials aims to encourage opportunities for cooperation, creativity, communication and active participation.

The points just described are only a few of the Plan's objectives, but they are relevant to a better understanding, which moves towards a humanistic approach and a rethink of spaces as an integral part of a system.

5.3 Structural analysis of the classroom

An initial description of the environment was carried out by filling in the grid below, which outlines the spatial and instrumental characteristics of the classroom. The compilation was personal and based on observations noted during extracurricular hours, therefore without the students present.

Analysing the teaching space makes it possible to have a global overview of the classroom and its characteristics. It can be useful for the teachers to have a clear and defined vision of the space to help them in case they want to proceed with a modification of the spatial organization that favors the student's well-being and motivation. On this topic, studies on the design of learning environments as outlined by Maugeri (2017) are referenced, in which the classroom must promote concentration and active participation on behalf of the students. To quote the studies themselves, "the person-centered approach translates into modern and attractive design, consisting of large spaces without clutter or barriers, optimized for teaching practices and movement" (Maugeri, 2017, p. 66). Other factors to be taken into account when analyzing the quality of the classroom are the presence of a light source or heavy technologies for digital teaching and elements related to visual and thermal comfort.

Through the analysis of the environment, one can obtain a clearer understanding of areas that can be improved according to the potential and physical limitations of the classroom.

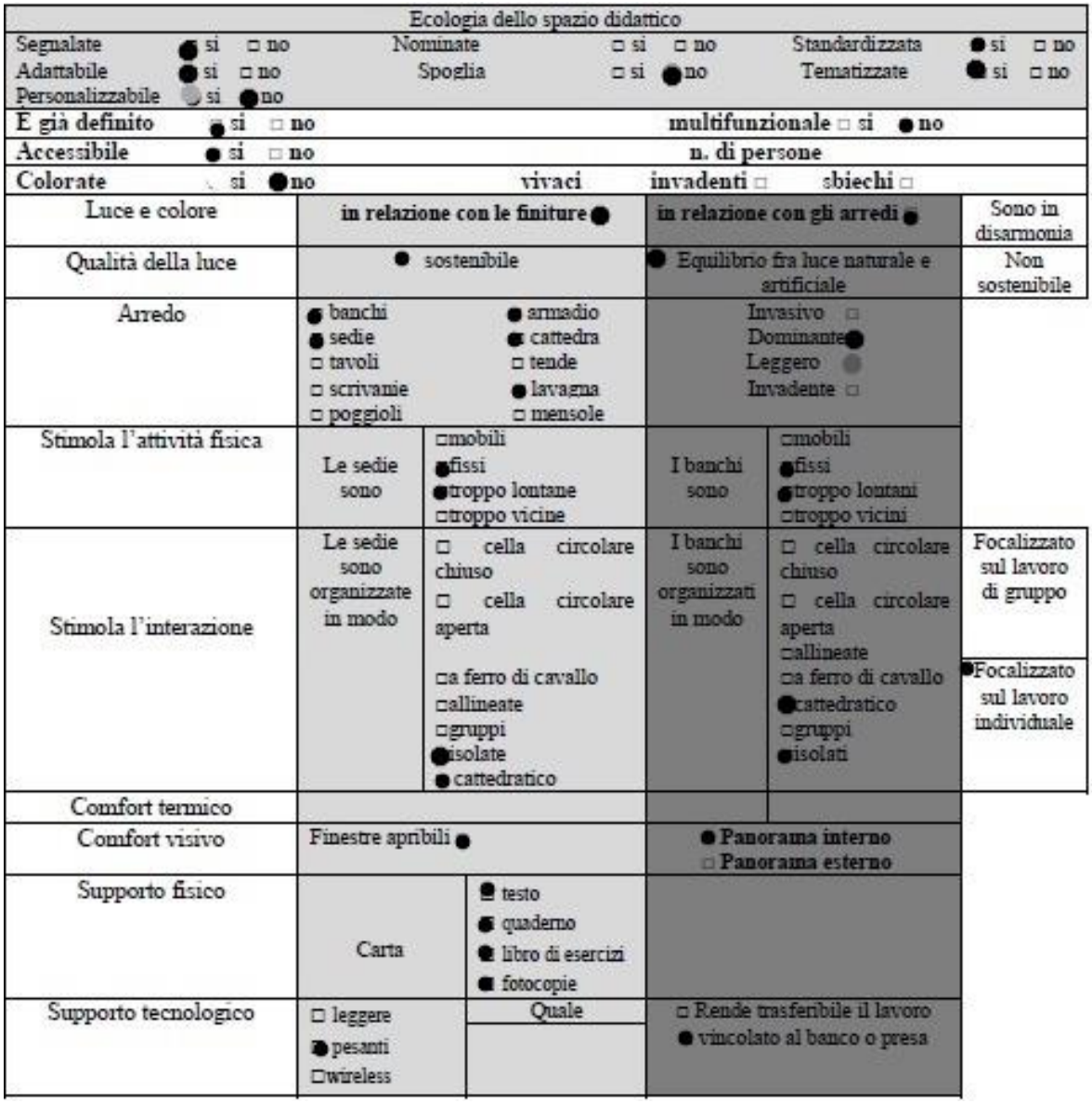


Figure 16 Ecology of the learning space, in Maugeri G., La progettazione degli ambienti didattici per l'apprendimento delle lingue straniere, p. 67.

5.3.1 Photo collection of classroom spaces

For a more complete analysis, classroom spaces and furniture are shown. The two fourth year classes have many similarities, so they will be shown and described together. Spatial observation represents an indicator of the work system and practices that the students are aware of and are expected to respect (Maugeri, 2017); an overview of the environment is

also a useful tool to understand the degree of interaction and negotiation between students. The following photos were taken during a visit to the school in extracurricular hours.

The layout of the benches

Both classrooms have a capacity of 21 students and are large and bright. The layout corresponds to the desk model with isolated desks facing the blackboard. This arrangement forces students to face one direction only and lends itself to a formalistic teaching approach; desks and chairs are heavy and not designed to be moved according to any activity, furthermore, the chairs are not ergonomic, so they can be uncomfortable after several hours of sitting. The separate arrangement of the desks does not allow collaboration and communication between students but is designed for individual study. All this suggests that the layout of the room is tailored to a traditional, frontal teaching approach.

Figure 17 Classroom layout. Personal elaboration.

Technological equipment

Both classrooms are equipped with interactive whiteboards, located next to the blackboard. The workstation is fixed and can be operated from a table placed next to the teacher's desk, where there is also a laptop computer.

Figure 18 Workstation. Personal elaboration.

Furniture and materials

The classrooms have an open shelf containing textbooks, a stereo and some other materials such as A4 sheets, folders, etc. A desk is placed near the blackboard to hold materials that students can use in class: tempera colours, coloured pencils and markers. In summary, the classrooms have bare furnishings consisting of a desk with drawing material and a cupboard containing paper material. In one of the classrooms, it can be seen that the teacher chose to move the desk to the left rather than a central position.

Figure 19 Materials. Personal elaboration.

Visual, acoustic, thermal comfort

The classrooms are very bright due to the big windows placed on the left side of the room which occupy almost the entirety of the wall; this brightness is also accentuated by the light colours of the floors, walls and ceiling. The opportunity to only use natural lighting is allowed by the position occupied by the classrooms, which are facing the south of the building. Pops of colour are added by the posters hanging on the back and right-side walls. The brown shade of the desks and chairs and the black of the blackboard and windows stand out from the rest of the room which is predominantly monochrome. Thermal comfort is provided by two heaters on the window side. As far as acoustic comfort is concerned, the presence of noise from outside is minimized as the building is situated near a road with very little traffic.

5.3.2 Limitations

During analysis, it is essential to consider measures that the school had to take in order to deal with the spread of Covid19; to keep students safe, it was essential to keep desks separate and to provide sanitizing gels and paper for personal use and to clean one's own desk. In this context it is blatant that freedom of movement and various types of activities that would require standing close together in groups or pairs are not feasible. A teacher from the school confirmed that before the pandemic, desks were arranged in pairs, and on some occasions even in islands of 4-5 desks. The variety of desk arrangements experienced pre-pandemic shows the school's willingness to achieve those objectives presented in the Educational Offer Plan, but which for reasons of student safety cannot be fully realized at present.

