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DIGITAL PLATFORMS FOR TEACHERS' DOCUMENTATION WORK: EXAMPLES IN FRANCE

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In a context of curriculum reforms, two digital platforms have been opened in France (around 2017). CARTOUN allows teachers to share lesson plans; DRBSB offers different kinds of resources and tools to design lessons. I analyse and compare these two platforms using a documentational approach perspective, and in particular the concept of connectivity introduced to study e-textbooks. This analysis uncovers intentions of the institution: fostering teachers' agency and collective work, but also shaping their documentation work through instrumentation processes.

In this paper I analyse and compare two digital platforms opened in France around 2017, in a context of curriculum reform. I firstly present the theoretical frame of this study: the documentational approach to didactics, and in particular the concept of connectivity. Then I briefly describe the French context, before analysing and comparing the two platforms.

THEORETICAL PERSPECTIVE

This study refers to the documentational approach to didactics (DAD, Gueudet, Pepin, & Trouche, 2012). This approach focuses on the interactions between teachers and resources, and on the consequences of these interactions. A teacher selects resources, modifies them, uses them in class; this is called the teacher's documentation work. Along this work, the teacher develops what is called a document: recombined resources, and a scheme of use (Vergnaud 1998) of these resources, for a given aim of the teacher's professional activity. This process is called a documentational genesis, it has two strongly linked components. The features of the resources influence the schemes developed by the teacher: this is the instrumentation process. The professional knowledge of the teacher influences his/her choices (modifications of the resource, of its intended use): this is the instrumentalisation process. Hence the affordances and constraints of the resources (here, the platform) contribute to shape the teacher's documentation work, and the teacher's resource systems (developed along their professional activity, Trouche, Pepin, & Gueudet, 2019). For a more precise analysis of the platforms affordances and constraints, I refer to the concept of connectivity (Gueudet, Pepin, Sabra, Restrepo, & Trouche, 2018), introduced in the context of the study of e-textbooks. We defined the connectivity of an e-textbook as its potential in terms of connections: cognitive and also practical for a teacher (or a student) using it. We distinguished between macro-level connectivity, which concern connections between the e-textbook and external content: other websites, resource system of the user, between users etc. This macro-level connectivity does not depend on the

mathematics content. Micro-level connectivity concerns a particular mathematical theme and connections within the e-textbook: between different representations, with other disciplines or real-life situations, with a given software, etc.

The research question we study here could be presented as:

“For two selected platforms in France, what is their connectivity, and how does this inform us about their affordances and constraints for teachers’ documentation work?”

CONTEXT: DIGITAL PLAFORMS AND EDUCATIONAL POLICY

In France a new curriculum for primary and lower secondary school (from grades 1 to 9) has been introduced since September 2016 (Gueudet, Bueno-Ravel, Modeste, & Trouche, 2017). This curriculum reform coincided with the so-called “Digital Plan for School”, introducing different means to support the use of technology in schools, and led in particular to the design of the two digital platforms studied here.

The first one is called “CARTOUN”, meaning “Map of technology use”. The CARTOUN platform offers to teachers the possibility to share their lesson plans (initially concerning lessons using technology, but now open to any kind of lesson). The author indicates his/her location, which appears on a dynamic map. Any teacher from primary school to upper secondary can upload a lesson plan. Amongst the different fields to fill when uploading a lesson plan, the teacher gives his/her contact e-mail, and can even invite colleagues to visit his/her class. Indeed the intention of the institution with this platform (opened in 2016) was not only to create a repository of resources designed by teachers, but to foster the development of teachers’ networks.

The second one is called the “Digital Resources for School Database” (DRSB in what follows, for more details see Gueudet et al. to appear). In the frame of the “Digital Plan for Schools”, the intention of the ministry of Education was to start replacing traditional textbooks on paper by e-textbooks. This led to the design (by private publishers) of the DRSB platform, opened in September 2017. Its use is not compulsory for teachers (a direct use by students is not intended). It is the only “official” platform in France offering resources which cover the whole mathematics curriculum from grades 7 to 9 (called “cycle 4”, in the new curriculum).

CONNECTIVITY, AFFORDANCES AND CONSTRAINTS

The CARTOUN platform

The CARTOUN platform offers lesson plans designed by individual teachers, by groups of teachers or groups associating teachers and inspectors. The resources can be found by using a browser, or on the platform dynamic map, where the authors of resources appear (Figure 1). For mathematics at cycle 4, 80 lessons are available.

