Portability, Feasibility, Collaborativeness: Teachers' Perception Of Tablet Use For Inclusive Education

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Abstract

Thanks to their peculiar features and their employability in collaborative activities, Tablets can be really helpful in fostering the inclusion of children who cannot attend school for medical reasons. Within the project TRIS context (Tecnologie per l'Inclusione Socio-educativa [Technologies for socio-educational inclusion]), we carried out a pilot study in which we equipped the junior high classroom of a homebound student with Tablets, for both each student (n=22) and the teacher (n=7), and the homebound student (n=1). Data from both questionnaires and semi – structured interviews were collected in order to investigate the change in teachers' competencies in Tablet use and the inclusive activities done with the tool, on one side, and to understand their perception of Tablet use in everyday class activity, on the other side. The results are likely indicating that teachers do recognize and use the Tablet as a useful tool for the inclusion of the homebound student, but they do not use it in other activities as it is still perceived as too demanding in terms of efforts and time.

Keywords: E-inclusion,Tablet, Homebound Education, Hybrid Classroom

1 INTRODUCTION

The rapid diffusion of the Tablet in school contexts has generated a series of expectations regarding these devices and, specifically, in considering Tablets as the tool that would have conveyed and facilitated the technologies integration into education. Several researches attempted to investigate how and whether Tablets are used in classroom activities, as well as the features and affordances that foster or hinder their use.

A critical review on Tablet use in schools [1] reported interesting findings about the impact on learning, in terms of raising motivation among students [2], knowledge acquisition [3] and the enquiry base learning use [4, 5, 6].
Traxler,& Wishart [7] claim that mobile devices can enhance the concept of learning by supporting, for instance, experiences of contingent, situated, authentic, context-aware and personalized learning. A case study on iPad adoption in Primary school reported a positive perception of the tool for quick information access and support in collaboration [8]. Similarly, the FRAME model [9] stresses the interaction among the device, the learner and the social aspects of learning, concluding that m-Learning improve collaboration among learners, information retrieval and the contextualization of learning. Another recent study reinforced the view that Tablets have a positive impact on learning/teaching, the students were more motivated and engaged in the learning process and increased level of collaboration was seen [10].
Although teachers are aware of the fact that Tablets can help in making lesson more interesting and varied [11], their use also needs a rethinking of the pedagogical approach [12] as Tablets allow a more students-centred learning [13].

In a quantitative and qualitative research, Liu et al. [14] point out how the teacher's attitude towards technological innovation is an important variable for integrating Tablet into educational activities. The use of the device, indeed, is associated with pedagogical and organizational changes (eg. additional time for lesson planning). Thus, this study shows that the teachers of whom integrate Tablets in their activities emphasize the importance of the "student-centered" approach, together with the opportunity to increase pupils' active engagement through the ICTs integration in the classroom.

However, evidence form literature reports also show the critical features perceived by teachers related to the educational Tablet use. Results of a qualitative research [15], indeed, give interesting insights related to teachers' attitudes towards the Tablets. Majority of teachers do not think that Tablet could

help in enhancing students' learning and they are also sceptical about an innovative use of this tool. Furthermore, teachers highlighted the importance of a methodological and technological support, and the need for adequate technological infrastructures in order to successfully integrate Tablets into lessons.

In Basil and Balkas [16], interviewed teachers reported several problems related to Tablet use in the classroom, among which include: time consumption, the feeling of not having control on what students are doing, and a lack of social relations within students. Nevertheless, Tablet use was also connected to some positive outcomes, such as an increase in students' motivation, having access to online resources and searching, their portability, a limited use of paper and books, and an ease of planning activies.

Further, in the education context teachers are using the Tablet more frequently with special educational needs. Many benefits are found in helping children with visual impairment [17, 18], with intellectual and physical disabilities [19] and on the austic spectrum [20].

The spectrum of students with special needs is too wide and there are students too who are inhibited from attending a regular instructional path for health reasons and confined in their home. Relatively to this issue, it was investigated, from the point of teachers' view, the effect of Tablets integration in a classroom of secondary school where a Homebound Student attends regularly using a Skype and others ICTs.

This pilot study was carried out within the project TRIS (Tecnologie per l'Inclusione Socio-educativa [Technologies for socio-educational inclusion]).

2 THE TRIS PROJECT: A HYBRID CLASSROOM

The main aim of the TRIS project was the identification and experimentation of new models of schooling for students who are temporarily or permanently unable to participate in normal education. The research project comes within a triennial frame agreement between the MIUR (Italian Ministry of University and Research), the CNR (Italian National Research Council) and the Telecom (telephone company) Foundation, and its aim is to promote experimental activities for the socio-educational inclusion of students who have difficulties in normal school attendance.

