Pedarchitecture: Which learning environments for the personalisation of teaching and learning? An educational architecture for the schools of the future

Mariagrazia Marcarini
University of Bergamo - Italy

ABSTRACT

This research investigates the possibility of overcoming traditional learning environment rigidity. It aims to answer how teachers have adapted their teaching to changing learning environments, what impact new educational spaces have on teachers and students, how to organize students with different criteria, and how learning environments can be redesigned in old schools with limited investments. The research studied three schools: in Denmark, the Hellerup Folkeskole in Gentofte and the Ørestad Gymnasium in Copenhagen; in Italy, the Enrico Fermi High School in Mantua. New Learning Environments enhance collaboration and stimulate the exchange of new teaching methods, enabling learning personalisation; in addition to Team Teaching, a "Bridge-Culture" concept was developed, offering a wider vision including structural and organizational details. Consequently, students improved learning skills, felt more responsibility and studied in different ways. In these "architecture feeds pedagogy" schools, some key concepts guide new learning environments design: readability, "semantic-topical", flexibility, invisible pedagogy, and affordance.

KEYWORDS: PEDAGOGY + ARCHITECTURE = PEDARCHITECTURE; INNOVATIVE LEARNING ENVIRONMENTS; TEAM TEACHING AND BRIDGE-CULTURE; THIRD TEACHER; LEARNING SPACES DESIGN

Mariagrazia Marcarini, PhD in Human Capital Formation and Labour Relations, is currently a Teaching Assistant of Special Education at the University of Bergamo and Educationalist in Secondary School CIA (Centro di Istruzione per l'Adulto e l'Adolescente - Adult and Teenager Education Centre) at Polo Alessandro Manzoni in Milan. She is responsible for the Strategic Area "School Architecture" of the ADi (Associazione Docenti e Dirigenti scolastici italiani-Association of Italian Teachers and Headteachers). Mariagrazia has over twenty-five years' experience in Special Education as Educator and Teacher of Math for students with disabilities and as Coordinator of Vocational Training Courses for Salesperson and Assistant Cook for students with disabilities at the Council of Milan. Currently, she collaborates with a team of architects to redesign learning environments to help teachers to change their learning practices involving students, teachers and parents in design. In addition to this, her research currently explores Post-Occupancy Evaluation in school buildings

INTRODUCTION

The cultural background that characterises our societies is undergoing a steady transformation and schools are involved in this change. Education is a global process involving all the supporting structures of human life (Ruini, 2009). In this scenario, the task the school has is to help each student in a process where everyone shapes himself in order to become a person (Maritain, 1943).

Teachers must be able to evolve disciplinary knowledge and teaching methodology according to the integral growth of the student (Bertagna, 2006) so that dignity, creativity and the basic right to schooling and education are recognised for everyone (Mounier, 1935). Both education and schooling are pivotal because one cannot educate without teaching, while it is easy to teach without educating (Arendt, 1961).

This can be done in many ways, but the organisation of learning environments, where the school is "third teacher", needs to be taken into account, as we have been reminded by Loris Malaguzzi (Edwards, Gandini, Forman, 1998).

Space talks (Hall, 1959), the setting itself of the furniture, the students' and the teacher's desks influence students and regulate their behaviour (Foucault, 1975). The teacher can be conceived as a theatre director who, by changing the teaching environment, can produce a different scenario and therefore introduce a new teaching model (Gamelli, 2001).

The analysis starts with the relationships between people, education and learning environments that can stimulate personalised learning. The students must be considered in a position to make choices, independent, responsible, self-sufficient (Hoz, 2005) and conscious of their learning (Collins, 1991; Dent-Read, Zukow-Goldring, 1997; Lippman, 2010). Personalised learning is the most useful strategy, so that each student reaches the best possible results (Miliband, 2006).

DESIGN

The research analysed three schools in two countries: Denmark and Italy.

In Denmark, the Hellerup Folkeskole in Gentofte (Copenhagen), for students aged 6 to 15, and the Ørestad Gymnasium in Copenhagen for teenagers aged 17 to 19.

The choice of Denmark was made for three reasons. The first relates to investments that have been made in the school architecture after the poor results in the OECD-PISA 2000 survey. The second concerns the choice of two schools that interpreted the Danish Government's directions on education to design new schools where it was possible to propose an innovative teaching method with the student at the centre of the education process with its various learning styles (McGrane, 2012). The third is historical: in Denmark since 1844 laws have been issued requiring adequate and clean classrooms, stressing the influence of the educational spaces on child development (Vindum, 2007).