5.4 Educational project: Valeri School

The "D. Valeri" primary school started the first Montessori class in the 2017-2018 school year and has now reached 4 total classes, one per school year, excluding the fifth. The desire to teach classes using the Montessori method was motivated by the risk of the school itself closing due to the high number of foreign students present in the neighbourhood attending the Valeri school; this situation caused some Italian families to move out of the neighbourhood or to choose different institutes for their children to attend. Thanks to the headmistress's and vice-principal's initiative, an inclusive and appealing proposal was devised to keep Italian families from departing and include foreign children. The municipal administration, which was aware of the difficult situation in the area, also collaborated with the school by allocating funds to buy furniture and materials.

Two teachers, already specialised in the Montessori method, started teaching a first-year class in September 2018. Subsequently, a training course in Differentiated Teaching in the Montessori Method was started, which trained other teachers who work at the school today.

Valeri's classes consist of pupils of homogeneous ages. In addition to the four Montessori classes, there are also four traditional method classes, for a total of 168 students, 85 of whom are in Montessori classes.

As described in the previous chapter, the Montessori education project is based on certain elements that distinguish it from a traditional approach; those at the forefront of this research are the following: environmental characteristics, lesson type, materials used and context of the classes themselves.

5.5 Structural analysis of the classroom

The same analysis grid is proposed for the Valeri school. The grid is a useful tool for an initial comparison between the two types of classes - Montessori and traditional - which present similarities and differences. A more detailed description of what is marked in the grid below will be made in the following paragraph.

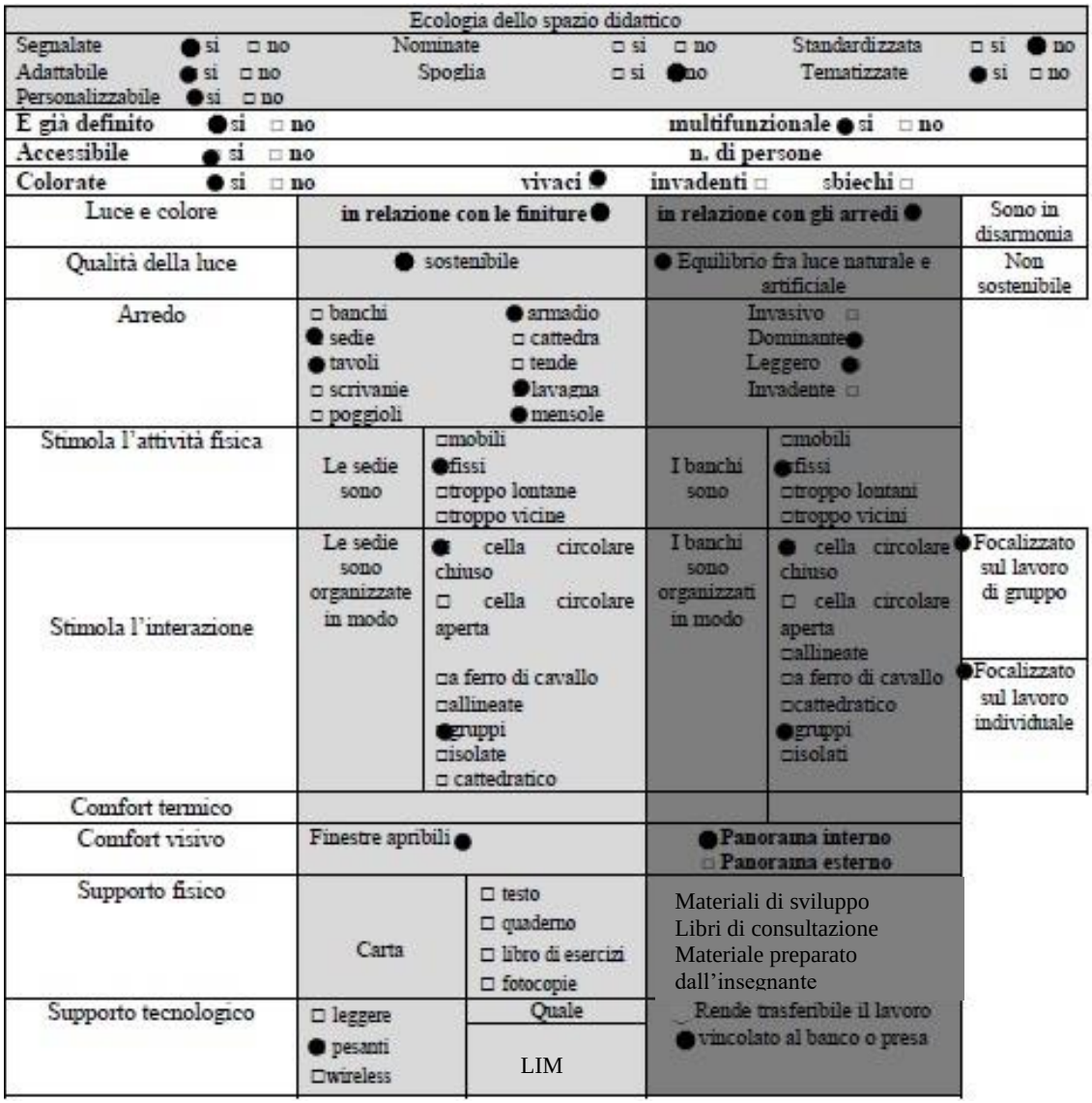


Figure 20 Ecology of the learning space, in Maugeri G., La progettazione degli ambienti didattici per l'apprendimento delle lingue straniere, p. 67.

5.5.1 Photo collection of classroom spaces

The layout of the benches

Regarding the arrangement of the desks, despite the restrictions caused by the spread of the Covid19 virus, the island arrangement and the presence of a few individual desks against the wall were maintained. This type of arrangement allows students to work individually, but also in pairs or small groups.

The type of furniture required for a Montessori classroom should be simple, beautiful and light (photo on the left). Unfortunately, the high cost of the furniture did not allow the acquirement of the same furniture for all the classes, so for the fourth-year class (photo on the right) we bought grey iron desks and white chairs, to maintain color harmony in the room. The chairs are not ergonomic, plus the presence of armchairs and ottomans is not indicated. The classroom, however, is functional because of its adaptability to the layout.

There is no traditional teacher's desk: the teacher sits on one side of the room rather than holding a prominent central position. In the Montessori classrooms, the teacher’s role loses its centrality since, during the lessons, students work with the materials that are presented to them. However, the teacher is tasked with the preparation of the required materials and a stimulating environment for the children, so as to awaken their passion for knowledge. Moreover, teachers are not divided by subjects but, if necessary, are only distributed logistically; this makes it possible for them to organize their space more precisely and effectively.

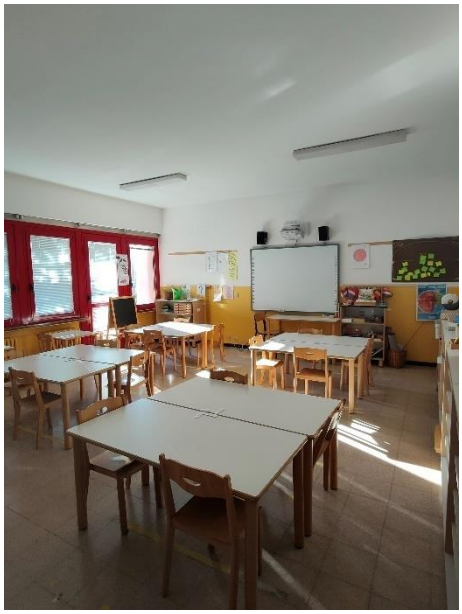


Figure 21 Classroom layout. Personal elaboration.

Technological equipment

The classes may be equipped with an interactive whiteboard or projector and a computer. In this aspect, they do not differ from the classes in the Mazzini school.

Figure 22 Workstation. Personal elaboration.

Furniture and materials

What characterizes a Montessori classroom is the presence of open shelves along the walls of the room. The furniture is proportionate to the size of the children, allowing them to master spatial awareness and take the objects they need independently. As the pupils do not use textbooks or notebooks for each subject and do not have a backpack, all the material they use is found in the classroom, while the work produced during the year is collected in

personal folders: these folders contain the items that allow the child to build up their knowledge. The materials are divided into subject areas, so that the children recognize where they are located in order to use them when needed and place them tidily away when the activity is finished. These materials enable the children to learn and, if needed, correct themselves when mistakes are made, without additional support from an adult. These objects are the key to triggering a learning process that must originate from the child, thanks to an initial stimulus given by the teacher and the environment.

Figure 23 Materials. Personal elaboration.