From the methodological point of view, the project developed along three close complementary lines: (a) study and experimentation of didactic/methodological approaches targeted at socio-educational inclusion and centered on the use of a hybrid learning space (HLS) [21]; (b) the study and experimentation of sustainable technological settings for the application of the aforesaid didactic/methodological approaches; (c) planning and experimentation of teacher training actions regarding the planning, conducting and assessing of the inclusive activities.

More specifically, our aim was to understand whether the teachers and classmates of the homebound students have been stimulated by the widespread presence of both school and personally-owned technologies to create moments of greater formal and/or informal social and educational involvement [22].

This situation moreover tends to make the line separating physical spaces (e.g. the classroom) from digital spaces (e.g. online learning environments) increasingly less clear-cut, leading to a new view of the space of interaction, which we might define as "hybrid". The potential of hybrid learning spaces is considerable, in fact, they are dynamic spaces created by the constant movement of users carrying portable devices that are continuously connected to the Internet and to other users.

This "always-on" status transforms our perception of space to include contexts which are remote from those we are actually living in at that moment.

The project involved four Comprehensive Institutes (Primary School and Lower Secondary School) and 3 Upper Secondary Schools and each experimental situation received a minimum set of technologies and online resources for creating an HLS within which the educational processes actively involving the non-attending student can be conducted, both during lessons and school activities and during homework or extra-school study, as "Tab. 1" shows.

Table 1. Technological equipment provided in class and at home

Class equipment	Home equipment
Interactive White Board	LapTop computer
LapTop computer	Tablet
Tablet	Audio Kit
Audio Kit Bluetooth	Printer/Scanner
PTZ Webcam	Graphic Tablet
Printer/Scanner	Wi-Fi mobile router

Furthermore, we equipped a middle school classroom with one Tablet for each teacher and student. Due to organizational limits, it was decided not to allow students to take their devices from the school to their homes.

This new classroom defined as *Hybrid* Classroom was conceived for a daily, synchronous and continuous participation by the HB student in school activities.

Considering the non-familiarity of the teachers and the devices, a research-action group, where a researcher and teachers worked together, was actived. In "Tab. 2", reports an example of activities co-constructed in order to find a reasonable compromise between normal teaching methods and class needs as well as to introduce new tools and methods for the inclusion of the young homebound student.

Table 2. An example of collaborative activity realized by Tablet.

Class equipment
This collaborative activity was aimed at fostering the students' capacity of writing compositions by using mental maps constructed through specific apps with their affordances In the first step of the activity, children were dived into pairs and had to produce a map using the app Mindomo, in which they had to describe their class experience. When the two members of the pair had completed their maps, they collaboratively corrected each of their maps. By "correct each other's maps" meaning that they had to erase, ask for details, or both, about the nodes that they found to not be straightforward enough to understand. In fact, the opportunity of cloud sharing the map with others given by the app Mindomo was particularly useful for this step of the activity: children could have access and make their correction on other members map. Furthermore, Mindomo automatically saves each step done, in both the map creation and correction process; this gives the possibility of reconstructing the process undertaken by each of the two members of the pair. The last step of the activity was the text composition based on the collaboratively constructed map. The cloud feature integrated in Mindomo also allowed the HB to participate this activity with the same modality as her classmates. Indeed, it allowed her to work with her activity partner on the same shared map even in a distance, breaking the physical separation between them.

3 RESEARCH

3.1 Participant

The sample was composed by seven teachers (M= 2, F=5), teaching both humanistic and scientific subjects. Six of them were between 40-49 years old and one was reported to be older than 50 years.

3.2 Research Question

The aim of this study is to investigate:

1. Tablet adoption in educational activities and any change of use (*Q1*);
2. Teachers' Tablet perception in the hybrid classroom context related to three dimensions: (i) organizational, (ii) pedagogical, (iii) inclusive (*Q2*).

3.3 METHODOLOGY

Both quantitative and qualitative data was collected. An *ad hoc* questionnaire was administered after six months (T0) and after one year and a half (T1) since Tablet introduction, while a semi-structured interviews was conducted at the end of the first year of the TRIS project.