The other part of the research was carried out in Italy, at the Enrico Fermi Institute in Mantua, High School of Applied Sciences for teenagers aged 14 to 19.

Thanks to some structural and organisational changes, introduced by the headteacher, this institute could be taken as an example of what was possible to do in old schools with limited investment, but with a tremendous impact on the pedagogical approach and teaching methodologies.

The aim was to answer the following questions:

- How have teachers adapted their teaching to changing learning environments?
- What impact might new learning environments have on teachers and students?
- How can the educational setting be changed for the personalisation of teaching and learning?
- How can learning environments be redesigned in old schools with limited investments?

METHODOLOGY

In the relationship between education and school, “the building sets the method” (Romanini, 1962, p. 21). “The question of the epistemological pre-requisite on the person’s centrality” (Pavan, 2003, p. 29) is fundamental, according to specific philosophical assumptions (Mertens, 2014).

The ecological paradigm has been chosen through the lens of the European Personalist Movement (Jacques Maritain, Emmanuel Mounier, Paul Ricoeur) with epistemological and anthropological structure of the human person and the influence that learning environments have on the person along with proxemics dimension and strong symbolic value of furniture present in the classrooms.

This research has an explorative character as it used quality survey techniques using the Case Study. It also focused on specific analysis by ‘mixing’ the Phenomenological-Eidetic and Grounded Theory methods, with a hermeneutical approach (Mortari, 2012). This has allowed a thorough understanding of the situation and to simultaneously safeguard the features of real life events (Yin, 2003).

Three schools were chosen as examples, considering them in their uniqueness, since each presents interesting basic information (Merriam, 1998).

As regards data collection, various techniques were combined (Silverman, 2000). Papers and documents supplied by the schools and found on the Internet, videos and photographs, direct observation of the school premises, of the objects as well as the observation of the interactions, group and individual interviews were used, asking similar questions but with a few differences, according to the different cases.

After the headmasters, teachers and students were interviewed. In Denmark, at the beginning of the interviews, photographs of old schools or of traditional teaching methods were shown as a lead-in.

At Hellerup the interviews involved: one teacher for 7 to 9 - year-old children (1st -3rd grade), one for 10 to 12 - year-olds (4th - 6th grade), one for 13 to 15 - year-olds (7th - 9th grade), the Coordinator of Students with Special Needs and a group of five students of different ages (7th - 9th grade). We also participated as observers in two primary school lessons.

At Ørestad two teachers and a group of six students of different ages were interviewed (1st - 2nd - 3rd year).

At Enrico Fermi Institute in Mantua, videos of Danish schools were shown before the interviews. The interviews focused on: a group of six teachers of the first and second year (1st - 2nd), a group of six teachers (3rd - 4th - 5th), both of whom consisted of high school and technical institute teachers; two groups of six students each, for the two-year and the three-year period, split between high school and technical institute.

The results are a selection of narrative material collected during the interviews, according to the ‘eye’ of the researcher.

HELLERUP SKOLE

Figure 1: School interior, by author.

Figure 2: Home base, by author.

Figure 3: The hexagonal-shaped steps, by author

Hellerup has about 650 students and is entirely open-space. There are nine Home Areas where students' daily life takes place. The large central staircase is 'the heart of the school' (Figure 1).

At the corners of these areas there are the Home Bases, two by two-meter hexagonal mobile structures (Figure 2) where pupils sit to listen to teachers' lessons for about twenty minutes. Then they go and sit in freedom where they prefer, in small or large group or alone, to practice school work: at the tables, lying on the floor, on the sofas in the relaxation areas or on the hexagonal-shaped steps (Figure 3). This enables the personalisation of student learning and empowerment.

ØRESTAD GYMNASIUM

Figure 4: School interior, by author.

Figure 5: Meeting room, by author.

Ørestad has about 1200 students, it is defined as "One room, one school" because it is a large cube-shaped building with several floors connected to each other by a helix staircase (Figure 4), the throbbing centre of the school, which is completely 'paper-free' and students use only iPads.

There are only a few classrooms compared to the total number of students because 'school takes place outside school'. Through a network of companies, students have the opportunity to take some lessons outside.

The school is an 'exploration ground' where teachers constantly develop new methodologies allowing each student to learn, be independent, develop their own opinions and to be able to work in a team.

There are several possible different space lay-outs/settings: open-space for individual or Cooperative Learning work, a meeting room where students work in teams monitored by teachers (Figure 5), classrooms with glass walls, where students attend brief frontal lessons, open areas that can be transformed into large spaces where, for example, three teachers can work with about ninety students.

