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DIMENSIONS AND FACTORS TO MANAGE AN HYBRID CLASSROOM

DIMENSIONI E FATTORI PER GESTIRE UNA CLASSE IBRIDA

V. Benigno[a], C. Fante[a], G. Caruso[a] , E. De Gregorio[b], F. Ravicchio[a]

[a]Educational Technology Institute, National Research Council, Genova, Italy

b Link Campus University of Rome, Rome ,Italy

benigno@itd.cnr.it

https://orcid.org/0000-0002-9385-7163

Abstract

In this study, a possible scenario cantered on the concept of "Hybrid Learning Space" is presented and discussed as a solution to support inclusive solutions for students unable to attend regularly school due to health problems.. In the Italian context, an Inclusive Hybrid Classroom model is developed and tested following three dimensions: 1) the methodological dimension, 2) the technological dimension and 3) the organizational dimension. During the TRIS project, 43 semi-structured interviews have been conducted and recorded with the teachers involved; the analysis of their content was carried out with the aim of identifying which conditions support a hybrid environment for distance learning with the students.

In questo studio viene presentato e discusso un possibile scenario incentrato sul concetto di "Hybrid Learning Space" come soluzione per supportare soluzioni inclusive per gli studenti impossibilitati a frequentare regolarmente la scuola per problemi di salute. Nel contesto italiano, un'aula ibrida inclusiva Il modello è sviluppato e testato secondo tre dimensioni: 1) la dimensione metodologica, 2) la dimensione tecnologica e 3) la dimensione organizzativa. Durante il progetto TRIS sono state condotte e registrate 43 interviste semistrutturate con i docenti coinvolti; l'analisi del loro contenuto è stata condotta con l'obiettivo di identificare quali condizioni supportano un ambiente ibrido per la formazione a distanza con gli studenti.

Keywords

Distance teaching; Inclusive Hybrid Classroom; organizational, methodological and technological dimensions; thematic analysis.
Didattica a distanza; Aula ibrida inclusiva; dimensioni organizzative, metodologiche e tecnologiche; analisi tematica.

Introduction

Over the past decade, increase in the use of mobile devices has opened up new opportunities for students to access learning opportunities from anywhere (Saadiah, Erny, & Kamarularifin 2010): the redefinition of learning environment spaces has led to the emergence of new approaches, called "Hybrid Learning", whereby the student shifts between different contexts, be they real or virtual, sometimes integrated or mixed (De Souza & Silva, 2006). In a hybrid space, teaching can be enriched by a tight combination of formal and non-formal learning processes derived from constant sharing of personal experiences and knowledge and amplified by social, individual and group interaction (Trentin, 2017).

Hybrid learning environments can be defined by three fundamental dimensions: the physical dimension (the space in which we are physically present); the digital dimension (everything that the use of digital technologies brings to the physical space); and the dimension of social interactions.

In schooling, it is therefore possible to create a hybrid classroom in which the physical components of the classroom and of a (remotely-connected) student's home are sublimated by the digital dimension, potentially overcoming conventional space and time constraints. A recent analysis of the literature (Raes, Detienne, Windey, & Depaepe, 2019) highlights how learning in a synchronous hybrid space can represent a more flexible and engaging environment than those of full physical presence, even if further studies of related pedagogical scenarios and their impact on students' results are necessary. Authors state that the hybrid virtual classroom also poses many challenges of both a pedagogical and a technological nature.

The use of technology is only the last link in a more radical transformation that concerns the organization and management of (hybrid) spaces and, above all, the didactic strategies adopted: to create a hybrid teaching-learning environment and, it is necessary to connote it in a didactic-pedagogical key (Benigno, Caruso, Fante, Ravicchio, & Trentin, 2018a).

