



Do tablets mean educational change? The materiality, hybridity and performativeness of teaching and learning practices in tablet-mediated classroom

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Abstract:

This text presents and discusses results of empirical research conducted during 3 school semesters (1.5 of school year) in a primary school in Poland. The research focused on the introduction of tablets (iPads) to didactic design and aimed at the observation of learning processes of the entire school community in connection with the appearance of a new educational actor. We used a qualitative research approach, mainly video-ethnography (60 hours of recorded material). This research approach resulted in the identification of maps of teaching and learning practices in the changing school field.

1. Introduction

When analysing the existing corpus of empirical research, it seems that the process of the introduction of mobile devices to the already established school practice, i.e. the things the teachers and learners actually do in the classroom space and how they shape new opportunities and ways of learning using mobile devices, is still insufficiently examined (Cerratto Pargman, Nouri, Milrad 2017). What is more, studies insufficiently represent the process of changes taking place in the learning and teaching practice in a longer perspective, at different stages of the process of the appropriation of mobile devices. Likewise, there are still very few studies taking the naturalistic perspective (i.e. the practices emerging in the classroom space without the researchers' intervention) as their starting point (Pegrum 2014).

This work aims at the provision of knowledge and a new insight into the learning and teaching practices in the classroom in a Polish primary school observed over a longer perspective, i.e. during three school semesters. Although the research was performed on a small scale, it can be defined as the monitoring of changes taking place in the educational culture of the school under analysis.

2. Theoretical framework

Analyses of the integration of technology in classrooms have a long tradition in research and a well tried and tested set of research approaches, owing to which the process of changes in the area of the use of technologies in the classroom can be described in combination with the reorganization of the process of the creation of knowledge and the emergence of new learning practices. These theoretical approaches assume a process of a gradual understanding of the gist of technology, which is to activate more advanced didactic design, as



described by the SAMR model (Puentedura 2014). Other approaches recognize more complex relationships between technology and the everyday classroom practice (Pechler et al. 2010; Pegrum 2014).

For the purposes of our research, we have adopted the theoretical framework developed on the field of digital didactical design with the model of technology integration assumed in the SAMR model. This theoretical corpus has become the starting point for the organisation of research and the interpretation of its results. Our research project has been focused on the analysis of structures – observable effects of the didactical design.

2.1. Digital didactical design theory

The didactical design theory to which we refer in our research covers three components: teaching, learning, and the integration of technology. Usually, the idea to design is connected with an intention to achieve an assumed didactic goal covering a certain result. Didactical design covers a network of interrelated elements which have a mutual impact on one another. What it boils down to in the case of the design of the advanced learning strategy is the combination of the actions of the teacher and learners in connection with the strengthening role of technology in their learning. It is worth analysing the mutual relationship between the following elements:

- a) type of adopted educational goals;
- b) type of planned learning actions;
- c) use of didactic resources, including technologies;
- d) anticipated role of the learner;
- e) anticipated role of the teacher;
- f) assessment and feedback.

2.2. SAMR model

The SAMR model, which makes it possible to take into account the relationship between the educational goals and the planned use of technology, i.e. various manners of the integration of technology into the processes of learning in the classroom, is another theoretical source.

One of the most frequently asked questions concerning the presence of technology in education concerns its impact on the teaching and learning process and outcomes. Concerns related to the role of information and communication technologies are reflected in the question of whether the modern digital tools are better and more effective than the teaching based on the traditional methods. The SAMR model developed by Puentedura (2014), in which the author defined several levels of the integration of technology into the education process: substitution (S), augmentation (A), modification (M) and redefinition (R), seems to be helpful in the understanding of the place, role and importance of technology at school.

3. Research design and method

In order to broaden the knowledge on what actions emerge in the tablet-mediated classroom, and how these actions change over time, we carried out empirical research in a primary school located in a city in the region of Pomerania, northern Poland. The research was a part of a project supported by the National Science Centre and it aimed at a description and analysis of the emerging teaching and learning practices in a classroom enhanced with mobile technologies. The video-ethnographic research approach was to serve not only the purpose of the collection of empirical data for the purposes of the project, but also the documentation of changes taking place in the school, which was treated as a learning community introducing changes to the curriculum and to the accepted teaching and learning practices.