Figure 6: TEAL
(Technology Enabled Active Learning)
classroom with Origami desk, by author.

ENRICO FERMI INSTITUTE

Fermi has around 1800 students. It used to be a school with traditional teaching methodologies centred on the teacher. The headmaster's vision has changed, starting with the total cabling of the building and the introduction of new computer technologies.

Afterwards, subject classrooms were created and assigned to the teachers so that the students reach them at the change of lessons instead of the reverse. Same subject teachers share the classroom and have the teaching materials (personal computers, interactive whiteboard, books) available for the lessons.

By dismantling the partition walls of some classrooms, TEAL (Technology Enabled Active Learning) classrooms (Dori & Belcher, 2005) (Figure 6) with Origami desks were created and, by redesigning some unused areas, informal spaces for relaxation and individual study were set up.

Economic investment has been contained, but with remarkable results in the new pedagogical approach, teaching methodologies, motivation and student learning.

RESULTS

Some fundamental concepts that should guide the design and/or reorganisation of the spaces are highlighted: readability, flexibility, semantotopics, affordance and invisible or latent pedagogy.

The 'readability' of the spaces refers to the possibility of categorising and recognising them immediately through certain elements that allow their orientation (Lynch, 1960; Kaplan, 1987).

There must be an "intrinsic flexibility or actual variety" that is what architects call "built-in-flexibility" (De Bartolomeis, 1983, p. 188-94), so that laboratories can also exist in a nonspecific space.

The design of an educational environment represents a process of attributing meaning to environments, defined as 'semantotopic' (Franceschini & Piaggesi, 2000). In order to design a physical space, that is, a 'topical text', the designers and the beneficiaries of the space must share the same meaning as well as refer to semantics.

The environments offer 'affordances' (Gibson, 1979), which is a kind of 'invitation' through the existing objects that guide actions.

The spaces organisation acts in an invisible way through the 'invisible' (Bernstein, 1979) or 'latent pedagogy' (Bondioli, 2008) which is passively accepted and experienced by teachers.

For these reasons, the three elements: structure, objects, and actions must interact, so as to be coordinated together.

HELLERUP SKOLE AND ØRESTAD GYMNASIUM

Being the schools a total or almost open space, teachers have to be very open minded and flexible and not shy because what one does is visible to everyone and it is an important aspect, from a psychological point of view, as it helps teachers to support each other and share challenges. This organisation allows students to learn more, better and with pleasure.

The teachers point out that the innovative architecture of the school and the new technologies 'nurture pedagogy' and allow the flexible use of learning environments.

At Hellerup and Ørestad there is an on-going collaboration, therefore it becomes easy to locate new teaching strategies, to plan lessons and to recognise the students with different learning styles.

The teachers have made their knowledge and skills available in order to share them in a Peer Education modality among colleagues as well as share the materials produced, the teaching strategies and the possibility to personalise both learning and teaching, in addition to workload.

This has developed a "Bridge-Culture" (Sandrone, 2007), which is a broader concept than Team Teaching, where teachers meet in groups at predetermined times (Dean & Whiterspoon, 1962; Bair & Woodward,1964) because it includes structural and organisational details and allows teachers to overcome the fragmentation of disciplines and the lack of a unifying centre.

According to students of both schools, the Cooperative Learning and Peer Education methods allow rapid, personalised and informal learning, as theorised by Roger Cousinet (1945).

The organisation of learning and teaching spaces can be found in the pedagogical activism theorised by John Dewey, Maria Montessori, Roger Cousinet, Célestin Freinet, supported by new technologies.

The students are closely monitored by teachers, who stimulate their learning in different ways by trying to empower them in order to make them independent in their itinerary, aware of their characteristics and give meaning to their learning. Students are grouped according to the scheme of the teachers, sometimes working in small groups, other times in large groups. This enhances socialising, learning to collaborate and to help.

Students are very good at interacting with the environments, adapting to spaces, using every corner, and making the school a place that feels like home (Volpicelli, 1964).

They feel totally free to choose the place where to study and move, as an open space 'broadens the spaces of the mind'. Flexibility allows students to leave the traditional "isolation and control school" (Iori 1996, p. 120). There is a flow of informal exchange between teachers and students, creating a collaborative atmosphere and educational community.

In both schools, students are not considered as a homogenous mass, but each one is a unique and original person, which reflects the concept of the Danish educationalist Nicolai F.S. Gruntvig (De Natale, 1980). In order to teach in these schools, it is imperative to believe in the pedagogical project and work closely with colleagues at multiple levels.