3.3.1 Quantitative data

In order to collect quantitative data about the Tablet adoption in educational activities and any change of use (*Q1*), a questionnaire was administered in which it was investigated the competencies, perceived utility, and difficulty connected with Tablet use (3 items), on a 5-point Likert type scale of agreement (1=Totally disagree, 5=Totally agree). Teachers were also asked to indicate the frequency with which they used the Tablet for several activities (9 items: "*to foster interaction within students*", "*to foster interaction between students and the HB student*", "*online searching*", "*gaming*", "*take photos or videos*", "*listen to music*", "*take notes during lessons*", "*to make collaborative activities with the HB student*", "*for individual activities*") on a 5-point frequency Likert type scale (0=Never, 1=Less than twice a month, 2=about once a week, 3=about twice a week, 4=everyday).

The data was analyzed using the exact version of the Wilcoxon test for paired ranks, in order to take into account the small sample size and a mono-directional hypothesis was specified.

3.3.2 Qualitative data

In order to investigate the teachers' Tablet perception (*Q2*), a semi-structured interview was collected for each of the teachers involved. These interviews were investigating different area: (i) the use of the technologies proposed by the TRIS project and difficulties related to their integration into educational activities (organizational area), (ii) the pedagogical methodology used during the school year and possible changes in respect to the traditional school setting (pedagogical area), and (iii) the experience with the homebound (HB) student (inclusion area). All the interviews were recorder with the consent of the teachers, and then transcribed. They lasted approximately 30-40 minutes.

A qualitative approach was used to analyse the interviews. Specifically, several conceptual categories ("codes") were identified for each of the abovementioned research areas. These codes were used to classify the interview transcripts. Four independent researchers performed a preliminary investigation of the transcripts, in order to identify inductively the main themes in the transcripts used as the codes codification system; thereafter, specific text portions were attributed to the codes according to their contents.

The "Tablet" code was collected from the code system, in order to isolate the text section specifically related with the tool. This code, indeed, identified all of the text sections where teachers mention the device.

MaxQda software was used in order to manage and analyse the transcripts. MaxQda allowed the investigation of the closeness and intersection between the "Tablet" code and other codes (co-occurrence).

4 RESULTS

4.1 Quantitative data

In "Tab. 3", the distribution and the results of the Wilcoxon test for paired rank were reported.

Table 3. Results of the Wilcoxon test for paired rank for differences within T0 (after six months) and T1 (after one year and a half)

	Q_1-mdn-Q_3 T0	Q_1-mdn-Q_3 T1	*p*	*r*
I feel that my actual competencies gave me the opportunity to use the Tablet	4-4-5	3-4-4	.156	.45

effectively				
I had some difficulties in using the Tablet	2-4-5	1-2-3	.063	.67
I have found that Tablet use is useful for taking lessons	4-5-5	4-5-5	.500	.71
Tablet use – To foster the interaction within students	1-1-1	1-1-3	.125	.71
Tablet use – To foster the interaction between students and HB student	**0-1-2**	**1-2-3**	**.031**	**.65**
Tablet use – Online searching	0-1-3	1-1-3	.406	.12
Tablet use - Gaming	0-0-2	0-0-0	.500	.71
Tablet use – Take photos or videos	0-0-1	0-1-2	.313	.27
Tablet use – Listen to music	0-0-0	0-0-2	.375	.33
Tablet use – To take notes during lessons	0-0-0	0-0-2	.250	.71
Tablet use – To make collaborative activities with the HB student	0-1-4	1-1-1.50	.625	0
Tablet use – For individual activities	0-1-4	1-1-1	.219	.31

Note: Q_1: First quartile, mdn: median, Q_3: third quartile, *p*: one-tailed exact probability, *r*: effect size, *α* = .05

After one year and a half, there was a decrease in the teachers' perceived competence (i.e., "I feel that my actual competencies gave me the opportunity to use the Tablet effectively") and teachers' perceived difficulties (i.e., "I had some difficulties in using the Tablet") in Tablet use, but these shifts were not significant. Interestingly, teachers did not change their opinion regarding Tablet usefulness for classes (i.e., "I have found that Tablet use is useful for taking lessons"), considering it as a useful tool. Regarding the frequency of use of the Tablet, the only significant raise was for the frequency with which teachers used the Tablet for connecting the homebound (HB) student with her classmates. A significant raise was found in the frequency of Tablet use to foster the interaction between the HB student and her classmates, shifting from a median use of less than twice a month to a median use of about once a week.

4.2 Qualitative data

In "Tab 4", the codes that were connected (in term of co-occurrence, as previously defined) with "Tablet" code, and their respective definition were reported.