In this article we are referring to one main research question:

RQ: What is the map of teaching and learning practices at different stages of the process of the introduction of new technologies into a school?



3.1. School selection and sampling

The school we selected for research was chosen in view of the fact that in 2015 it decided to invest into a wireless internet connectivity and to purchase Air iPads (using their own financial means), which were to be used as a part of the 1:1 model. For the purposes of our research, we selected teachers who volunteered to conduct classes using tablets. They are all women and their professional experience as teachers ranges from 2 to more than 20 years of work. In this school, women constitute more than 90% of the teaching staff. A detailed structure of the sample is provided in Table 1. The subjects represent various school subjects and domains of knowledge.

Table 1. Structure of the sample – teachers

Teacher symbol	Age
T1 (mathematics)	59 years
T2 (Polish)	58 years
T3 (IT)	45 years
T4 (English)	34 years
T5 (nature)	29 years
T6 (religion)	27 years

Teachers were informed about the research procedure, conditions and timing of the empirical research. The collection of empirical data was commenced in September 2015 and was completed in December 2016. The video-ethnographic qualitative approach was selected as the leading approach to our research.

3.2. Data collection method

We have participated in the collection of more than 60 classroom observations documented with field notes and videos showing the lessons (more than 60 hours of video material) during three school semesters. During this time, the same groups of learners and the same teachers were observed, which made it possible for us to maintain a certain continuum and document the real changes in the ways tablets are used for educational purposes within the existing framework and in the longitudinal perspective.

A detailed review of the collected data divided into semesters, grades, and the analysed groups of school subjects is presented in Table 2.

Table 2. Data collected at school divided into school subjects, grades, and semesters

	Semester 1 2015/2016	Semester 2 2016	Summer holidays (→)	Semester 3 2016	Grade
Video ethnography: total hours of observations divided into:	22 hours	22 hours		19 hours	
mathematics	4 hours	4 hours		4 hours	Grade III → IV and grade IV → V
Polish	4 hours	4 hours		4 hours	
IT	4 hours	4 hours		3 hours	
English	4 hours	4 hours		3 hours	
nature	3 hours	3 hours		3 hours	
religion	3 hours	3 hours		2 hours	

3.3. Operationalization of the adopted theoretical models – development of the coding schemes

The coding scheme originates from the didactic design theory extended with the SAMR model, from which the names of the analysed categories were taken (from A to G). Then, on the basis of knowledge on the stages

of advanced learning strategy (Dylak 2013) and the possible stages of the integration of technologies in the classroom, values (on a 1-5 scale) symbolising identifiable and separate ranges of the actions of teachers and learners, and the manner of the use of technology during classes were assigned. The lowest values (1 and 2) correspond to the transmissive logic of the Polish school, with its concentration on “closed” knowledge, textbook, and memorization-related actions. In these contexts, technology is clearly pressed into the order of the