Figure 1. The CARTOON Platform.

The platform has been designed with a clear instrumentation intention, to foster the use of digital tools in class. In terms of macro-level connectivity, the CARTOON platform is clearly designed to create connections between authors and users. The content offered can be downloaded, and inserted in the teachers' resources system. On the opposite, any teacher can upload a lesson plan, but this requires filling different fields, it is not an immediate process, so the connections between the platform's content and the user's resources system are constrained. In the lesson plans, many external links are offered: to websites proposing to download software, or presenting a more detailed version of the lesson.

On the micro-level, I have chosen the theme of "First degree equations". Two lesson plans correspond to this theme. The first one focuses on solving such equations; students have access to computers and can use a software called "Thot" to help them. They have a list of equations to solve and they can work at their own pace. The second one is an activity in geometry (with Geoboard, a tool to construct figures on grids) using equations. I observe in these resources connections with software; between different kinds of representations; with the official competencies of the official curriculum, and for the second resource connections between equations and geometry, and between different possible solutions.

The Digital Resources for School Database

The DRSB platform for mathematics at cycle 4 is called "BAREM" (meaning Bank of Resources for Mathematics). The platform offers resources of different kinds. Some resources are called "bricks" (3056 bricks are available); others are called "modules" (394 modules), and associate several bricks. Twenty kinds of bricks are offered, for example: exercise, ICT exercise (involving software), interactive exercise, differentiated exercise, mind map, video, starter (short activity to start a lesson),

teacher's sheet etc. The teacher can find resources on BAREM using several criteria: level, kind of resource, competencies, difficulty, theme, plus any kind of freely chosen keyword. Figure 2 below displays a BAREM screen, after the choice of the keyword "equations". The resources can be proposed to students working on the platform, or downloaded by the teacher; most of them can be modified. On BAREM the teacher can also upload his/her own resources, and can create his/her own modules or "paths" associating several bricks. The teacher can share resources with colleagues from his/her school and with other colleagues.

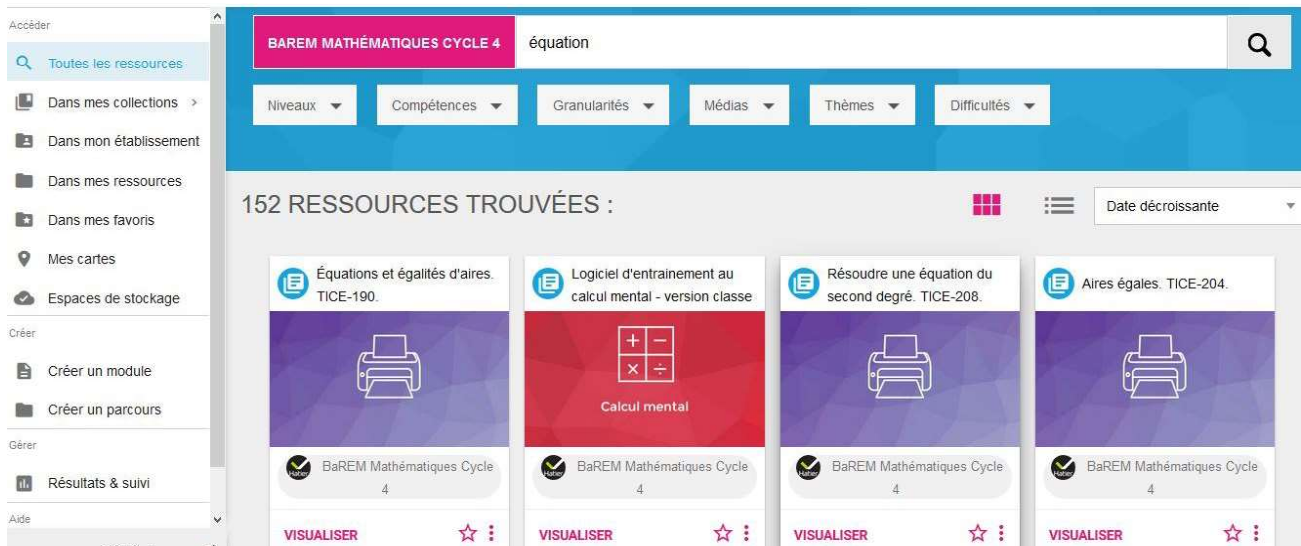


Figure 2. The Platform BAREM for mathematics in France.