Table 4. Codes label and their definition

Code	Definition
Negative attitude (resistance) towards technology integration	The teacher affirms that he/she does not integrate technologies into his/her educational practice because of his/her personal/emotional characteristics and/or for the class characteristics
Educational time consumption due technological setting	The teacher affirms that using technologies significantly slows down the course of the lesson and/or the usual class routine
Critical class setting management due to presence of HB student	The teacher affirms that he/she have/had some difficulties in the simultaneous management of the class and the homebound student
Technology as a tool for inclusion	The teacher reports a use of technologies aimed at the inclusion of the homebound student, and, in general, for the students
Positive effects on students' learning	The teacher affirms that the use of technologies improves students' learning
Positive effects on students' motivation	The teacher affirms that the use of technologies improves students' motivation to study and to engage in class activities, leading to an improvement in students' learning
Tool for the overcoming of traditional teaching	The teacher stresses the fact that using technologies is an effective help in overcoming the traditional and teacher-centred teaching
Technology as support to innovation of teaching methods	The teacher affirm that technologies allow innovative educational and teaching styles
Need for planning the educational activities at home	The teacher affirms that the designing of educational activities with technologies requires to be done in advance at home, in order to effectively and adequately propose them in classroom

In "Fig. 1", we graphically report the positive and negative factors (codes) that are related to the Tablet, as they emerged from the analysis of the interview.
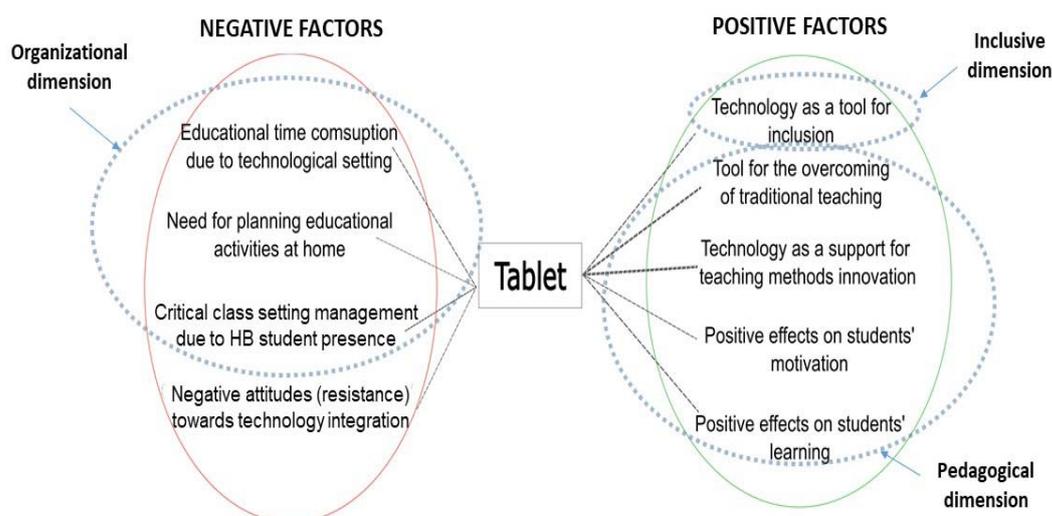
Figure 1. Positive and negative factors related to Tablets (co-occurrence analysis)

In the following sections, we report the negative and positive factors related to "Tablet" code, respectively. We also give an example of the text identified with the specific code.

4.2.1 Negative factors related to Tablet

Negative attitude (resistance) towards technology integration: Some of the interviewed teachers show a sort of resistance in technologies, and Tablet, integration into their class activities.

"Sometime there is this theoretical planning…just saying…different. But in the end, in practical activities the traditional approach wins, instead of a one more direct to collaborative activities and the use of the Tablet even for a simple activity".

Educational time consumption due to technological setting: One of the difficulties related to the Tablet use, as it was reported by some of the teachers, is the perception of a lengthening of the educational time connected to organizational and management aspects (preparation of students' Tablet, facing of Tablet and connection technical problems).

"I don't know whether I'm wrong or not… I told myself that probably I was fearing that the educational time would have lengthen even more. I mean… I arrive, take the Tablet… put down the Tablet… anyway, the activity itself is exciting for the children so, when we do the collaborative activity, the group activity, it may be that the time is even more lengthened".

Critical class setting management due to the presence of the HB student: Some of the interviewed teachers reported that another factor that hindered a more frequent use of the Tablet was the management of the double setting (school classroom and homebound student's home).

"At the beginning, I was attentive in speeding the connection with the HB student because I didn't want to lose time for the lesson […]. The hour that I have is not enough so, initially this hurdle to the lesson course…because I had to think about the connection, I had to do the roll call and then register the children that were not present and this is time consuming for the lesson…and so during my hour I don't use the Tablet very often".