Context of research

In the Italian context, home schooling is usually provided for students who cannot attend school due to illness, however this solution does not allow maintenance of social contacts with the peer group and continuity of educational paths. The indications related to the hybrid space have stimulated the development of an ecosystem model(Bronfenbrenner & Stefani 1986), centered on the concept of an “Inclusive Hybrid Classroom” in order to promote the social and educational inclusion of homebound students.

The concept of an “Inclusive Hybrid Classroom” concept was established in the TRIS project (Benigno et al. 2018a; Benigno, V., Fante, C., Ravicchio, F., & Trentin, G. 2018b), a three-year framework agreement was signed between the Italian Ministry of University and Research (MIUR), the National Research Council (CNR), and the Telecom Italia Foundation (social outreach arm of a major telecoms provider).

The project involved four students affected by chronic diseases (2M, ages 7 and 8; 2F, ages 8 and 10 years) without cognitive impairments, their teachers and their classmates. The duration of the project intervention phase in the experimental sites varied according to the hiring times of the monitored cases, from a minimum of one school year to a maximum of two and a half years.

The project saw the establishment of a research-training group whose members included both the researchers and the teachers involved. Qualitative and quantitative data were collected, specifically, the semi-structured interviews conducted with the various project participants made it possible to identify the factors pertaining to the three dimensions of the hybrid classroom:

The methodological dimension, which concerned the didactic-pedagogical approach adopted to foster active involvement of the homebound student in learning activities and social interaction with their classmates. Having a homebound student as a class member requires teachers to manage classroom activities in a manner that differs from traditional teaching situations;

The technological dimension, which concerned the study of sustainable technological infrastructure setups (class and home side) and the identification of mobile technologies and cloud resources capable of satisfying three typical functionalities: interpersonal communication, sharing of resources, co-construction of artifacts;

The organizational dimension, which concerned the organization of classroom and home spaces in a manner suitable for teaching in a hybrid class, and also entailed redefining or creating new routines specifically to fit the new context and organization of teaching times.

During the experimentation of the pilot project, the wider ecosystem was also monitored, in order to understand the complex relationships between teachers, parents and families. Analysis of the relational context of the experimentation was fundamental for identifying key variables for supporting the realization of a hybrid classroom; the evidence that has emerged regarding this point has been gathered in the "contextual dimension".

Aim of the study

The aim of this study is to identify the factors involved in the design and management of a hybrid learning environment taking into account the dimensions of the hybrid classroom model.

Participants and Procedure

The study involved 43 teachers covered primary and lower secondary school levels.

A qualitative approach has been adopted utilizing an individual semi structured interviews video-recorded at the end of each school year.

Analysis of the Interviews

Given the descriptive and explorative nature of the research goals, analysis of the interview data was carried out using a thematic analysis approach that aimed to identify and analyze patterns (or themes) within a set of data (Braun & Clarke, 2006; Kelle, 2007). An inductive or bottom-up approach was used for each theoretical dimensions identified (contextual, methodological, technological and organizational dimension).

Themes are developed through the analysis process rather than being defined beforehand. A theme is a cluster of codes conveying similar meanings, whereas a code is the primary product of the analytical process at the most fundamental descriptive level (Vaismoradi, Jones & Turunen 2016).

The interview sessions were video-recorded and subsequently transcribed verbatim by a member of the research team. As for the analytical phases of data handling, initially, for each dimension a sample of interviews representative of the entire set of transcribed texts was selected (three interviews for each survey dimension). These interviews were read independently by five researchers, and each had to identify a series of emerging conceptual categories that could be used to classify the material in question ("codes").

The next phase involved comparison between the five researchers' outputs and discussion of the individually identified categories in relation to the investigated dimension; any divergences in interpretation were resolved through a discussion / negotiation process.

Once agreement was reached between the researchers, the "codebook" (the set of codes and related definitions) was built for each area of subsequent investigation.

These content analysis were carried out using MAXQDA (Kuckartz & Rädiker, 2019), a software package for qualitative research, including exploratory and qualitative text analyses.