Table 3. Coding scheme adopted in the video-ethnographic part of the research

Category	Description of the adopted coding scheme
A. Type of adopted educational goals	<ol style="list-style-type: none"> 1. unclear; coverage of the lesson topic 2. provision of knowledge, consolidation of knowledge/ skills 3. search for information and its use within the framework defined by the teacher 4. search for information and its independent processing, re-contextualisation, etc. 5. production of knowledge in a new form/shape
B. Type of executed learning actions	<ol style="list-style-type: none"> 1. individual watching of illustrative materials (presentation prepared by the teacher) 2. individual/group exercises, consolidation of skills 3. individual/group activity consisting in the reorganisation of knowledge under the teacher's control 4. group activity consisting in autonomous processing of knowledge from sources indicated by the teacher 5. group activity consisting in the processing of knowledge
C. Use of didactic resources	<ol style="list-style-type: none"> 1. domination of textbook; tablet used for displaying materials 2. domination of textbook, applications closely subordinated to the textbook material 3. breaking textbook's monopoly through a multitude and variety of applications 4. breaking textbook's monopoly through applications designed to reorganise knowledge 5. use of applications used for the production of knowledge and balancing of textbook knowledge
D. Learner's role	<ol style="list-style-type: none"> 1. recipient of the ready educational content 2. exercising and consolidation of the supplied knowledge and skills (memorisation) 3. reproducer of educational content with elements of independent knowledge processing using an indicated source 4. reorganisation of knowledge, transformation and group negotiation of knowledge, opinion expression skills 5. group transformation of knowledge, independent search for materials and information and assessment of sources, cooperation and involvement in the learning team, negotiation of ways technology can be used
E. Teacher's role	<ol style="list-style-type: none"> 1. expert, controls short time of activity with tablet through additional procedures 2. expert, limits tablet use time and controls the correctness of the use of applications, provides technical support if necessary 3. expert-controller with elements of facilitation, supports learners' involvement, provides substantial and technical support to learners, strong relationship of control of the learning process 4. consultant, monitors the subsequent stages of group work, provides feedback 5. companion, observer (mentoring elements) of the learners' independent actions
F. Assessment and feedback	<ol style="list-style-type: none"> 1. no feedback, no assessment 2. comments concerning classes, a kind of a general summary 3. assessment addressed to an individual or group and concerning the result of work 4. assessment and feedback during the particular stages of individual or group work and after the end of work 5. assessment criteria announced at the beginning of classes, feedback at the subsequent stages of work, assessment after the end of work, elements of advisory assessment
G. Educational goals in connection with the role of technology	<ol style="list-style-type: none"> 1. making knowledge transmission more attractive 2. substitution – streamlining 3. extension – improvement 4. modification – considerable change 5. redefinition – transformation



transmissive orientation of the Polish school. The value 3 refers to attempts at stepping beyond the transmissive school logic in the analysed scopes of actions, although, at the same time, it is marked by high teacher pressure and an increased control (as expressed in the teacher's frequent messages such as "you must" and "you must not"). The values 4 and 5 refer to the construction of the learning situations outside the framework of the transmissive, conservative logic of the Polish school. These are attempts at the creation of learning situations engaging the cognitive curiosity of the learners, their independent thinking, analytical skills, and cooperation in a group. Therefore, we are talking about attempts at the bottom-up construction of an alternative progressive learning model in which technology plays a significant and indispensable role. The coding scheme containing the area of variation of the observable practices is represented in Table 3.

The determination of the coding scheme for the substantial research material helped us to avoid the methodological charm of "raw data" and the related trap of anecdotism, which consists in the reporting of the content of the video or the most interesting, non-typical issues, while skipping those elements which are ordinary.

3.4. Coding procedure

Every hour of the watched material consisted of a recording of one lesson. Having watched it, we performed coding on the basis of a list of categories (A-G), making sure that the code selected best represents the character of both the recorded material and the actions that were observed. We performed the coding independently, which increased the reliability of the process.

Analysis of the video-ethnographic material was performed using the following four steps:

1. Applying a coding scheme to the entire video material

This step resulted in the ascribing of a code value to each video material related to each teacher.

2. Calculating code values in the particular categories for the particular teachers for each semester (from I to III)

During the procedure, the values obtained by teachers in the particular categories were totalled, and the result was subsequently divided by the number of the recorded observations. In this way, a mean result for the particular teacher in the time period under analysis was obtained. Keeping the division into semesters, we obtained three collective tables (one for each semester) presenting the mean values obtained by the teachers.

Table 4. The mean values obtained by teachers in the first semester (I)

Teacher	Number of observations	The mean values obtained by teachers						
		A	B	C	D	E	F	G
T1	4	2	2	2	2	2	2	2
T2	4	1.75	2.25	2	2.25	2	2	2.25
T3	4	1.75	1.5	1.5	1.5	1.5	1.25	1.25
T4	4	2.5	2.75	2.75	2.75	2.75	2	2.5
T5	3	1	1	1	1	1	1	1
T6	3	2.3	2.3	1.6	2.3	1.6	1	1.6

Table 5. The mean values obtained by teachers in the second semester (II)

Teacher	Number of observations	The mean values obtained by teachers						
		A	B	C	D	E	F	G
T1	4	2	2.5	2.25	2	2	1.5	2.25
T2	4	2.75	2.75	3	2.25	3.25	1.75	3.5
T3	4	1.75	1.75	1.75	2	2	1	1.75
T4	4	3.5	3.5	4.75	3.75	3.75	4	4
T5	3	2	2	2	2	2.3	1	1.6
T6	3	1.6	2.6	3.3	3	3	1.6	3.3



