USING FRENCH WEBSITES TO FIND USEFUL ONLINE MATERIAL TO INTEGRATE THE HISTORY AND EPISTEMOLOGY OF MATHEMATICS INTO OUR TEACHING

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ABSTRACT

This paper (based on a workshop which will not be described here) mainly aims to present the bibliographic database Publimath which contains in particular the works of IREM (Research Institutes in Mathematical Education) and APMEP (Association of French Professors of Mathematics), as well as numerous resources in different languages that the editorial team finds relevant: for instance, proceedings of earlier conferences. More than 8000 items associated with the history of mathematics, both original historical sources and accounts of classroom experiments, are included in the database.
The first part of this paper is an answer to the question: who manages Publimath?
The second part provides a first orientation to the database itself.

1 Two important actors in French mathematical education and their websites

The **IREM** Network consists of 28 regional IREMs (Institutes for Research on Mathematics Education) in France. It has been funded by the Ministry of Education and the universities since 1969. National committees (called CII = Commission Inter Irem) are organized either around a level of education or a theme. Two of these CII, *Repères IREM* and *Publimath*, are intended to disseminate the work of IREM. The CII *History and Epistemology of Mathematics* coordinates the regional groups that work with history, philosophy and/or epistemology of mathematics.

The APMEP (Association des Professeurs de Mathématiques de l'Enseignement Public) was created in 1910. It is a federation of 26 regional associations of mathematics teachers, with regional activities and national committees, funded by membership fees and sale of productions.

Both organizations act as an interface between research (in history and/or didactics) and teaching/training, bringing together teachers of mathematics from kindergarten to university. They produce paper and digital working documents, published by the IREMs or APMEP, as well as conference proceedings, journal articles, and books for private publishers.

Both also have websites which focus in part on the History of Mathematics:

- The APMEP website is: https://www.apmep.fr/. The page dedicated to the group working about History of Mathematics is https://www.apmep.fr/-Histoire-des-maths-
- The national IREM website is "Le Portail des IREM": http://www.univ-irem.fr/.
- The page dedicated to the CII "Histoire et Epistémologie des mathématiques" is http://www.univ-irem.fr/spip.php?rubrique15

2 Publimath: a database and a search engine

Publimath is a joint operation of IREM and APMEP. It is a database that is intended to identify not only the work resulting from research carried out in the IREM network or APMEP, but also any publication useful to the mathematics teacher, as this is the easiest way to offer access to all their in-house materials productions alongside others related to teaching, learning, and scientific culture. These include:

- the working documents posted on the IREM websites;
- books and journals of the IREM network and APMEP ;
- proceedings of conferences such as HPM (History and Pedagogy of Mathematics and ESU (European Summer School) ;
- papers published by learned societies of mathematics ;
- books produced by private publishers;
- websites, videos and other educational materials.

Publimath is freely accessible to anyone, as is the associated database "Bibliothèque numérique des IREM" (IREM Digital Library). These resources are useful to the entire educational community of mathematics teachers, from school to university, teacher trainers, and students training to become math teachers., They are also of interest to researchers in didactics in history, and in the history of mathematics education, as the majority of these resources have been used in France for a long time by teachers and thus offer valuable information on French curricula and didactical practice.

2.1 Les *fiches*

Each item in the Publimath database is described in a "*fiche*". There are 28,759 *fiches* as of March 19, 2018. The following example is: http://publimath.univ-irem.fr/biblio/ACF11023.htm

Auteur(s): Smestad Bjorn; Nikolantonakis Konstantinos

Titre : History and Epistemology in Mathematics Education: Proceedings of the Sixth European Summer University (ESU 6). Historical methods for multiplication. p p. 235-244. (Méthodes historiques de multiplication.)

Editeur : Verlag Holzhausen GmbH Vienne, 2011, Autriche
Format : p. 235-244 Bibliogr. p. 244-244
ISBN : 3-85493-208-1 *EAN :* 9783854932086

Type : chapitre d'un ouvrage *Langue :* Anglais *Support :* papier

Public visé : chercheur, enseignant, formateur

Classification : F40

Résumé : Cet article résume le contenu de l'atelier, dans lequel les auteurs ont étudié la multiplication "grecque", donnée par Eutocios d'Ascalon dans son commentaire sur "La

mesure du Cercle" dont ils étudient une partie. Ils partent de l'hypothèse que cet algorithme historique de multiplication est d'accès facile car les stratégies mentales informelles mises en oeuvre intuitivement par les enfants font appel aux mêmes processus de calcul. L'idée importante est que la numération de position est fondamentale et que les élèves agissent avec des quantités et non avec des symboles isolés comme cela arrive avec l'algorithme classique. Cela aide les élèves à contrôler leur pensée à chaque étape du calcul. Ils ont également discuté de la méthode russe et de la méthode "par croix" (fondamentalement la même que "la preuve par neuf") pour contrôler l'exécution des opérations.