Results

The contextual dimension (ecosystem relationships)

Three main contextual themes came to light from the interview analysis: teacher collegiality; the creation of educational partnership between school and family and the strong bonds among students (Table 1).

On this last point, the hybrid space requires close collaboration with families "Educational pact with the family". The aim here is: 1) to build a bond of trust "Creating a climate of trust with the family "; 2) gain families' involvement, especially those with younger students "Need for distance mediation of an adult"; 3) support families in setting up a suitable study space at home; and 4) establish a shared understanding so as to avoid undue family interference in learning activities and minimize distraction from the home environment "Management of family interference" and "Management of the home setting".

As regards the first factor mentioned above, namely collegiality, it emerged that management of the hybrid class requires teacher cooperation in various areas: the adopted technologies "Need for collegiality in the management of technology"; the hybrid space "Need for collegiality in the management of Hybrid Spaces "; and the planning of learning activities "Need for collegiality in teaching ".

The second finding was that the hybrid space also requires greater and more intense school-family collaboration "Educational partnership between school and family". This entails: building of a bond of trust "Creating a climate of trust with the family "; requesting teacher involvement, especially with younger students "Need for distance mediation by an adult"; supporting the family in constructing a school setting in their home; sharing rules in order to avoid family interference in teaching and learning processes and to manage the dynamics of the home environment "Management of family interference" and "Management of the home setting".

Another theme highlighted by the analysis of the teacher interviews is management of the relationships among the student cohort "Maintaining an emotional connection bond".

Themes and codes	**Instance**
Collegiality	
Need for collegiality in the management of technology	*"technology requires work ... whenever possible, with colleagues too"*
Need for collegiality in teaching	*"The important thing is team work ... which is really harmony among colleagues ..."*
Educational partnership between school and family	
Creating a climate of trust with the family	*"... the parents help the student in everything; getting [the learner] to reason [themselves], that's a very important thing for me..."*
Need for distance mediation by an adult	*"When I had to connect, sometimes a mother was present who mediated the relationship with the learner."*
Management of the home setting	*"Sometimes household chores were being done near [the learner's] room that disturbed the lesson."*
Management of family interference	*".... The student looked away [from the webcam], as if waiting for a suggestion from someone else who was there to make suggestions."*
Relationships among students	
Maintaining emotional connections (BOND)	*"Students look for contact with their homebound classmate, even beyond lessons start and you have to help them because the relationship between peers is important.."*

Table 1. The contextual dimension: identified themes and codes

The Methodological dimension

In relation to the adopted teaching methods (Table 2), a general change appeared to emerge in the teaching approach followed "perception of change in one's professional practice", in particular a transition from lecture-style lessons to more active educational activity "overcoming the lecture-style method". Furthermore ,the teachers reported the need to actively involve students during classroom activities "actively engaging students in synchronous activities" and to alternate these with asynchronous moments "promote asynchronous activity".

More specifically, the teachers appeared to recognize that adopting active approaches centered on peer tutoring and pair-work helped to generate more intense participation on the part of the homebound student and the building and maintenance of friendships with peers "active teaching", "peer-tutoring", "pair-based learning".

Themes and codes	**Instance**
Planning educational activities	
Need to plan educational activities	*"It required a continuous preparation of the teaching material and work at home"*
Alternate between synchronous and asynchronous activity	*"... from the start, the technologies guaranteed me greater interactivity with the students, who immediately felt more involved."* *"When everyone is at home, they share and continue the work to be done ..."*
Teachers' Educational Approach	
Perception of change in one's professional practice	"*So ... the change of setting meant a change of course as for me, a change of course in teaching"*
Overcoming the lecture-style teaching method	"*It was no longer a lecture in which the children [simply] listened ... there was more participation. "*
Learning and evaluation strategies	
Active Learning	*"The first thing ... for this type of activity ... is that it always takes an initial phase of presentation and explanation on my part..."*
Peer tutoring	*"The learning reinforcement through peer work ... was important"*
Pair learning	*I often [get learners to] work in pairs. Also for a speech of simplicity of dialogue ".*
Evaluation strategies equal to the rest of the class	*"I did oral tests, through conversations or collective interventions of the whole class and then the written tests and the student was evaluated in the same and identical way as his classmates"*

Table 2. Methodological dimension: identified themes and codes

The Technological dimension

Analysis of the interviews revealed technological factors that either hindered or facilitated innovative education and the inclusion of the homebound student (Table 3).