Table 6. The mean values obtained by teachers in the third semester (III)

Teacher	Number of observations	The mean values obtained by teachers						
		A	B	C	D	E	F	G
T1	4	2	2	3	2	2	2	2.25
T2	4	4.5	4.5	4.5	4.5	4	2.5	4.5
T3	3	1.75	1.5	1.5	1.5	1.5	1.25	1.25
T4	3	4.6	4.6	4.6	4.6	4.6	3	4.6
T5	3	4.3	3	3	3	3	3	3
T6	2	2	3.5	3	3.5	3	1.5	3

3. Placing the values obtained by teachers on diagrams for each semester

As a next step based on the coding scheme, the calculated mean values were placed on the diagrams representing the particular semesters during which our research was carried out.

4. Analysing transformations in teachers' practices

Before performing analyses for this dimension, we determined the thresholds of the mean values defining the boundaries of the orders in which the teachers' practices are located.

We identified the mean values between 1 and 2.49 as practices representing the order of the transmissive school. What we are dealing with here is a confirmation of the values of the heretofore existing culture of education – one to which technology is closely subordinated.

We defined the mean values ranging between 2.50 and 3.49 as tension areas being a part of the existing culture of education experiencing the first serious “cracks” in its practices (where new teaching and learning practices are emerging).

We recognised the mean values ranging between 3.0 and 5 as a symptom of the culture of education experiencing a progressive transformation, with new teaching and learning practices appearing relatively frequently in connection with the integration of new technologies.

4. Findings

This section presents the results of the video-ethnographic research in the form of diagrams – maps of the emerging teaching and learning practices in the classrooms during the three semesters of our analyses. The maps result from the coding, which was related to seven categories. In the picture of the results, we have kept the time axis since it is significant for the emerging changes in the area of the teaching and learning practices in the tablet-mediated classroom. Each research cycle was provided with a title reflecting the gist of the problems appearing in the classroom.

4.1. Disappointment

For the majority of teachers, the first semester of research in the classroom involved the experience of disappointment and a conviction that iPads “are a failure in the conditions of Polish schools” (T5). The teachers considered the investment into the purchase of iPads as not having been fully thought-out. We are convinced that the main problem evident in the first semester of the video-ethnographic analyses consisted in attempts at the fitting of the new tool into the framework of the heretofore existing practices and activities and subordinating it to them.

As shown in Diagram 1, teaching practices are almost entirely contained in the knowledge transmission order. The collective table for this cycle shows that almost all the teachers' results ranged from 1 to 2.49 points. Only one teacher participating in the project – the teacher of English – exceeded the threshold determined as transmissive. Staying in this framework can be interpreted as a process independent of the teacher's age and his/her private (positive or negative) attitude to modern technologies.



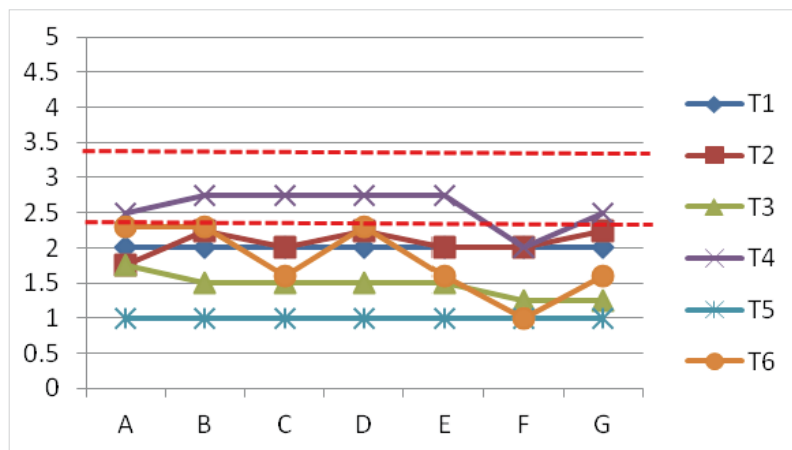


Diagram 1. Map of emerging practices (semester I)