Notes :

Chapitre des Actes de la sixième université d'été (ESU 6). @

Mots clés :

"calcul algorithmique"
"histoire des mathématiques"
"multiplication de nombres entiers"
"preuve par 9"
"réflexion sur l'enseignement des mathématiques"
"technique de multiplication"

Some comments :

The button gives access to an abstract in English:

This paper summarizes the contents of our workshop. In this workshop, we presented and discussed the “Greek” multiplication, given by Eutokios of Ascalon in his commentary on The Measurement of a Circle.
We discussed part of the text from the treatise of Eutokios. Our basic thesis is that we think that this historical method for multiplication is part of the algorithms friendly to the user (based on the ideas that the children use in their informal mental strategies). The important idea is that the place value of numbers is maintained and the students act with quantities and not with isolated symbols as it happens with the classic algorithm. This helps students to control their thought at every stage of calculation. We also discussed the Russian method and the method by the cross (basically the same as “Casting out nines”) to control the execution of the operations.

The phrase "langue: anglais" indicates that the paper is written in English. If you want only items written in a specific language, go to the page **recherche avancée,** click on **Langue**, then choose “anglais”, or “espagnol”, etc. The database contains several hundreds of papers in English.

The symbol @ means that you can find the pdf online, either with direct access or through a link to another site. There are more than 10,000 documents of this type, including those in the *bibliothèque numérique* for which you can get the paper with 1 click on the sentence "Bibliothèque numérique des IREM et de l'APMEP". If you want to see only the items available on line, go to the page **Recherche avancée,** then click on **Ressource(s) en ligne @.** If you use the simple search engine, papers available on line have the symbol @ after the title.

2.2 Two modes for searching

2.2.1 Simple search

Let's try it: open the homepage here http://publimath.univ-irem.fr/. This gives access to "recherche simple" (simple search).

In the first box, you can put in all the key words that you like, in any language you like.

In the second box, you have a choice between *les fiches*, *la liste des mots-clefs* (keywords), *la liste des auteurs* (authors), *les notices du glossaire* (glossary). A glossary notice is intended to provide quick information (e.g., definition of an object or a concept, biographical details of mathematicians) and references for further research.

To start your search, click **Valider.**

These two lists (*liste des mots-clefs*, *notices du glossaire)* are very useful for people who don't know French mathematical or teaching vocabulary well. If you put in an English word, you'll get the "fiches" in which the word appears in the abstract in English, even if the paper is written in another language.

As in all the basic search engines, you'll get all the items in which any one of your search terms appears (full text research). The tag "bibliothèque numérique" allows for searching **only** the items in the "bibliothèque numérique."

2.2.2 Advanced search

Now, if you know precisely what you are looking for, you can use the "recherche avancée et dans les revues" (advanced and journals search) by clicking on that tag; it opens a second page: http://publimath.univ-irem.fr/avancee.php

If you look for a specific kind of document, as a website, a video , click on the button "Type" and choose in the drop-down menu : site internet website) or film (video)

"Public visé" means "Target audience".

If you are wondering what "CDI Litteramath" is, it is a collection of books available in every french school library (CDI) for students in the first 4 years of secondary schools.

A useful tip: clicking on the logo Publimath on any page will take you back to the homepage: http://publimath.univ-irem.fr/

2.3 How to contribute to the improvement of the Publimath database?

First, a little experiment: on the first page, try this search: Put your last name in the line:

Chercher My last name in liste des auteurs **Valider**

Do you find your name? If yes, click it!

Do you find all your papers? If yes, do you like the "fiches" about them?

If not, you can help us to improve Publimath!

Click on:

Aidez-nous à améliorer cette fiche (help us to improve this fiche). A small video will show you how to do it.

Ideally, the author or publisher of a document fills out the review form available on the homepage by clicking on **Proposer une fiche**

But you can also provide information on any document that you think is worth it. If some fields are not completed, the team members will do it.

Anyone can contribute to enriching the database by translating an abstract, proposing an improvement for the summary, proposing a new summary, or correcting existing data. Non-French associations and journals are welcome! We especially need your help in increasing the references for papers written in English.

How to contact us? By clicking on the button **Contactez-nous** on the home page.

2.4 More about Publimath

Usage statistics are available at**: http://publimath.univ-irem.fr/usage/**

This database, born in 1996, is maintained by a team of about ten people who, in addition to writing and improving the files, each have a specific task, such as

- ensuring the architecture of the database,- following the census of publications of interest to our public (in French)
- maintaining connections with
    - the CII History and Epistemology of Mathematics;
    - APMEP publications;
    - international publications.
- performing English-French translations.
- populating the glossary.

For the last 5 years, the two big new tasks have been

-the creation of a classification based on the ZDM ontology which is in the testing phase; in the "fiches," you find this in the field "Classification"

- the digitalization of IREM and APMEP's documents.

Hombeline Languereau is currently co-responsible for CII Publimath (with Michèle Bechler, who has served in this role since the creation of the CII in 1996). Anne Michel-Pajus ensures in particular the connections with the CII History of Mathematics and international publications.