The potentially hindering factors that were identified included: teachers' perceived sense of inadequate self-efficacy in technology use "sense of inadequate self-efficacy in the use of technologies"; difficulty in managing the technological setting, especially due to the daily use of technologies that the experimental set-

ting demanded "difficulty in managing the technological setting"; and a general negative attitude towards integrating digital technology into a traditional teaching context "Resistance to technology integration".

In addition, the needs associated with the acquisition of specific skills in the use of ICT "Need for basic ICT skills " also emerge, as well as the need for time to experiment with them " Need for time to experiment with teaching technologies".

As to factors facilitating the use of technologies, some intrinsic tool affordances have been identified. The teachers recognize that the technological setting allows collaboration and interaction between students in class and the homebound student "Affordance /collaboration" and access to a greater number of resources "Affordance/access to resources".

Finally, the teachers recognize how the use of technologies can guarantee a didactic innovation process and facilitates personalization of their actions in response to the specific needs of individual students "Technology as a tool for didactic innovation", thus promoting active participation by everyone "Technology as an inclusion tool".

Themes and codes	**Instance**
Factors hindering use technologies	
Inadequate sense of self-efficacy in the use of technologies	*"I feel in difficulty with technology I didn't know what to do"*
Difficulty in managing the technological setting	*"We only see the face and we don't see that ... maybe it would take a slightly broader network (to connect learners)"*
Resistance to technology integration	*"I realize that in my teaching practice a more traditional type of approach often prevails"*
Prerequisites for the use of technologies in the classroom	
Need for basic skills in the use of ICT	*"I repeat that basic skills are needed in the use of these technologies. Otherwise they can really become an obstacle"*
Need for time to experiment with teaching technologies	*"So now I would like to start using other (technologies) ... but I didn't have time to experiment.*
Technology Affordances	
Affordance /collaboration	*"I realized that….technology allowed me to carry out the shared jobs that we call "writing with multiple hands"*
Affordance / access to resources	*"So ... well ... you also have the possibility to access the online resources, which you download and store on your computer"*
Positive factors in using technologies	
Technology as a tool for didactic innovation	*"Certainly the technologies have allowed me to start (adopting) more innovative teaching compared to the past."*
Technology as an inclusion tool	*"Technologies catalyze attention, there is no doubt, they make the lesson more dynamic, more ... within everyone's reach"*

Table 3. Technological dimension: identified themes and codes

The Organizational dimension

Three themes emerged in the management of the hybrid class: organization of physical and virtual spaces, creation of relationship routines, and adherence to classroom etiquette (Table 4).

In the first instance, the teachers stated that teaching within the new hybrid environment meant having to modify the physical classroom environment, for example by moving chairs or rearranging the desks "Organ-

ize physical spaces". Organizing and running a learning virtual environment guaranteed peer-to-peer communication, as well as the sharing and co-construction of documents between students in the classroom and the homebound student "Organize online learning environments".

Regarding the relationships routines, the teachers reported performing actions necessary to support their work in the new educational context, such as student involvement and responsibility-taking in carrying out actions for the management of the technologies both before and at the end of the lesson "Relationship routines facilitate the teacher's work". In addition, shifting desk-mate in class with the homebound student also facilitated development of a feeling of friendship "Relationships routines facilitate a feeling of friendship".