ENRICO FERMI INSTITUTE

The new organisation of learning spaces by switching to 'subject classrooms', 'debate classrooms' and 'TEAL classrooms', obliged teachers to revise their teaching methods.

Traditional frontal teaching was reduced and new methodologies introduced such as Cooperative Learning, Peer Education and Debate. The use of new technologies allowed teachers to bring the 'school to children's rooms'.

The teachers appreciated the opportunity to share the classroom with their colleagues without having to move continuously from one classroom to another. Again, this modality has created the Bridge-Culture.

The drawback is the lack of informal exchange with the colleagues of the same class, the advantages are however greater. Teachers agree that new teaching methods have increased the students' attention, motivation and interest enhancing positive learning, learning behaviours and discipline management.

Students are thrilled because moving from one classroom to another at the change of lesson allows for a break of 'decompression' and can potentially increase relational exchange and socialisation with students of other courses and familiarisation with the whole school.

The classrooms become 'readable' because the students can personalise them with their teachers. Students claim they are willing to go to school because they find comfortable, familiar environments where they learn without anxiety. An environment that makes them feel comfortable is 'the fuel of motivation'.

CONCLUSION

Célestine Freinet claims that, if modernisation is made possible in the classrooms and learning spaces, it is also possible to modernise teaching (Freinet, 1946).

It becomes important to start from the space, its organisation and new technologies in order to propose a new teaching model where at the centre there is the learner, as the conscious protagonist of his own learning (De Natale, 1980).

The innovative structure of learning environments with the high-tech classroom and "variable geometry setting" (Ferri, 2011, p. 115), albeit with a different organisation, has allowed the introduction of new teaching methodologies and learning personalisation.

In the three schools, the students agree that teachers are not always expert in dealing with new technologies and they sometimes ask students for help in a sort of 'mutual learning process'.

The results of this study represent a useful point of specific analysis of pedagogical architecture and heuristic value for any subsequent investigation.

'Pedarchitecture' seems to be the right word to link pedagogy and architecture of learning spaces.

Part of this research was published in the book '*Pedarchitettura. Linee storiche ed esempi attuali in Italia e in Europa, Studium, Roma 2016*'.

ACKNOWLEDGEMENTS

I would like to give my thanks: Prof. Giuseppe Bertagna; Prof. Giuliana Sandrone; Lene Jensby Lange; Alessandra Cenerini and ADi (Italian Teachers and Headteachers Association); Cristina Bonaglia and the teachers and students of Enrico Fermi Institute of Mantua; Jørn West Larsen and the teachers and students of Hellerup Skole; Allan Kjær Andersen and the teachers and students of Ørestad Gymansium; Norberto Bottani; Prof. Christian Khün; Prof. Alastair Blyth; Prof. Wesley Imms, Mrs. Joann Cattlin, Dr. Marian Mahat, and Kirra Liu.

REFERENCES

Arendt, H. (1961). *Between Past and Future Six Exercises in Political Thought*. New York: Viking Press.

Bair, M., & Woodward, R. G. (1964). *Team teaching in action.* Boston: Houghton Mifflin Company.

Bernstein B. (1979), *Classi e pedagogie: visibili e invisibili*, by E. Becchi (Ed.), *Il bambino sociale*, Feltrinelli, Milano.

Bertagna G. (2006). *Pedagogia dell'" uomo" e pedagogia" della persona umana": il senso di una differenza.* In G. Bertagna (Ed.), Scienze della persona perché (pp.17-74). Soveria Mannelli: Rubbettino.

Bondioli A. (2008). Un dispositivo per l'analisi e la valutazione dell'organizzazione pedagogica della scuola dell'infanzia (DAVOPSI). In Bondioli A., Nigito G. (a cura di), *Spazi, tempi, raggruppamenti. Un dispositivo di analisi e valutazione dell'organizzazione pedagogica della scuola dell'infanzia (DAVOPSI) (pp. 115-257)*. Azzano S. Paolo (BG): Edizioni Junior.

Collins, A. (1991). Cognitive apprenticeship and instructional technology. In L. Idol & B. F. Jones (Eds.), *Educational values and cognitive instruction: Implications for reform* (pp. 121-138). Hillsdale, NJ, US: Lawrence Erlbaum Associates, Inc.

Cousinet, R. (1968). *Une méthode de travail libre par groupes*. Paris: Éditions du Cerf.

De Bartolomeis, F. (1983). *Le attività educative: organizzazione, strumenti, metodi*. Roma: La Nuova Italia.

De Natale M.L. (1980). *L'educazione per la vita, N.F.S. Grundtvig pedagogista ed educatore danese*. Roma: Bulzoni.