Acoustic, visual and thermal comfort

The colored walls of the classrooms create a cosy atmosphere thanks to the use of warm tones such as yellow and red. The beige furniture also contributes to a pleasant and relaxing environment. The organization and tidiness of the materials are on brand for the Montessori education program, which considers it essential to teach students to keep their classrooms tidy and clean. Montessori believed that an orderly space helps to organize the child's inner world.

As far as acoustic comfort is concerned, the teacher confirms that during class activities the atmosphere is relaxed and quiet; it is possible that there is more confusion in the classroom when students carry out activities in groups but, not having been able to attend a lesson, she is unable to confirm this. As in Mazzini school, there are two heaters under the windows in the classroom. More information about the students' perceived comfort will be analyzed in the following chapter, where the questionnaire will be presented.

5.5.2 Limitations

The Montessori method provides freedom of movement in the learning space; therefore, the child is allowed to change workstation if they deem it necessary. In compliance with the anti-Covid regulations, the school has had to take restrictive measures such as:

- students are required to maintain the same workstation throughout the day, indicating their position with a name tag;
- it is not possible to change the arrangement of desks;
- students may only work in pairs or small groups of a maximum of 3-4 children;
- the mat used to mark out the workstation is no longer for shared use but each student has their own mat, which they are required to take home and wash every weekend;
- each student has a personal stationery kit (pencils, glues, pens, scissors, etc.), whereas previously the material was shared;
- the reading area, which included a corner with a carpet and soft chairs, has been temporarily eliminated; pupils are required to work solely at their desks.

These changes are limiting as they do not make all the Montessori recommendations applicable, but they are necessary as long as the state of emergency persists.

5.6 Conclusions

The analysis of the learning environments highlighted similarities and differences in the composition and structuring of the environments. The arrangement of the desks that characterizes two different types of didactic approaches is very significant: one is formalistic whilst the other is humanistic. Another relevant element is the use of different working materials - textbooks for the Mazzini school and development materials for the Valeri school

- which constitute the means to achieve knowledge. Furthermore, it can be said that the changes adopted to cope with the ongoing health emergency are a disadvantage for both schools and for the well-being of all students; this should be taken into account when analysing the results of the questionnaire.

In the following chapter the research project will be presented and the results obtained from the questionnaires completed by the students will be observed.

Chapter VI

Research Design

6.1 Introduction

This research focuses on analysing the quality of learning environments as a factor that generates intrinsic motivation and promotes overall student well-being. The time a primary school child spends in their classroom can vary from 5 to 8 hours a day, meaning almost half of said day is spent in an educational setting that they recognise as such; because of this, it must also act as a stimulating, motivating place that accompanies each individual in their personal growth in a serene way that respects freedom of expression.

A modern school does not homogenise its students but presents itself as a means of encouraging the development of individuality. Several factors are involved in this development, one of which is the way the surrounding environment is organised. The ability of a space to respond to the needs students within it is measured by its abundance of stimuli, arrangement and level of perceived well-being.

This research intends to investigate the level of motivation and well-being related to the learning environment as perceived by students. It is hypothesized that the results will present differences in evaluation according to the school which the students themselves attend.

6.2 Research question, methods and steps

This research aims to identify the arrangement and structure of different learning environments in relation to student motivation. The studies carried out on motivation linked to teaching and on the role played by the environment in the individual's perceptual system were considered essential for the creation of a questionnaire to assess students' perceptions in relation to the learning space.

The theoretical framework, which guided the creation of the questionnaire, refers to studies in environmental psychology, psychology of motivation and the principles of Dr. Montessori's educational project.

Thanks to the analysis of the questionnaire's results, it is possible to answer the question that produced this research, namely: is an educational space able to influence a student's level of motivation?

The thesis project was presented to the contact persons of both schools. First, an interview was arranged with the headmistress of the Mazzini school in Maserà di Padova, who enthusiastically welcomed the thesis research. While, for the Valeri school, the contact person for the Montessori classes made herself available to answer questions about the project initiated by the school and to show off the classrooms.

The research experience took place mainly in two phases. The first phase, corresponding to a visit to both schools - Mazzini and Valeri - made it possible to observe the classrooms and obtain a collection of photographs which have been described in the previous chapter. Furthermore, in this phase it was relevant to compare the principles of the Montessori approach with direct observations made in the classrooms of Valeri in order to confirm the elements at the basis of the educational proposal as described in chapter 4. In this case, the observations concerned the organisation of the learning environments and the developmental materials. As far as observation during school hours is concerned, in order to document how the students act in the classroom the teacher's statements were taken.

The second phase, dedicated to the administration of the standardised questionnaires, made it possible to detect the students' perception of their own classroom and therefore assess the degree of motivation determined by the environment in which they are placed.

It is assumed that the perception of a student in a traditional classroom is different from that of a student in a Montessori classroom, and it's further assumed that the perception of well-being, as defined by scientific research, is qualitatively higher in students in the Montessori classroom. Underlying this assumption is a learning environment based on the free choice of each individual, the value placed on the space itself and the work material. Indeed, the Montessori method is strongly based on the development of intrinsic motivation as a key element that fosters the student's curiosity and willingness to learn.

A notable limitation of the research is to be attributed to the restrictions imposed by both schools during this peculiar period shaped by the ongoing health emergency; each student's freedom has been reduced in both schools, but we think that it's still possible to carry out qualitative research that assesses their motivation.

6.3 Participants

The students involved in the research were respectively:

- 21 students of a fourth-year class attending the Mazzini school with a normal timetable;
- 21 students of a fourth-year class attending the Mazzini school with an extended timetable;
- 21 students from a fourth grade Montessori class at the Valeri school.

The students, aged between 9 and 10, filled in a questionnaire created using Google Forms; the way in which the questionnaires were presented by the teachers is not known. The questionnaire was given as a homework assignment for the Mazzini students, while in the Valeri institute, students were allowed to choose at what time of the school day to fill it out, sticking to the free choice approach of the Montessori method. The delivery took place over the course of a week. The number of questionnaires collected does not correspond to the total number of students: 4 questionnaires were not delivered by the fourth class of the Mazzini school. This was due to the presence of some foreign students who, according to the teacher, would not have been able to carry out the questionnaire at home by themselves. In conclusion, the total number of questionnaires collected was 59.

6.4 Data collection

As already mentioned, this research made use of three main tools: an analysis grid for classroom observation, a photographic collection for the description of the environments and a questionnaire for the students.
It is useful to highlight that an evaluation tool containing specific criteria for this research was not previously found, therefore, after studying of the available sources, it was decided to implement the proposed questionnaire, as it was considered appropriate to the context and the educational project of both schools. The tools used are presented in detail below.

6.4.1 Classroom observation and photo collection

An essential moment for the start of the research was the direct observation in the classroom. In this case it was not an observation during school hours in the presence of the students, since the possibilities of entering the school as external persons are very limited due to the anti-Covid restrictions. Similarly, the administration of the questionnaires, which was initially planned to be carried out in the presence of the students and by paper, had to be modified.

Initial observation was essential for the collection of space-defined information, which was then included as an evaluative element in the questionnaire. The photos were added to give the reader more clarity while reading and to help them understand the interpretation given to the different environments.

A first description of the classrooms was possible thanks to the evaluation grid developed by Maugeri (2017), which was used without distinction for the analysis of both classrooms. The compilation of the grid was influenced by the subjective perception of the thesis student following her visit to the schools. Its compilation allowed a first description of the environments, highlighting the elements present and those missing in each educational context.

The elements and conditions marked in the grid expose mainly the visual characteristics of the spaces and allow an initial analysis of the pedagogical function of the environment; what it does not allow to identify are the working methods that distinguish the two. At this point it still isn't possible to define in which approach the environment has a supporting function for education or whether it actually plays but a marginal role. This will be taken into account in the analysis of the questionnaire.

6.4.2 The questionnaire

The questionnaire was given to the students in order to discover their views regarding a number of values attributed to their learning environment. It was sent to 63 students through the Google Forms application, of which 59 were completed and analysed.

As already mentioned, the questionnaire was not completed by everyone in class: for the fourth-grade students of the Valeri school, the possibility of completing it was given during school hours as an activity presented by the teacher; for the fourth-grade students of the Mazzini school, the completion was assigned as homework.

In this scenario, the different moments of completion are not considered relevant for the analysis of the results whilst on the contrary, it would have been important if it had taken place during the days spent in DAD (*Didattica a Distanza*, Distanced Learning), because the children's approach to the questionnaire could have given different results according to the emotional and psychological state caused by DAD itself. In this case, the emotional states of the students, forced to stay home by the global emergency, cannot be considered the same for everyone, but only for those students who experience DAD as an something that caused boredom, fear, stress or other negative behaviours which may not be experienced in class.