In relation to classroom etiquette in the hybrid space, in some cases the teachers declared that they apply the same rules as in the traditional classroom, such as getting the student at home to raise their hand to intervene or to leave their workstation temporarily for particular needs "Application of pre-existing classroom etiquette for both homebound student and classmates".

These pre-existing rules were clearly spelled out in order to encourage better management of synchronous activities and to improve the sense of equality between classroom and homebound students. However it was necessary to establish some new rules for the homebound student, especially regarding assessment practices "Develop new rules for homebound student" and also for classroom students in order to support management of the new classroom environment "Creating new rules related to the classroom setting".

Themes and codes	Instance
Organization of physical and virtual spaces	
Organize physical spaces	*"…position the computer so that the student at home can see the class and you can see them .*
Organize learning online environments	*"So first of all it was necessary to create a specific account for the school, then I also created one specifically for the class."*
Relationship routines	
Relationships routines to facilitate the teacher's work	*"Everyone must be empowered. I delegated ... the students to organize the tools"*
Establish and shift the virtual desk mate	*"The virtual classmate helps both the teacher and the student both for organizational and communicative aspects"*
Relationships routines to facilitate a feeling of friendship	*Let's say that the relationship routines is mainly a question of turnover…. so that all students have the opportunity to get in touch with the homebound student"*
Behavioural rules	
Application of pre-existing rules for the homebound student and class	*"The homebound student participates like the others , that is, they have to raise their hand to ask questions or go to the bathroom ..."*
Develop new rules for the homebound student	*"The classmates had to avoid talking amongst (just) themselves, being noisy; they had to use a slightly speak up more (when addressing the class)"*

Table 4. Organizational theme: identified themes and codes

Discussions

The context dimension

The design and management of a hybrid learning environment requires a change of course in established teaching praxis, entailing a shift away from isolated, standalone actions taken by the individual teachers

towards a more collegial management approach of joint action coordination, both with regards to adoption of certain digital technologies and of particular teaching strategies.

A further insight that emerged from the reported experimentation is the need for a closer relationship between the two key educational agencies, namely the family and school, which have always been called on to collaborate in children's education (Pang, 2011; Lawson, 2003). Managing hybrid solutions in the classroom seems to require more intense and frequent collaboration, considering that the online learning activities during school hours impacts on "new" and different spaces (i.e., the student's home). In order to implement the new school setting testing in the project, it has been fundamental to motivate the students' families to collaborate, making them more aware of their active role in their children's educational path.

To implement a hybrid class, it is essential for teachers and schools to support parents, for example by providing clear indications for setting up a space dedicated to school activities and encouraging student autonomy. The new household "schooling space" needs to be respected by family members, considering it as a dedicated environment with specific boundaries: parents should avoid the temptation to intrude on the online activities and try to minimize background disruption.

Distance learning places children in a different relational dimension regarding the roles and tasks involved, although this factor may not be completely new for many digital natives (Pernsky 2001; Bennett, Maton, & Kervin, 2008). The classroom community represents a possibility for children to get to know each other and to interrelate, making friends and learning to manage conflicts. As the project findings have shown, this dimension also requires consideration in a hybrid space and needs to be allowed for in deployment.

Student participation of in digitally-mediated distance learning per se does not lead to socialization, especially at lower school levels. Therefore, special attention and effort needs to be dedicated to the maintenance and support of activities oriented towards the social and educational dimension (Thapa, A., Cohen, J., Guffey, S., & Higgins-D'Alessandro, 2013).

The methodological dimensions

As far as the teaching methodology is concerned, the project interviews show how, overall, the teachers reorganized their teaching activities, realigning them to ensure the active and dynamic participation of all students.

Interchanging synchronous and asynchronous activities is also considered an effective strategy for reducing homebound student fatigue who would normally otherwise be required to maintain a continuous connection to the classroom during class time. Designing asynchronous activities can also support affective connections outside of normal school hours, for example when the teacher assigns collaborative homework .

