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Ghislaine Gueudet

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# Technology and resources use by university teachers

Ghislaine Gueudet, CREAD, University of Brest, France

## Abstract

In this paper we introduce the study of the use of resources by mathematics teachers at university. The available resources evolve, in particular concerning Open Educational Resources offered on the Internet. Studying the consequences of these evolutions for the teaching and learning practices requires to introduce a comprehensive concept of resource. A resource for the teacher is defined here as anything likely to re-source the teacher's practice: technologies, but also traditional textbooks on paper, or even discussions with colleagues. Teachers look for resources, transform them: we call this the documentation work of a teacher. Along this work, teachers develop documents, which associate resources and professional knowledge. The structured set of all these documents, developed along the years by a teacher is called his/her documentation system. Understanding the evolutions resulting from the use of different kinds of resources requires to study the teachers' documentation systems. We set up a study of these systems in the context of a university in France, investigating the work of six teachers with different profiles for their teaching in the first and second year of university with scientific students.

## Introduction: from technology to resources

The use of technology at university has been studied for many years. In most research works, "technology" means software, like Computer Algebra Systems or programming technology, for example. But the available technology evolves: recently, studies appeared about the use of Virtual Learning Environments, in particular for distant learning. Studying the consequences of these evolutions for the teaching and learning practices requires to introduce a comprehensive concept of *resource*. A resource for the teacher is defined here as anything likely to re-source the teacher's practice: technologies, but also traditional textbooks on paper, or even discussions with colleagues (Gueudet, Buteau, Mesa & Misfeldt 2014). Teachers look for resources, transform them: we call this the *documentation* work of a teacher. Along this work, teachers develop *documents*, which associate resources and professional knowledge. The structured set of all these documents, developed along the years by a teacher is called his/her *documentation system*.

Understanding the evolutions resulting from the use of technology requires to study the teachers' documentation systems. We set up a study of these systems in the context of a university in France, investigating the work of six teachers with different profiles for their teaching in the first and second year of university with scientific students.

## Results: in increasing, but still limited place of technology in teachers' documentation systems

The documentation systems of the teachers interviewed comprise several sub-systems: documentation for lectures, for tutorials, for assessment, for communication.

*The place of technology in "usual" documentation systems: for communication only*

For 4 out of the 6 teachers we met, only the sub-system for communication incorporates technology in some of the documents developed. For the preparation of lectures, the resources used are the notes of colleagues who previously taught this course, when such notes exist (often under the form of a “polycopie” transmitted to the students from the beginning of the year as a .pdf file on the teacher’s webpage); or mathematics books otherwise. Most of the lectures are still traditionally given on the blackboard; only one of the six teachers tried for the first time in 2013-2014 to project slides. For the tutorials, the main resource is a list of exercises shared between the different teachers who intervene (and with the students). The teachers interviewed never search for resources on the Internet to prepare their teaching. Proposing the polycopie, the exercises sheets, the previous exam texts on his/her professional webpage is done by 3 of the 4 lecturers. The lecturer’s webpage is a central resource for the communication from the lecturer to his/her colleagues and his/her students.

### *A central place of software in particular documentation systems*

Nevertheless the use of digital resources remains limited, compared for example with secondary school. As mentioned above, one of the colleagues interviewed teaches in a symbolic computation course. This course uses Maple – in fact learning to use Maple is an objective of the course, where no new mathematics content is presented; the students learn to produce algorithms and programs linked with the mathematical content of the other courses, concerning matrices (Gauss algorithm), the resolution of linear systems, the search for prime numbers etc. The colleague teaching this course is herself researcher in formal computation. She has professional beliefs about the usefulness of programming, for the learning of mathematics. Maple is central in her resource system, since it intervenes in several documents she developed for different teaching or research objectives. A similar case is observed with a colleague using Scilab for his teaching of numerical analysis; Scilab intervenes in documents in all the subsystems – except for assessment.

This study remains naturally limited, since it only concerns six teachers, in a single university; enlarging this study in order to produce comparative analyses is one of our research perspectives.

### **Reference**

Gueudet, G., Buteau, C., Mesa, V., & Misfeldt, M. (2014). Instrumental and documentational approaches: from technology use to documentation systems in university mathematics education. *Research in Mathematics Education*, 16(2), 139-155.