The questions in the questionnaire were divided into domains by values related to the aesthetics of the classroom, emotional value, general well-being, classroom functionality and lastly motivational value; a further section was dedicated to the survey of students' needs. Finally, the last part of the questionnaire asked students to choose a classroom model that they would find most motivating by looking at photographs.

In the following paragraph the sections of the questionnaire will be described individually.

6.5 Presentation of the questionnaire

In this paragraph, the structure and content of the survey instrument used for data collection will be presented. The questionnaire was filled in by the students in digital format, which was considered as a solution in case the classes were in DAD. The estimated completion time was about 20 minutes but could vary depending on the reading speed of the student; in any case, there was no time limit for completion. It was however required to answer all questions in order to be able to send in the questionnaire: this ensured that no points would miss by accident.

The questionnaire is relatively short, as we wanted to avoid boring the students. In addition, a light blue background was chosen to increase the visual pleasure during completion. For

privacy reasons, the questionnaires are anonymous; no personal data was asked of the students, except for that which indicates the class to which they belong.

For simplicity, the sections of the questionnaire are presented as prepared for the paper format and not as seen in the digital version.

6.5.1 Section 1: aesthetic value

The delivery for this first question asks the student to read carefully what is asked and to mark with a cross on the spaces marked under POCO (a little), NON SO (don't know), MOLTO (a lot) according to their opinion. They are reminded that there is no correct answer, but that the aim is to mark the square they personally think is right.

The first question asks about the aesthetic value that each student attributes to their classroom. We thought it important to include a number of adjectives that fell within the sphere of the five senses, since a student's perception is not only visual, but also includes touch, taste, smell and hearing. The only sense that is not described is taste, as the conditions necessary to examine it were not found.

The decision to include pre-prepared items instead of an open question was made in order to simplify the activity for the student and to direct them towards a specific selection of characteristics that this research aims to investigate.

1. Come descriveresti la tua aula?

	POCO	**NON SO**	**MOLTO**
Accogliente			
Luminosa			
Ordinata			
Colorata			
Rumorosa			
Profumata			
Spaziosa			
Pulita			

6.5.2 Section 2: emotional value

The second question aims to evaluate answers in relation to the sphere of feelings. In order to investigate the emotional value that the student attributes to the environment, they are asked to answer by marking the moods they feel during school hours.

It is reasonable to assume that students don't feel the same every day and that their answer may also depend on their mood at the time of completion. In any case, we wanted to investigate whether the answers were mostly related to positive or negative feelings.

2. Pensa ora a quello che provi quando sei a scuola. Come ti senti quando sei in aula?

	POCO	**NON SO**	**MOLTO**
Rilassato			
Felice			
Arrabbiato			
Preoccupato			
Motivato			
Incuriosito			
Stanco			
Annoiato			

6.5.3 Section 3: welfare value

Sections 3, 4 and 5 do not require you to answer a question, but to reflect on what is asked in the question and tick FALSO (false), NON SO (don't know), VERO (true) according to preference.

The items in the third section are designed to investigate the level of well-being perceived by students. There are many factors that contribute to personal well-being, such as: the comfort of desks and chairs investigated in items 1 and 2; thermal comfort (items 3 and 4); acoustic comfort (items 5, 6, 7, 8), visual comfort (items 9, 11, 13) and spatial comfort (item 12). These factors are essential in creating an environment that promotes an individual's well-being.

	FALSO	NON SO	VERO
1. I banchi sono comodi e hanno una giusta altezza per me.			
2. Le sedie sono comode e hanno una giusta altezza per me.			
3. In aula fa troppo caldo			
4. In aula fa troppo freddo.			
5. Quando sono in aula faccio fatica a concentrarmi perché c'è troppo rumore.			
6. La confusione che fanno i miei compagni mi distrae.			
7. Stare seduto al mio posto mi permette di concentrarmi più facilmente.			
8. Sento i rumori esterni (dalla strada, dalle altre aule).			
9. In aula non c'è abbastanza luce per vedere quello che sto facendo.			
10. In aula ci sono molti materiali per le attività di laboratorio.			
11. I materiali (libri, colori, fogli, oggetti per i laboratori) sono ben disposti e organizzati.			
12. In aula c'è spazio per muoversi liberamente.			
13. Le pareti sono decorate con cartelloni e disegni.			

6.5.4 Section 4: functionality value of the classroom

The fourth section investigates elements that make the classroom functional. In this section, students are asked to assess their perception of the learning space with reference to:

- an adequate level of autonomy, thanks to the availability of objects and materials to encourage autonomous discovery (items 4, 5, 6), but also thanks to the role played by the teacher, who may leave more or less freedom of action to her students (items 1, 2, 3);

- the choice of work in the classroom, which can be collaborative or individual (items 7, 8, 10). Depending on the spatial characteristics of the classroom and the furnishings, it will be more or less possible to organise activities in groups or in pairs. This type of activity is promoted by the teacher;

- the degree of responsibility perceived within the class group (items 9, 11, 12, 13, 14).

	FALSO	NON SO	VERO
1. In classe posso esprimere me stesso (i miei interessi, le mie passioni).			
2. In classe, l'insegnante parla per la maggior parte del tempo.			
3. Durante le lezioni svolgo delle attività che corrispondono ai miei interessi.			
4. Posso scegliere i materiali di lavoro che preferisco.			
5. In classe imparo cose nuove grazie all'uso pratico dei materiali.			
6. In classe apprendo usando soprattutto i libri di testo.			
7. In aula riusciamo a fare spesso lavori di gruppo.			
8. In aula usiamo spesso la LIM/ computer durante le lezioni.			
9. Contribuisco a prendere decisioni sulle attività e sulle regole della classe.			
10. Imparo grazie alla collaborazione con i compagni.			
11. In classe mi impegno perché mi piace lavorare in aula.			
12. In classe mi impegno perché è quello che sono tenuto a fare.			
13. In classe mi impegno solo perché non voglio deludere la maestra e i miei genitori.			
14. Quello che imparo in classe lo applico anche fuori dalla scuola.			

6.5.5 Section 5: motivational value linked to learning

The fifth section investigates the level of motivation in relation to learning. It consists of 7 items that guide the student to reflect on their relationship with studying and working in class, but also in everyday life. Items 5, 6 and 7 refer to the learner's ability to exploit the skills learned and use them in other contexts, which do not necessarily have to have been presented in class. This ability to put what is learned into practice is a consequence of a strong motivational drive and a curiosity to learn.

	FALSO	NON SO	VERO
1. In aula svolgo le attività con impegno.			
2. Mi piace quello che imparo.			
3. Faccio volentieri le attività durante le lezioni.			
4. Sono soddisfatto quando porto a termine un lavoro in classe.			
5. Metto in pratica quello che imparo attraverso attività di costruzione con diversi materiali e strumenti.			
6. So che quello che imparo è utile per la mia vita.			
7. Sfrutto quello che so già quando devo affrontare nuovi compiti.			

6.5.6 Section 6: students' needs

The sixth and last item section is dedicated to the identification of students' needs. It was considered essential to include this part in the questionnaire to indicate the importance attached to listening to what students have to say. Listening and asking students what they need are two valid and useful tools to improve their learning experience.
The LO FACCIO GIA' (I already do) box has been added to the response options to indicate that the need has already been met.

	FALSO	NON SO	VERO	LO FACCIO GIA'
1. Ho bisogno di più movimento.				
2. Vorrei svolgere attività pratiche e di laboratorio.				
3. Vorrei degli spazi dove potermi rilassare.				
4. Vorrei svolgere più attività sui libri.				
5. Vorrei fare più attività in gruppo o a coppie.				
6. Mi piacerebbe lavorare in autonomia.				
7. Preferisco la DAD.				
8. Vorrei applicare alla realtà le cose che studio.				
9. Vorrei poter scegliere quali materiali di lavoro utilizzare.				

6.5.7 Section 7: comparison of settings

The questionnaire concludes with an observation and comparison exercise in which students are asked to look at two photographs and answer questions. The pictures represent two classrooms: a traditional classroom and a Montessori classroom. The aim of this activity is to understand whether the students are able to distinguish two types of classrooms with different characteristics and choose the one they prefer. In addition, they were explicitly

asked to identify the classroom in which they would be most motivated to carry out school activities.

The two images proposed in the questionnaire are presented.

Figure 24 Example of a Montessori classroom. Personal elaboration.