In fact, teachers have viewed planning collaborative activities to do in out-of-class time as an effective way to facilitate social contact with the homebound students (Zydney, McKimmy, Lindberg, & Schmidt, 2019). In addition, activities conducted using online learning environments should promote discussion-oriented methods that support the sharing of experiences thus maintaining a high level of social interaction among participants. Related to the issue of the evaluation the teachers declared that they used for the students attended at home the same strategies adopted to the all class.

The technological dimensions

For a while now, researchers have been investigating the different factors that prevent large-scale integration of ICT use into formal education; one of the most critical of these is related to teachers' lack of digital skills and expertise.

For some time now, researchers have been investigating the various factors impeding widescale integration of ICT use in formal education. It has been found that one of the strongest of these is related to the shortfall in teachers' digital skills and competences (Bingilmans, 2009; Buabeng-Andoh, 2012; Gil-Flores, Rodríguez-Santero & Torres-Gordillo 2017). This issue continues to represent an obstacle to ICT integration in teaching practice, feeding negative attitudes among teachers and a reticence to use digital technologies (Tondeur, Van Braak, Ertmer, & Ottenbreit-Leftwich, 2017; Vongkulluksn, Xie, & Bowman, 2018).

Teachers interviewed reported the need for training in the innovative use of digital tools. Recent study results (Gil-Flores et al., 2017) suggest that ICT use in the classroom is significantly influenced by the perceived need for training, increased teacher collaboration, and perceived self-efficacy (Benigno, Chifari & Chiorri, 2014).

In the context of the hybrid classroom, being "forced" to use technologies to address a real-world problem is likely to have been an incentive for teachers to be innovative.

This shift may also have been encouraged by the specific affordances of technologies supporting communication among students, the sharing of materials and the collaborative construction of artefacts.

The organizational dimension

Integrating two physical spaces (home and school) required teachers to reframe physical spaces, reconsider the relational dynamics of the classroom, and create new virtual environments and routines.

The teacher is called to organize online teaching environments suitable for different teaching activities that can be co-managed with students; also assigning students tasks and roles that force them to take responsibility can empower them in the teaching-learning process.

In some cases, teachers stated that the rules needed for effective management of the hybrid space were the same as in standard settings (e.g., requiring the homebound students to raise their hand to speak up or leave their desk for special needs); in other cases, specific rules had to be established to ensure that the classroom environment worked properly, such as establishing shifts among students to carry out certain daily routines (e.g., getting digital technologies up and running).

Rethinking rules and establishing new routines that actively involve the class can be good strategies for making the teacher's work more sustainable. The same applies to encouraging students to manage dynamics and support distance learning.

Conclusions

The hybrid class can be regarded as a new teaching space arising from the adoption of digital technologies (cloud resources and videoconferencing systems) for the sublimation of two distinct physical spaces, namely the classroom and the setting of the homebound student; it represents an effective solution in situations in which the physical presence of a student is permanently impossible.

The hybrid class can be considered a scenario capable of fostering active participation of all the students, who are involved in distance learning activities through strategies suitable for supporting situations where the physical presence of one or more students is impossible for periods of variable duration.

Experience with learning environment adopted during TRIS project field activities has generated some ideas and possible indications for ways of supporting distance teaching solutions. These may prove useful for meeting the educational challenges posed in emergency situations such as the current Covid-19 pandemic. As several authors suggest (Huang et al., 2020; Wang, 2020), we need to rethink established educational practices and create new educational models capable of reducing the sense of isolation associated with physical dis-

tance; this includes leveraging ICT affordances to create new opportunities for interaction and cooperation (Reimers & Schleicher, 2020).

Ethical approval & Informed Consent

The reported research project activities involved external subjects and has been reviewed and approved by the Commission for Research Ethics and Bioethics of the Italian National Research Council (CNR), (letter dated 14.06.2019).

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