- A: Most often these included the transmission and consolidation of knowledge or the training of specific skills. Educational goals were not always clearly determined by the teachers. They were most often related to the execution of the subsequent topic of the lesson, about which the learners were informed at the beginning of the lesson, while the range of skills and exercises to be done were not announced at all.
- B: During the first semester, learners most often used iPads for watching illustrative materials (fragments of videos or presentations prepared by the teacher). In this sense, the learners' iPads were transformed into small, immobile TV sets, on which they could watch a video or a presentation when looking closely (these presentations were also always additionally shown on the interactive whiteboard). During mathematics, English or religion classes, learning practices were more clearly connected with the exercising and consolidation of skills in an individual or group manner (for example exercising addition and subtraction skills during a fixed time, followed by a comparison of results).
- C: The teachers considered the textbook and the workbooks as the leading resources of knowledge and sources of skills. The applications selected by teachers were strictly subordinated to the leading didactic materials (most often a single type of mathematical operations or a certain defined group of English vocabulary were exercised).
- D: In their actions, learners did not step beyond being passive recipients ready for the knowledge prepared for them by the authors of textbooks and the teachers. They played a more active role during exercises, where they were expected to perform efficiently, fast, and correctly. The scope of their activity was dominated by actions related to the memorization and consolidation of knowledge.
- E: During the first stage of our research, teachers did not go beyond the role of experts transmitting knowledge or equipping learners with skills. Teachers had an additional task to carry out: the organisation of activities in connection with the use of iPads, i.e. handing the devices out to the learners, controlling the time determined for the activity selected and making sure that the learners did not use independently any other applications available in their devices.
- F: In this cycle of analyses, practices in the scope of assessment and feedback were presented sporadically in the form of a general summary of the classes. It was often the case that the element of assessment and feedback for learners was entirely absent.
- G: It seems that the goals of the lessons under analysis could be well achieved without any iPads, which were reduced to the role of a substitute of a screen displaying video material. Tablets were used during a very short, clearly limited time span of up to 10 minutes. During this time, learners had a chance to exercise some concrete skills such as addition, note-taking, or consolidation of English vocabulary. The use of technology did not move beyond the narrowly-understood substitution and streamlining of the heretofore undertook learning actions.

4. 2. Encouragement

The subsequent cycle of research should be called a critical period, during which some teachers carried out a huge amount of work towards changing their own teaching practice (results of 2.50 and more). For

others, however, it was a period in which they continued using the new tool in a marginal way, highlighting the “incompatibility” and “inappropriateness” of iPads for the teaching of their subjects (the teachers of mathematics, IT, and nature – their results were still below the 2.50 threshold). The results are presented in Diagram 2.

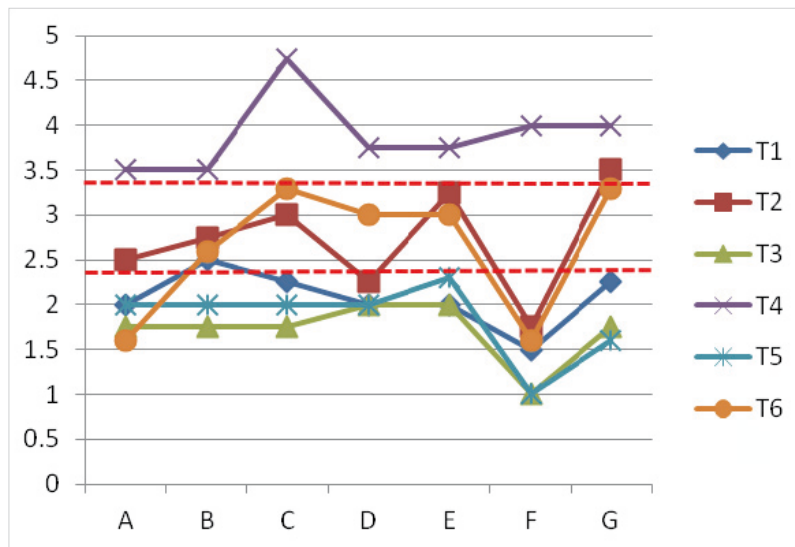


Diagram 2. Map of emerging practices (semester II)