Figure 25 Example of a traditional classroom. Personal elaboration.

The last section of the questionnaire allows us to analyse the students' perception of their own classroom. The use of images is intended to provide students with a possibility of comparison with a reality that for many may be unknown. The final questions investigate their preferences for one type of setting over another.

1- Scegli quale aula ti è piaciuta di più (1 o 2) e spiega perché.

- 1
- 2

Perché

_____

_____

2- In base alla risposta precedente, scrivi se ti piacerebbe fare lezione in quel tipo di aula.

- SI
- NO
- NON SO
- L'aula che ho scelto è molto simile alla mia

3- Saresti più motivato ad imparare e studiare nell'aula che hai scelto?

- SI, perchè_____
- NO, perché_____
- La mia motivazione rimarrebbe la stessa.

6.6 Conclusions

The construction of the questionnaire took into account elements analysed in studies on learning motivation and in studies of environmental psychology. The description of the sections made it possible to understand the reflection carried out around the study of learning environments and their characteristics. The compilation also gave the students the opportunity to reflect on the characteristics of their learning environment and the needs that this place should be able to satisfy.

In the following chapter we will examine the results and draw conclusions from the research.

Chapter VII

Data Analysis and Research Findings

7.1 Data Analysis

In this chapter the data collected from the 59 completed questionnaires will be analysed. Each section of the questionnaire has been considered and examined individually. It's important to keep in mind that the questionnaire consists of six sections, each investigating a specific value: aesthetic value (section 1), emotional value (section 2), well-being (section 3), classroom functionality (section 4), learning motivation (section 5) and satisfaction of students' needs (section 6). The last activity in the questionnaire, considered as a supplementary section, was analysed with different criteria than the first six.

The results obtained by each of the three classes, for each section, were compared with each other and represented graphically to allow the reader to have a clear interpretation.

For simplicity's sake, we will refer to the classes with the following terms: Mazzini TP (where TP stands for "Tempo Prolungato" and indicates the fourth-year class with an extended timetable at the Mazzini school), Mazzini TN (stands for "Tempo Normale" and indicates the fourth-year class with normal timetable) and Valeri (fourth-year class with Montessori method).

From the data collected in the questionnaires, a numerical value was associated to the answer marked by each student; these values correspond numerically to -1, 0, +1. That being said, numerical values were not assigned consistently for all six sections. From section 1 to 5 a numerical value +1 was attributed to the items indicating a positive quality in terms of aesthetic pleasantness of the classroom, functionality, well-being, emotional and motivational state. On the contrary, negative values were assigned a correspondent negative number (-1). A value of 0 was assigned to the neutral "Don't know" answer. During the analysis of the results, the "Don't know" answers were not considered, as they were interpreted as misunderstandings on the child's part.

A different evaluation of the results was carried out for the items in the sixth section, dedicated to the analysis of students' needs; here, values were assigned based on the satisfaction of the aforementioned needs. A positive value was assigned to the answers that

demonstrated a need being satisfied, whilst a negative value was assigned to the answers that showed any given need had not been met, although it had been expressed by the children. In this case as in the previous ones, “Don't know” answers were assigned a null value.

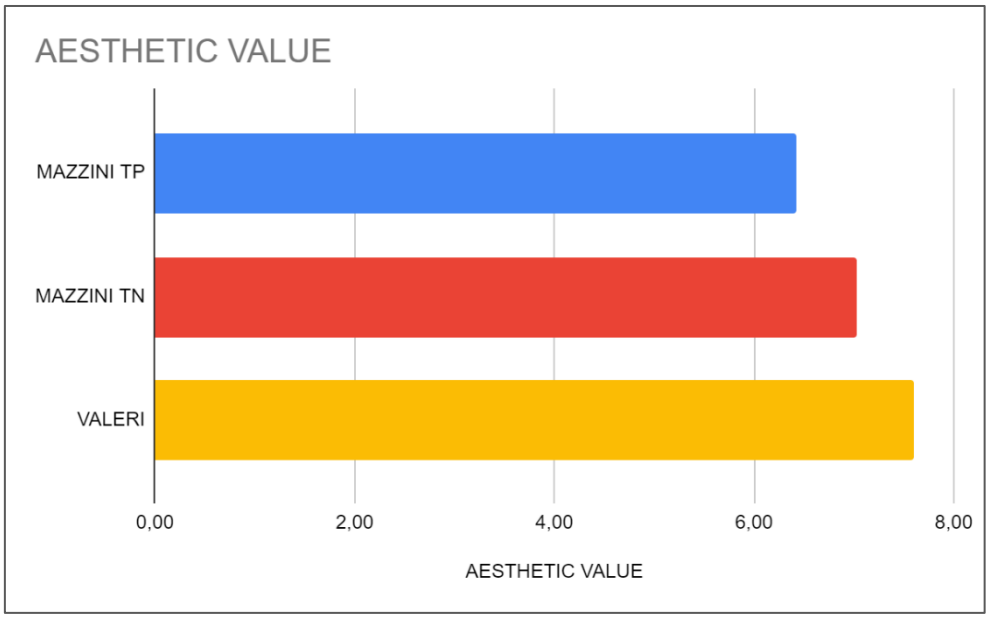
The following phase entailed summing the scores of items belonging to the same section. This made it possible to compare the score obtained in each section with those obtained by the other two classes.

Subsequently, the scores were standardized each assigned a specific value on a scale from 1 to 10, where 10 corresponds to the image of an ideally perfect class. The decision not to use a scale of numerical values in the questionnaires themselves was made in order to make the questionnaire more comprehensible and easier for the students to answer.

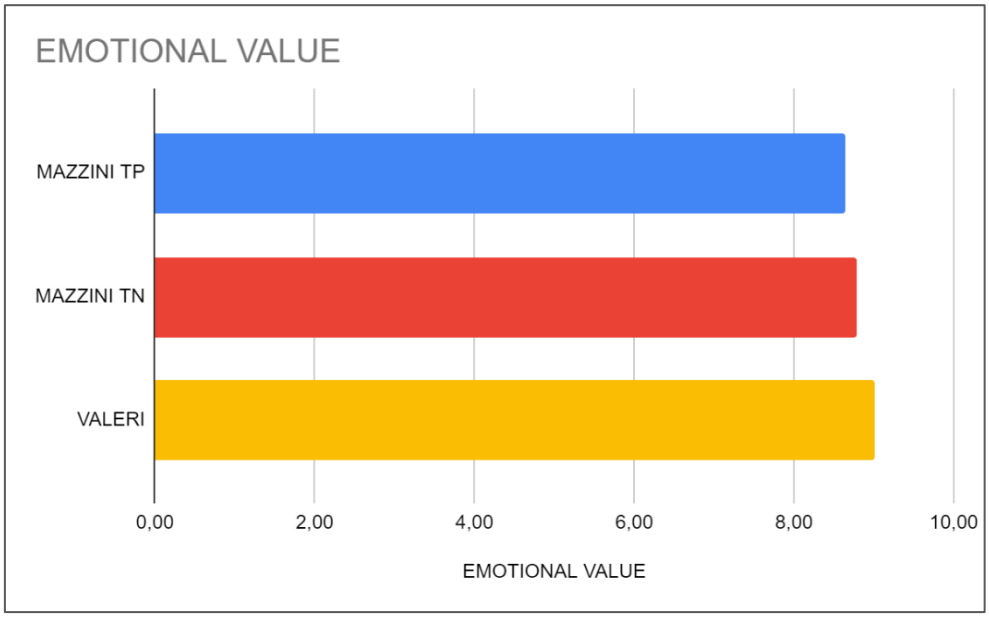
As anticipated at the beginning of the paragraph, section 7 was analysed with different criteria than the previous 6 sections since, as we know, this last part of the questionnaire asked the students to observe photos of two classrooms (1 and 2), choose the one they preferred and answer a couple of questions about the perceived level of satisfaction and motivation related to the chosen classroom. For this section, no numerical value was assigned to the answers; we instead decided to use pie charts to visually represent the results.

Within this section, the most relevant data for our research concerns the choices that each student made seeing the different options of classrooms and the subsequent degree of motivation that each environment would be able to inspire. It’s interesting to take note of the number of students who indicated a possible increase in motivation in accordance with the type of classroom they selected. Above all, the number of students from the Mazzini school who chose the Montessori environment as the most motivating place and vice versa will be considered.