The BAREM platform has clearly been designed to support the implementation of the new curriculum; we interpret this as an intention (of the ministry of Education) of fostering instrumentation processes of the users. The content corresponds to the new curriculum; moreover, several kinds of resources or tools correspond to policy priorities. The resources called "ICT exercises" support the use of GeoGebra and of the spreadsheet. The resources called "differentiated exercises" propose three versions of the same problem text, more or less guided. One of the search tools concerns the official competencies. At the same time the platform offers many possibilities for teacher design, including the possibility to modify some of the resources proposed, to upload his/her own resources, to share resources with colleagues. We interpret this as fostering instrumentalisation processes.

The concept of macro-level connectivity can enlighten these affordances of the platform. BAREM offers possibilities of connections: with the user's resource system, by downloading the platform's resources, but also by uploading his/her own resources on the platform; between different teachers by sharing resources; between the teacher and his/her students. Nevertheless, there is no possibility to contact the authors in order to suggest modifications. Moreover BAREM is only linked with the other platforms from the same publisher (concerning sciences, and German for cycle 4), but there are no external links.

Concerning the theme of “First degree equations”, 36 resources are available on BAREM. 28 of these resources are technical exercises: transforming and solving an equation. 2 exercises are in a geometric context, using a dynamic geometry software; 2 exercises a related to real-life situations; the remaining resources are 2 interactive exercises and 2 mind maps (concerning different kinds of equations). Thus at the micro-level for the theme, I observe connections between concepts (with the mind maps); connections with real-life situations and with geometry (but a reduced amount of those); connections with dynamic exercises.

DISCUSSION: COMPARING THE TWO PLATFORMS

The two platforms analysed here are both official platforms, and I claim that both of them embed institutional intentions that can be interpreted in terms of instrumentation processes. BAREM offers a content corresponding to the new official curriculum. CARTOUN is a platform for sharing lessons; nevertheless, these lessons follow a model proposed by the institution. Moreover some “official” groups (involving inspectors) share their work on CARTOUN. Both platforms are designed with an aim of evolutions of teachers’ practices: to foster the use of ICT; to support the implementation of the new curriculum, presented in terms of competencies. They are also designed with an intention of fostering teacher agency in different ways, and this appears in the analysis of their macro-level connectivity.

The macro-level connectivity of CARTOUN is especially developed in terms of possibilities of connections between teachers – which can be interpreted here also as connections between teachers and authors. BAREM offers the possibility of connections between teachers, if a teacher wants to share his/her lessons with colleagues. But there are no possible connections between teachers and authors. On the opposite, BAREM offers the possibility of connections between teachers and students, which does not exist on CARTOUN. Concerning connections with teachers’ resources systems, they are more developed on BAREM: a teacher can design a lesson, mixing in it BAREM resources and his/her own resources. On CARTOUN the teachers can download a lesson; but uploading is framed by different fields to be filled. About connections with external websites, they are more developed on CARTOUN since the authors are free to propose external links in their lesson plans.

In terms of micro-level connectivity, concerning equations, both platforms connect different representations, and connect equations and geometry. BAREM offers better connections between concepts with the mind map on equations; while CARTOUN offers better possibilities for addressing different students’ needs, with a lesson where students can solve equations at their own pace (and no “differentiated exercise” on this topic in BAREM). CARTOUN has also better connections with software, through external links inserted in the lessons.

CONCLUSION

The use of textbooks to support instructional reforms has been extensively studied (e.g. Ball & Cohen 1996). Digital platforms offer new means for this aim, and can lead to new phenomena. We claim that the documentational approach, and the concept of connectivity in particular, can enlighten these phenomena. In this study we illustrated it by the analysis and comparison of two platforms in France.

A study of the actual use of the platforms is necessary to complement this first analysis, from potential connectivity to actual connectivity in classroom uses. Since their use is not compulsory, and probably also because of the popularity of a previous platform: LaboMEP, developed by the Sésamath association (Gueudet *et al.*, 2018), finding mathematics teachers actually using these platforms is a complex task.

Another direction for a better understanding of the transformations of teachers' work produced by digital platforms is provided by the international comparison. This work was initiated in (Gueudet *et al.* to appear); this symposium is a new step in this comparative work.

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