- A: The dominating type of educational goals was still related to the provision of knowledge or skills and their consolidation. These goals were not at all verbalized during classes or were expressed just before the task to be completed. However, the Polish and the English teachers started formulating them more clearly around the model of the information search and processing.
- B: For some teachers, the learning practices were still tantamount to the consolidation of knowledge or the exercising of skills. Nevertheless, some teachers started to create more opportunities for the learners' independent information search and processing. However, this activity remained under the control of the teacher – the teachers of Polish, English, and religion indicated sources (website addresses). Learners most often prepared presentations in groups, looking for the appropriate information and supplementing it with illustrations.
- C: For some teachers, the textbook was still the basic source used during lessons, and the work with the tablet was of marginal importance. In the case of three teachers, there was a noticeable change: iPads were not only used for most of the work time during the lesson, but sometimes they marginalized the use of the textbook. Only during one lesson of English was the textbook not used at all – it was when the learners were involved in group work preparing presentations on Commonwealth countries.
- D: During the lessons under analysis, learners played both the traditional roles of performers of practical actions such as efficient counting, copying of pages and making tables (working with the *Pages* and *Numbers* applications during IT classes), and active roles – they looked for information and negotiated the manner of its elaboration and presentation in groups.
- E: As for the teachers' roles, a clear division was observed. On the one hand, the traditional role of the teacher as an expert determining and controlling the short time span for exercises involving the use of iPads (the iPads were then taken away from the learners) was strongly marked. On the other hand, some teachers introduced a certain change to their role as an expert, supporting the learners' stronger independence and involvement in group work. Teachers tried to be facilitators making the solving of a task easier rather than enforcing ready solutions. However, this new emerging role was limited by the former habits, as many instructional elements such as “you must” or “you must not” appeared in the communication between teachers and learners, showing their strong controlling tendencies concerning the manner in which the tasks are to be carried out and their expected effect.
- F: Teaching practices at this stage of our research were marked by considerable inconsistency, as in the majority of cases there was no assessment or feedback at all or assessment had the form of a very general



summary of the lesson, which provided very unclear information to the particular learners. In the case of the teacher of English, an entirely new model of assessment emerged: it involved the provision of feedback during group work (after each stage of the completed work) and after the completion of work (assessment of the work result).

- G: Technology continues to be used mainly at the basic level of substitution, without a functional change, when learners preparing a project use applications such as the *Mind map* (making a note of their ideas in the application instead of on a piece of paper) during a single stage of their work and then develop a presentation using the *Keynote* application. Also the learners' preparation of questions and answers for a game in the *Kahoot* platform (religion class) did not step beyond the logic of substitution. Some teachers reached the level of augmentation, for example through their use of the *PlayDoh Touch* application (elements made from the play dough are scanned and digitally repeated as an element of a story in a digital picturebook), carrying out a quiz (and the immediate provision of feedback to the groups participating in the competition), or the use of the *Big Challenge* application. In the case of the English language, technology started playing a role strongly transforming learning practices, because some types of actions such as recording dialogues, making short videos involving a conversation, linking the written form of a word and its meaning with the correct pronunciation (the use of the *Aurasma* AR application), etc. would not have been possible without it.

4.3. Emerging progressive teaching and learning practices

The last cycle of research carried out in the third semester was on the one hand marked by the effort to deeply reconstruct teaching practices in connection with the appearance of technology in learning (with results above the 3.5 threshold), whilst on the other hand our research revealed that some teachers did not manage to reorganize their practices and continued obtaining results fitting the knowledge transmission logic (i.e. below the 2.49 threshold) in the same period under analysis. The collective results are shown in Diagram 3.

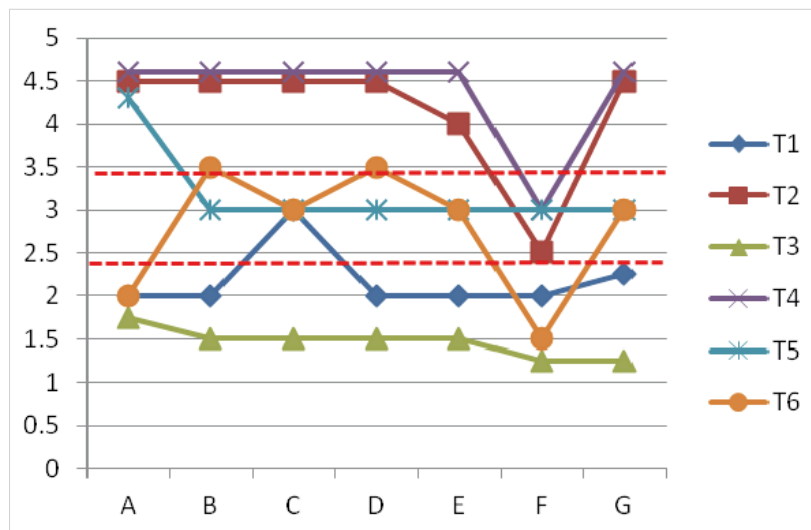


Diagram 3. Map of emerging practices (semester III)