Need for planning the educational activities at home: Another factor potentially perceived as hindering the Tablet use is a higher amount of time, which is necessary in order to prepare in advance the activities to propose to the classroom.

"The difficulty was mostly when you had to prepare the lesson when you were already in the classroom, I mean… Take the Tablets, turn on the Tablets…and illustrate to the children what they have to do…".

4.2.2 Positive factors related to Tablet use

Technology as a tool for inclusion: Some of teachers recognized the technology and Tablet usefulness in fostering the participation of children with special educational needs, included the HB student, thanks to some specific affordance of the tool.

"*Using the Tablet had facilitated the execution of the activities done with my pupil [with special educational needs]. It facilitated the activities because he was attracted by the Tablet… also for his difficulties with handwriting, with the pen itself, writing with Tablet helped him very much*".

Positive effect on students' learning: Some of teachers report a positive effect of the Tablet on students' learning.

"*The chance of being online allow having access to several information sources simultaneously and this is a positive outcome for all of us, especially for the students. I have used several apps for mathematic learning as a support and strengthening for lesson subject. Clearly, tell the students to practice with the Tablet is another way of teaching*".

Positive effect on students' motivation: Some of the teachers acknowledge to the Tablet used a positive effect on students' motivation to learn.

"*Actually, you realize that they learn with fun, doing something that they really like. Anyway, in respect to the traditional class that may be boring… you know, the mechanical and repetitive exercise? This is a more original way to learn*".

Tool for the overcoming of traditional teaching – student centered approach: Some of the teachers described the Tablet as a tool that help in the overcoming of the traditional and teacher-centered lesson.

"*Clearly, tell the students to practice with the Tablet is another way of teaching. They are more motivated and consequently they are more active*".

Technology as a support to innovation of teaching methods: Some teacher report that ICTs and Tablet integration had changed their teaching, fostering a more innovative approach.

"*Technologies have enlarged and changed my way of teaching. It was easier to integrate them in science class. I found of particular interest the use of the videos. I have to understand how I can innovate my teaching area, for sure the use of personal Tablets somehow fostered the personalization through some app in order to reinforce learning outcomes*".

The organizational dimensions connected to Tablet integration the teacher reported seem to be negative factors: as for the other ICTs and problems related to technologies management; an increased need for at home lesson planning as well as educational time during the lessons, were reported by teachers. In addition, a personal negative attitude towards technology integration was observed.

On the other hand, the teachers recognise some positive factors linked with a supportive role of the Tablet in pedagogical dimension, such as the innovation in teaching method and positive effects on students.

Furthermore, among the positive factors, we observed the recognition of the Tablet as a useful tool for the inclusion of the HB and other special needs students, as already emerged from the quantitative data analysis.

5 CONCLUSIONS

The study's outcomes show that, within a peculiar experimental context aimed to an HB student inclusion, teachers integrate the tablet devices in their lessons for peculiar purposes. The tool, moreover, is perceived both in a positive and in a negative way, where the former is mostly related to the organizational dimension and the latter is related to the pedagogical and inclusion dimension.

The analysis of the quantitative and qualitative data reported that the main driver of the Tablet integration in the classes is the HB student inclusion. Indeed, the quantitative data shows that the teachers use the devices to foster interactions among at home student and her peers in the classroom, confirmed by the qualitative analysis of the interviews.

While other Tablet uses do not emerge from questionnaire's answers, some teacher reported a general innovation of teaching methods linked with the devices during the interviews.

Considering quantitative data, an innovative approach, characterized by a deep exploitation of Tablet affordances aimed to implement activities that couldn't be possible with other ICTs, doesn't show up.

The critical factors related to *organizational dimension* could have discouraged teachers to experiment deep innovative activities. Time consumption and the Tablet management in a setting with an HB student emerged, together with a general resistance to technology integration, as critical factors for the mobile device integration. It could be possible to read these elements under the effort overload perspective, assuming that any technology integration in classroom should demonstrate to have a return of investment to overcome the related potential problem.

On the other hand, teachers' interviews show a positive perception of a students' motivation and attention increasing, that confirm the previous literature's states. It could be supposed, therefore, that this element could be an important driver for the Tablet integration in educational processes.

The evidences presented in this paper suffer from the limitations of a study based on a single case, however, it is interesting to notice that, within a peculiar experimental context aimed to an HB student inclusion, Tablet has been adopted by teachers in their professional practice. The elements emerged by the research, moreover, could represent important landmarks for similar interventions.

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