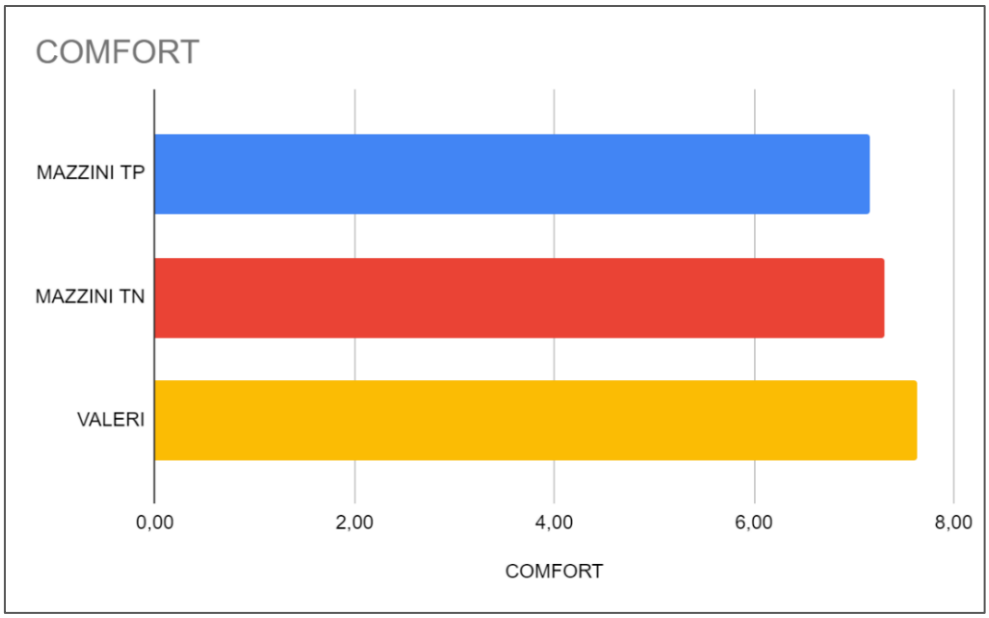
7.2 Findings



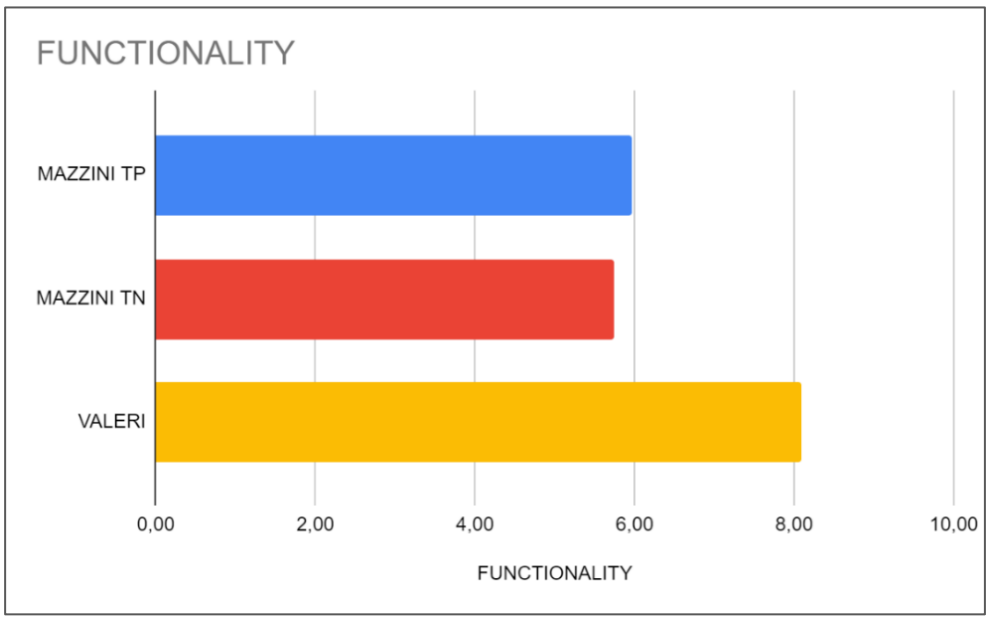
The graph for the first section shows the students' perceptions regarding the classroom's aesthetics. On an increasing scale, the values assigned were: 6.42 for the Mazzini TP class, 7.03 for the Mazzini TN class and 7.61 for the Valeri class. We can therefore say that the scores do not show significant differences and that, overall, the space they were in was judjed as a pleasant and positive environment.



The second section analyses the emotional state of the students during their time in class; the data collected show a high level of emotional well-being for each group. The total scores are: 8.65 for Mazzini TP, 8.78 for Mazzini TN and 9.01 for Valeri.

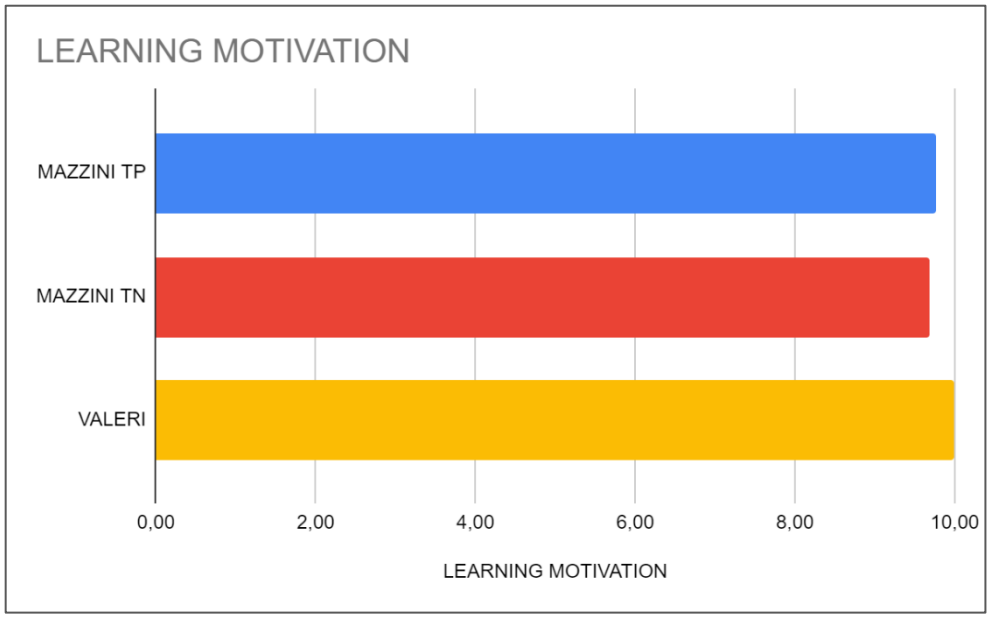


The perceived quality of the learning environment took into account different factors, such as: the comfort of desks and chairs, the temperature in the classroom, natural and artificial lighting, acoustic disturbance, the size of the student's surroundings and lastly available classroom materials. In all three cases, scores surpassed a value of 7 out of 10 (7.16 Mazzini TP, 7.31 Mazzini TN, 7.63 Valeri).

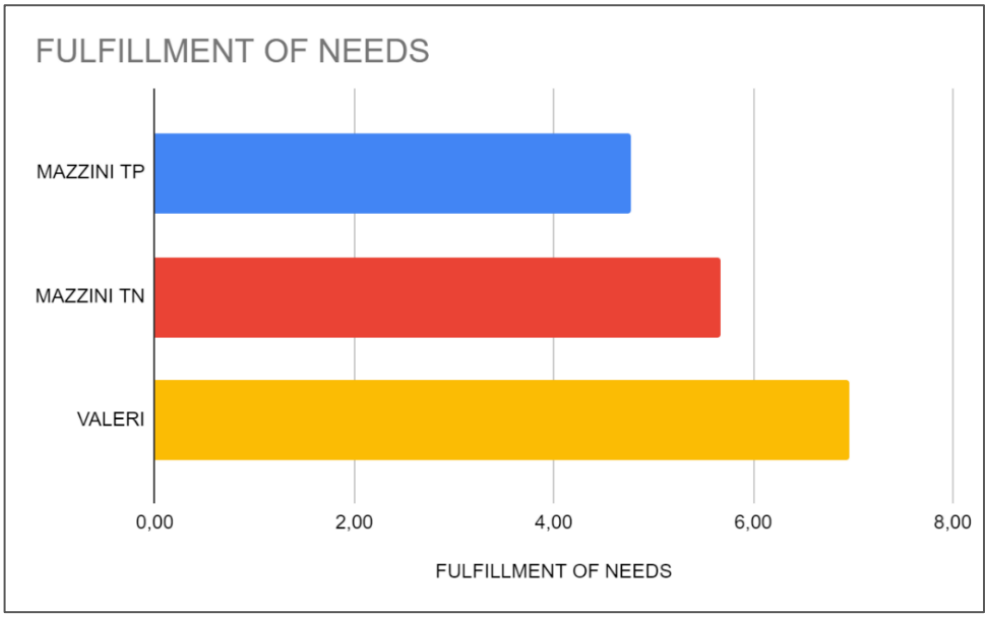


Compared to the previous sections, there is a significant difference in the results concerning the functionality of the classroom. The Valeri class (8.09) reaches a vastly higher score than both Mazzini TP (5.96) and Mazzini TN (5.74). Affirmative answers regarding the student's freedom to acquire new knowledge through activities that tailor to their personal interests support the score obtained by the Valeri class. Furthermore, the acquisition of different skills

and information thanks to the use of practical materials rather than textbooks (which, as we recall, are not used in the Montessori method) is recognised and appreciated by the students.