- A: On the one hand, educational goals were not at all verbalised or were signalled unclearly, but without any doubt the new teaching practices included those covering clearly defined goals related to the learners' independence as creators of knowledge (results of above 4 in category A).
- B: Learning practices continued to include the well-established individual exercises based on many fast repetitions (mathematical applications). The emerging new practices included without any doubt group activity consisting in the independent negotiation-based creation of knowledge by learners from sources indicated by the teacher or from other sources. What was appreciated here was the learners' personal knowledge and experience.
- C: Strategies of the use of the available resources were also very diverse. On the one hand, we can see the dominating role of the textbook, but also some clear attempts at breaking down this domination by balancing

and multiplying sources. From the point of view of the process of the construction of knowledge by the learner in connective contexts, this emerging practice is of huge significance (results above 3).

- D: In this category both the traditional role of the learner as the recipient of the ready knowledge (results of below 2.49) and the emerging new framework of learners' roles were identified. The learners benefited from being causal agents processing or creating knowledge. This reorganisation of the learners' role consisted in granting them a higher degree of independence and appreciating their technical competence, which resulted in the mandate for the creation of their own content.
- E: What showed in the case of this category, was both a conservative tendency – the teachers' attachment to the role of an expert transmitting knowledge (results of below 2.49) – and efforts to change this role. By acknowledging the learners higher agency in the area of the creation of knowledge, teachers “moved” their own role towards the consulting and mentoring practices, which facilitated the emergence of new teaching practices (results of 4.0 and more).
- F: Surprisingly, in this category all the teachers obtained results turning towards the traditional direction (not more than 3), which means that practices in the area of assessment and feedback are not a highly reconstructed aspect of the teachers' practices. Although there were single cases of evaluation in stages, the assessment most often concerned the effect of work, or the teachers limited themselves to a general summary of classes. From the point of view of the learners' independent construction of knowledge, this collection of teachers' practices raises concern, as it leaves the learners without adequate feedback on the quality of their own work.
- G: In the case of this category, we can see both the use of technology in the substitution and augmentation model (such as the frequently applied game-based approach: the *Kahoot!* application used for the checking of the learners' knowledge), but also clear attempts at the modification of learning practices through technology (designs of books prepared with the help of the *Book Creator*), and designs of presentations to do with explanation of natural phenomena (*Aurasma*). Also, *iMovie* applications combining narration, image and sound were used. Teachers also developed visual competences and algorithmic thinking through the practice of changing a tale into a game plot (*Bloxels* application) as well as narrative games. Frequently used also were interactive books, which appeared during this cycle of our research.

5. Conclusion: Materiality, hybridity and performativeness of teaching and learning practices in the classroom

An important conclusion from our research is the discovery of incompatibilities of teaching/learning practices in the classroom due to the emergence of mobile technologies. In the “wow effect” that accompanied the implementation of the new technology, we found waiting for changes and hope that they will happen spontaneously thanks to the existence of a new order of things in the school space. Disappointment and a sense of teachers' profession regarding the new technology involved the necessity of revising and reconstructing their own activities in the classroom, but also the discovery that the new technology is not very suitable for achieving the current teaching goals. It does not seem, however, that a confirmed change in teachers' practices would only be effected by such issues as a growing understanding of the essence of the new educational tool and, consequently, the possibility of imagining its fuller use in school activities. Currently tablets are not accompanied by any action programs that would correspond to the patterns of current teaching and learning practices. No school instance or educational policy has defined or approved a set of educational activities and a set of educational goals that new technology can or should serve. What's more, the tablet is in its essence an “open” tool whose educational possibilities will be revealed when it is involved in the socio-material learning networks.