Dean, S. E., & Witherspoon, C. F. (1962). Team teaching in the elementary school. *Education Briefs, 38* ,4. Office of Education, Division of State and Local School Systems, Instruction, Organization and Services Branch.

Dori, Y. J., & Belcher, J. (2005). How does technology-enabled active learning affect undergraduate students' understanding of electromagnetism concepts? *The journal of the learning sciences, 14*(2), 243-279.

Edwards, C. P., Gandini, L., & Forman, G. E. (Eds.). (1998). *The hundred languages of children: The Reggio Emilia approach--advanced reflections*. Connecticut: Greenwood Publishing Group.

Ferri, P. M. (2011). I nativi digitali e i personal media. In M. Mincu (Ed.), *A ciascuno la sua scuola. Teorie, politiche e contesti della personalizzazione*. Tornio: Sei.

Foucault, M. (1975). Les corps dociles. *Surveiller et punir. Naissance de la prison.* Paris: Gallimard.

Franceschini, G., & Piaggesi, B. (2000). *La progettazione degli spazi nella scuola dell'infanzia: un percorso di studio e ricerca-azione.* Milan: FrancoAngeli.

Freinet, C. (1946). La Coopération à l'Ecole Moderne. *Brochure d'Education Nouvelle Populaire N*, 22.

Gamelli, I. (2001). *Pedagogia del corpo. Educare oltre le parole*. Roma: Meltemi.

Gibson J. J. (1979). *The Ecological Approach to Visual Perception*. Boston: Houghton Mifflin Company.

Hall, E. T. (1959). *The silent language*. New York: Doubleday.

Hoz V.G. (1988). *Educación personalizada*. Madrid: Rialp.

Iori, V. (1996). *Lo spazio vissuto. Luoghi educativi e soggettività*. Firenze: La Nuova Italia.

Kaplan, S. (1987). Aesthetics, affect, and cognition: Environmental preference from an evolutionary perspective. *Environment and behavior*, *19*(1), 3-32.

Lippman, P. C. (2010). *Evidence-based design of elementary and secondary schools: A responsive approach to creating learning environments.* New Jersey: John Wiley & Sons.

Lynch, K. (1960). *The image of the city* (Vol. 11). Cambridge, Massachusetts: MIT press.

Maritain, J. (1943). *Education at the Crossroads*. New Haven: Yale University Press.

McGrane, S. (18th January, 2012). Open Spaces Transform Danish Education. *The Wall Street Journal.* Retrieved from: https://www.wsj.com/articles/SB10001424052970204555904577168592091278750

Merriam, S. B. (1998). *Qualitative Research and Case Study Applications in Education.* Revised and Expanded from "Case Study Research in Education". San Francisco: Jossey-Bass Publishers.

Mertens, D. M. (2014). *Research and evaluation in education and psychology: Integrating diversity with quantitative, qualitative, and mixed methods.* Thousand Oaks: Sage publications.

Miliband, D. (2006). *Policy strategies to enhance the personalised learning agenda. In CERI, Personalising Education, OECD, Paris.*

Montessori, M. (1921). *Manuale di pedagogia scientifica*. A. Morano.

Mortari, L. (2012). *Cultura della ricerca e pedagogia*. Prospettive epistemologiche. Roma: Carocci.

Mounier, E. (1935). *Révolution personnaliste et communautaire*. Paris: Aubier.

Pavan, A. (2003). Dai personalismi alla persona. In Pavan A. (Ed.), *Dire Persona*. Bologna: Il Mulino.

Ricoeur, P. (1983). Meurt le personnalisme, revient la personne…*Esprit*(1940-), *73*(1), 113-119.

Romanini, L. (1962). *Costruire scuole*. Milano: Garzanti.

Ruini, C. (2009). *Prefazione*. In *La sfida Educativa*. Bari: Laterza.

Sandrone, D. G. (2007). *La cultura assente.* Rubbettino.

Silverman, D. (2000). *Doing qualitative research: A practical guide*. London: Sage.

Simon, H. (1991) Bounded rationality and organizational learning. *Organization Science, 2*(1), 125-134.

Vindum, K. (2007). A misura di bambino/On childrens scale: Due scuole di Arne Jacobsen/two schools by Arne Jacobsen. *Casabella*, (750/751).

Volpicelli, L. (1966). *Educazione contemporanea: aspetti e problemi*. Armando

Yin, R. K. (2003). Case study research: design and methods, Applied social research methods series. *Thousand Oaks: Sage Publications, Inc.*