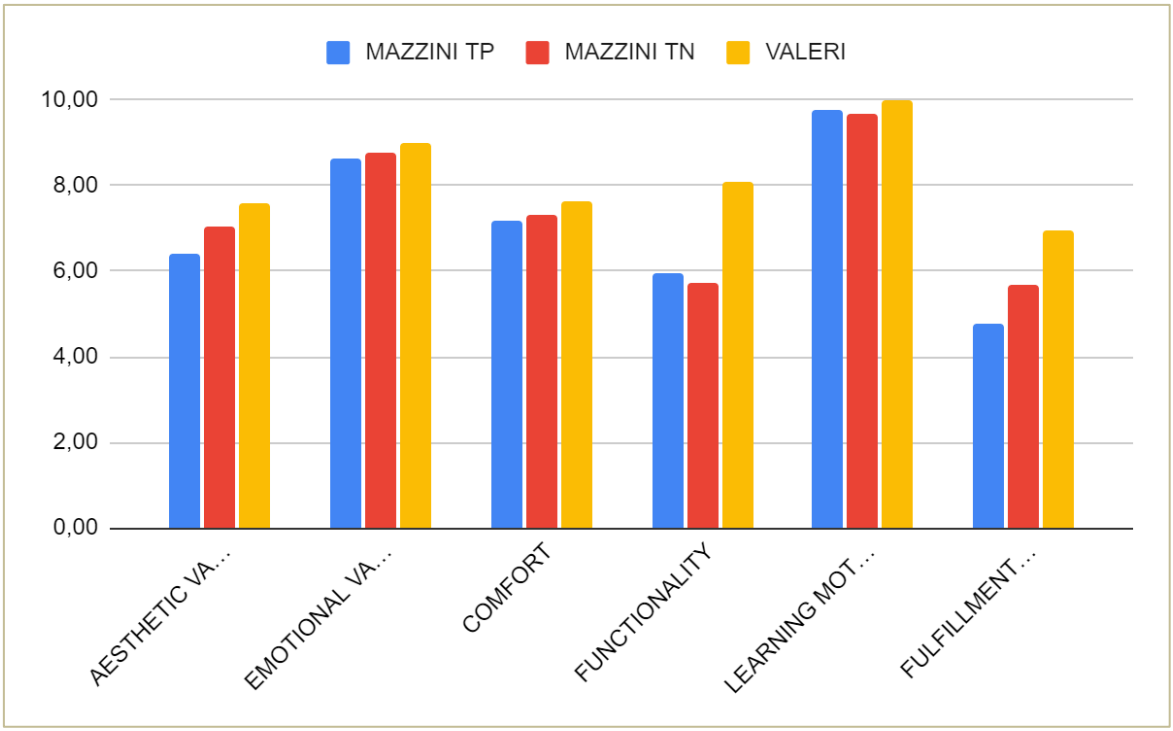


The fifth section, which regards motivation to learn, is the one which demonstrates higher scores than any other section. The Mazzini TP class (9.76) slightly exceeds the score obtained by the Mazzini TN class (9.69), while the Valeri class (10) obtains the highest score.



The last graph represented highlights the degree to which needs are met. As we can see, the Mazzini TP class (4.77) obtained the lowest value analysed so far. Among the needs most frequently expressed by the students are: the need to carry out more practical and laboratory activities, to do more activities in groups or in pairs, to apply the knowledge learned in class

to an outside reality and finally to be able to choose their working materials. The most expressed need of Mazzini TN (5.68) and Valeri (6.96) classes also corresponds to an increase in assignments which involve groups or pairs.



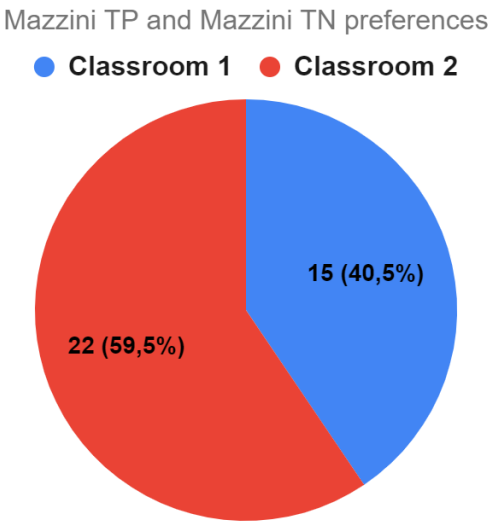
The graph above represents all previously analysed values. This representation allows us to have a general overview of each perceived value defined in the questionnaire. Overall, the Valeri school obtained the highest scores in all six sections. On the other hand, the values that obtained the lowest scores were:

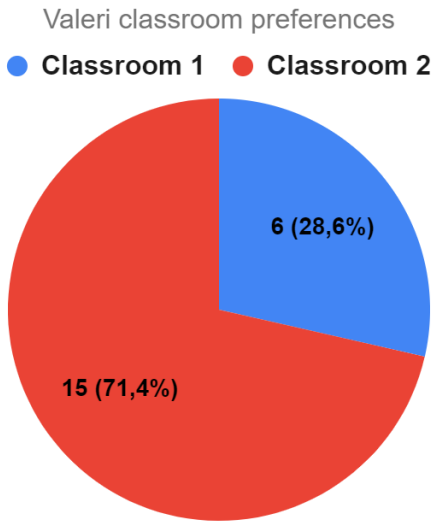
- for the Mazzini TP and Mazzini TN classes: classroom functionality and satisfaction of students' needs;
- for the Valeri class: aesthetic value and satisfaction of needs.

The seventh and last section of the questionnaire investigates the students' preferences towards two types of classrooms: classroom 1, representative of a traditional layout, and classroom 2, representative of Montessori teaching space. Since both Mazzini classrooms have the same layout, they were considered together.

The graphs below show that in both groups more than half of the students prefer classroom 2, which is the Montessori classroom. Analysing the answers concerning the reason behind their choice, the most frequent motivations were the following:

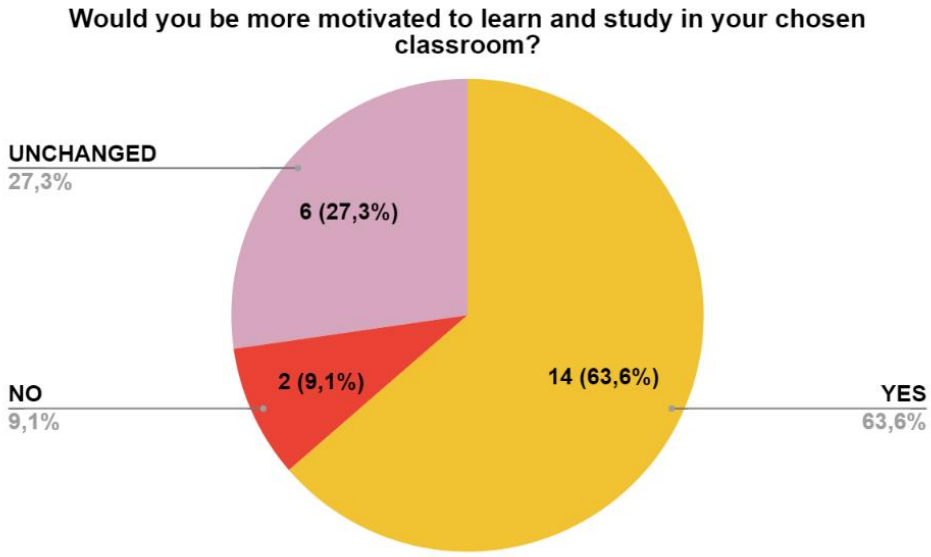
- the students of the Mazzini school who chose classroom 2 (59.5%) considered it more spacious, welcoming, comfortable and capable of transmitting a sense of freedom. While the students who preferred classroom 1 (40.5%), chose it for its orderly layout and the chance to remain more concentrated than they would be in a Montessori classroom.
- the students of the Valeri school who chose classroom 2 (71.4%) preferred it because of its accessibility to materials, furniture and size. The students who chose classroom 1 (28.6%) said their choice was motivated by the same characteristics listed by the Mazzini students, i.e., they preferred the orderly layout of the classroom and the arrangement of the desks which would allow them to concentrate more.