Socio-materiality is not only a didactic resource, but above all, it functions as a way of organizing knowledge and is therefore a stimulus for teaching and learning practices. The “finite”, “closed” materiality of objects indicates the important role of ready and proper knowledge, which is in this form transmitted by the teacher and should be opened by the student in an adequate context. Some teachers, probably due to the type of subject taught, managed to reconstruct the socio-material network of learning by incorporating new technologies into it. This new hybrid type of learning network turned out to be promising for them from a didactic point



of view (an opportunity to create a new quality of knowledge, meaningful learning and a greater involvement of students), but also proved to be consistent with the requirements of the education system in their subject. Therefore, since the risk of violating the requirements of the curriculum was not large, performative actions of teachers led to significant divergences, fractures and transformations as part of the existing practices and ways of managing school knowledge of students. A knowledge that is closed, inscribed in the order of reproduction and rigour of the exam, may be accompanied by liquid knowledge or personal knowledge of students, knowledge imposed by the school – negotiable knowledge. In other words, these teachers have formatively created a space for new teaching practices that seamlessly and flexibly blend into the structure of school domination.

Another group of teachers is clearly attached to the repertoire of activities from before the emergence of new technologies and their strategy of building distance to new tools is functioning in their performative activities. We believe that in these cases the reason does not have to be an insufficient understanding of the essence of technology in relation to their own teaching subject, but a very clear concept of school knowledge and requirements in its scope. A flexible, hybrid learning network could lead to unfavourable effects from the point of view of the curriculum requirements for the subject being taught. It can be assumed that it is for the interest of students – and this how teachers perceive this interest – it is to receive knowledge consistent with the logic of school domination. Therefore, teachers block or significantly limit such knowledge distribution channels that would make the structure more flexible or transformed. They are inclined to include tablets in the learning network in so far as this network will guarantee the creation of the same learning outcomes as before.

Performativeness of teachers is not limited only to what they do (what types of activities they produce and why they undertake these types of practices). Performativeness as an activity also includes how the dominating discourses and institutions influence them and how they limit and shape (these discourses) what we call unit action (Butler 2015).

Haraway (1985), in the classic text on the possible types of technology – society relationships has highlighted both the possibilities of its functioning in the existing structures of domination and alternative minority discourses. Haraway's analysis can be in some sense related to our research. Since teachers' practices are related to the management and control of students' knowledge, and they (these practices) depend on cognitive infrastructures available in the classroom, it is worth reviewing video-research material in terms of the use of mobile applications designed by teachers. However, we are less concerned about the types of educational applications used during lessons (or their names), and more important are the connections between types of cognitive relations activated by tactile technologies and types of knowledge to which this cognition is related. This summary is presented in the table below.

Table 7. Relations of the types of touch assumed in the application with the type of knowledge being constructed

Type of touch	Type of student activities	Definition of knowledge
Single touch	Memorizing Consolidation Exercise	Ready Correct / incorrect result
Drag and drop	Supplementation Memorizing the pattern or scheme	Ready Closed, algorithmic
Multitouch Exploratory touch	Exploring Discovering new possibilities in existing systems Transforming	Processed Negotiable
Imaginary touch	Adding Creating patterns Transformation	Negotiable Personal

All the identified cognitive relations can be attributed to emerging new teaching and learning practices in the classroom due to the introduction of mobile technologies into it. Nevertheless, they have a decidedly different value in terms of creating knowledge. The first two types of cognitive relations are clearly part of the transmission order of the school, which is why they appear most often in the registered research material. These new types of practices do not have a high emancipation value and do not change the way student's



knowledge is organized. They clearly bind two factors – the student’s closed knowledge of achieving a tactile routine (bodily recognition, habit preservation, etc.). In turn, the last two types of relations are clearly associated with a set of teaching and learning practices that break the logic of the transmission philosophy of teaching, allowing free exploration, the ability to draw conclusions, create or imagine other possibilities. The relative freedom of touch and movements on the tablet here also means the relative freedom to create knowledge.

Therefore, it is worth noting that modern technologies appearing in the school space are the basis for the emergence of new teaching and learning practices, although these new practices can serve (and they usually do) old teaching purposes. Technology does not activate any liberating discourse by the mere fact of its use in the classroom.

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