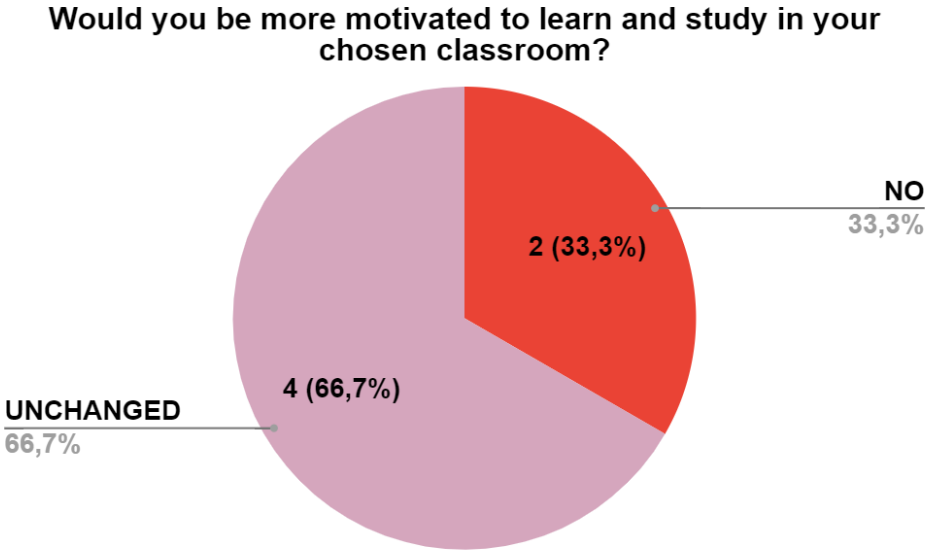


A further investigation was devoted to the data obtained from the answers to the last question, which was: would you be more motivated to learn and study in your chosen classroom?

The data observed and reported in the following graphs consider the percentage of students who chose a different classroom from the one they currently belong to. Their motivation is assessed in terms of the pleasantness that the student assigned to the chosen classroom.



The graph shows the percentage of students from the Mazzini school who indicated that they preferred classroom 2. A total of 22 students out of 37 (total number of both classes), equivalent to 9.1%, stated that their motivation to study would not improve, 27.3% did not perceive a change in motivational stimulus, and 63.6% (14 students) stated that their motivation would increase in the Montessori learning environment.



The second graph shows the percentage of students from the Valeri school who indicated that they preferred Classroom 1. Out of a total of 21 students, only 6 chose the first option; of these 6 students, 66.7% stated that their motivation would remain unchanged, while 33.3%

stated that their motivation would not improve. No one reported an increase in motivation in the chosen class.

7.3 Considerations

The choice of administering the questionnaires to the students was significant in order to be able to collect data on each student's perception regarding the quality of their classroom. By analysing the results and their graphic representation, differing values emerged from the three classes examined. We should also point out that in the statistical analysis, the scores obtained were not influenced by the number of students in each class, which made it possible to compare and contrast the results.

Overall, the Valeri class obtained a higher score in all sections of the questionnaire, reaching the maximum score (10) when concerned with questions about students' motivation to learn. Differences were surprisingly found between the two classes of the Mazzini school: the class with an extended timetable scored overall slightly lower than the normal class, exception made for the sections regarding Functionality and Learning Motivation, where higher values were found.

Regarding the graphs about the seventh section, more than half of the students (37 out of 59) rated the quality of the Montessori learning environment as more positive than the traditional one. As mentioned above, students perceive the Montessori classroom as more comfortable than its traditional counterpart. It's worth pointing out that a small group of students (7 to be precise) chose the traditional classroom specifying their preference towards the order and desk arrangement rather than that of a Montessori classroom. It's interesting to take this data into consideration since it is a determining factor that the students pointed out when choosing Classroom 1, considered important for the functionality of the physical setting itself.

Results obtained from these questionnaires can serve as a tool to support teachers and school managers to improve the quality and functionality of scholastic environments; the most relevant section to help understand how to undertake such task is the sixth one, aimed at identifying the needs of each student.

Looking at the graph of overall scores, a lower value was found for section six than for the others: we believed that implementing a more mindful approach based on listening to needs and taking measures to meet them can have an incredibly positive effect on students'

psychological and physical well-being. Nevertheless, we must remember that the needs most frequently expressed by students in these questionnaires cannot, as of right now, be met because of restrictions that have been imposed on schools to contain the spread of the Covid-19 virus. For example, from the data collected it was observed that many students would like to do more practical and laboratory activities and work more in groups or pairs. Although implementing meaningful changes to classrooms at this time is particularly difficult, it can, on the other hand, be taken into account for future evaluations of the learning environment.

Conclusion

Through the research work presented, two fundamental factors that are being studied in modern didactics have been described: motivation and learning environments. The theoretical aspects presented in the first part of the research confirmed the importance that motivation and environment occupy in the child's educational path, closely analysing the role played by the latter as a potential motivational factor. According to this claim, examples of innovative and functional learning environments that promote students' well-being, personal interests and abilities were selected and described with particular interest towards strong motivational development.

In particular, the research paper investigated the importance of the environment described in the Montessori Method. Through the analysis of Dr. Montessori's educational proposal, it was possible to assign aspects to the environment that would make it suitable for the development of the intrinsic motivational components behind learning. In fact, as opposed to the standard classroom model, the Montessori environment places students at the centre of the learning process and plays the role of a third teacher in supporting the individual's learning experience. Because of this, it was deemed valid to consider the Montessori environment for experimental research comparing it to a more traditional learning space. The two teaching spaces differ in organisational, environmental and methodological dimensions: this research aimed to assess the impact of the learning environment on student motivation.

The experiment involved two primary schools in the province of Padua, of which three fourth year classes took part. Whilst choosing the schools, it was deemed most effective to compare a learning space defined as "traditional" to a Montessori environment. The experiment was divided into two phases: the first, in which the two environments were presented and described; the second, corresponding to the collection of data through the administration of a questionnaire that evaluated the students' perception of their learning space.

The data collected made it possible to analyse the scores assigned by the students based on a series of values attributed to the classroom. Thus, the aesthetics of the classroom, its emotional impact on the students, functionality, promotion of well-being and motivational input were judged. In addition, the student’s needs in relation to the functionality of the space were investigated.

In formulating a conclusive reflection on the research carried out, two of the main points that were identified concerning motivation will be expressed. The first concerns the scores obtained in the section dedicated to the motivation to learn: it was noted that the students possess a strong motivation to learn, which does not seem to be closely linked to the functionality value of the classroom after all. In fact, especially for the classes of the Mazzini school, the graphs show that a low value of functionality and comfort corresponds to a high value of motivation.

If these first analyses did not give satisfactory results, the second point we will consider was much more interesting for this research. We are referring to the last section of the questionnaire, dedicated to the evaluation of the two classrooms visually presented to the students; here, it is possible to confirm that the students perceive the Montessori environment as a more motivating and learning-friendly place; the reason behind the students' choice of the Montessori classroom corresponded also to perceived needs not being met in their current learning environment. Thus, the students identified the Montessori environment as a way to possibly satisfy their needs, especially in regards to the practical use of materials, collaborative and "laboratory-type" activities and the need for greater freedom of movement, which could be analysed as a need for autonomy and greater responsibility.

Finally, the importance given by some students to classroom order was noted. This characteristic, considered within the traditional classroom, should be taken into account as a motivational factor that was not seen within the Montessori classroom.

In light of the results obtained from this research, we hope that new experimental studies will be conducted to better evaluate the importance of learning environments. It is important to emphasise that listening to the student's actual needs can be the first step towards the implementation of measures aimed at satisfying these needs and, consequently, increasing student motivation. The optimisation of learning environments is part of the process of re-evaluating teaching in a qualitative way, in which subjects must be placed at the centre of their learning process.

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