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# MALlette de REssources pour le Nombre à l'Ecole

## Schools' resource kit for learning the concept of numbers

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Project linked to C2I2e certification

University training and continuing education for school teachers

## Detailed project description

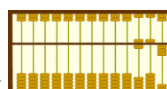
["Passenger train"](#) freeware

["Cars and garages"](#) freeware

- Go to the contents of the "Learning the concept of numbers for pre-schoolers" software kit



- Go to the contents of the "Chinese abacus in schools" kit



The Gerpref School resources kit for learning numbers is part of a national project that brings together the IFé, COPIRELEM and CREAD "Maths resource kit for schools (Early Years - Key Stage 1)".

Launched in September 2011 as part of a partnership between the IFé and COPIRELEM, the "Maths resource kit for schools (Early Years - Key Stage 1)" project is supported by the DGESCO and focuses on integrating different types of tools for teaching maths in primary schools (Early Years and Key Stage 1). This project is linked to the observed lack of diverse number work in preschool in general and in maths in particular that was noted in the conclusions of the 2012 national conference on maths and highlighted by the Inspection Department of the Ministry of National Education.

Considering the volume of available resources, the work involves making it possible for teachers to use the resources directly in class by providing precise guidelines as well as explaining and illustrating the didactic and pedagogical situations involved. Those explanations are supported in pre- and post-analysis derived from existing research and excerpts of videos that were made of actual practice in class.

The learning principles that underlie the selection and development of resources are based on the necessity of taking into account the importance for a student of actually handling tangible objects in order to enhance mathematical conceptualisation. The issue teachers have to deal with concerns the conditions required for them to adopt these resources so they can include them in their daily practice.

The work carried out by the MARENE Group is part of the documentary approach to didactics (Gueudet & Trouche 2010) that considers teachers' work with resources – design, sharing and

usage processes that are always creative - at the centre of their professional development. The resources thus developed rely heavily on the commitment of stakeholders, teachers, trainers and researchers. They also widely enable teachers to work together and make this a key component in developing resources.

This theoretical framework has already enabled the implementation of different studies concerning systems for the professional development of teachers. For primary school teachers, the work of the TREMA-1 team (group from Brittany's Institute for Teacher Training that preceded the GERPREF **MARENE group**) identified the conditions required to integrate technology (Poisard *et al.* 2011). Under the Pairform@nce Programme (Gueudet *et al.* 2012), the relevance of cross-experimentation was highlighted. This system is currently being adapted for implementation in primary schools within the framework of the group's design and pooling of resources. This work concerns specific tools designed for developing the concept of numbers and calculation from Early Years to Key Stage 2. It is carried out in cooperation with the Brest and Rennes IREM (mathematics teaching research institutes).

## **Software products and related equipment for developing the concept of numbers in preschool**

Many free software programmes concern the learning of mathematics during the Early Years and Key Stage 1. Two of them - "Passenger Train" and "Cars and Garages" - were created by the group. Respectively they involve using numbers as a way of remembering positions in Year 1 (children aged 5-6) and numbers as a way of remembering quantities in Reception (children aged 4-5). Usage scenarios were tested in class and have yielded support resources. What was produced relies in particular on the works of the TREMA-1 Group (technologies and resources in mathematics in preschool and primary school, the Institute for Teacher Training research group of Brittany-INRP, formerly the IFE (2008-2011)), which has assessed how teachers could integrate resources as part of documentary methods (Poisard *et al.* 2011; Gueudet, Bueno-Ravel and Poisard, 2014).

## **Physical and virtual Chinese abacuses; numbers and calculations from Early Years to Key Stage 2**

The work done on calculating devices, especially the Chinese abacus (Poisard 2005) has shown their possible impact on pupil learning. However the Chinese abacus is yet to be used in class, sometimes due to a lack of equipment, but mainly due to the lack of specific training and appropriate resources. Furthermore, the development of a [virtual abacus](#), by the Sésamath' association, has opened up additional opportunities for the use of the abacus in class when equipped with digital devices (Bueno-Ravel, Gueudet & Poisard, 2009): pupils working alone or in pairs with the abacus or using it on a projector (or even an interactive whiteboard when available) for information pooling.

Resources were produced for using the physical abacus and for a possible combination with the virtual abacus in Year 1 (children aged 5-6), Year 2 (children aged 6-7), Year 3 (children aged 7-8) and Year 4 (children aged 8-9). They are currently being tested.

The **MARENE** work, which was undertaken in September 2011, was carried out within a research group bringing together school teachers funded by the DGESCO. It led the researchers to produce and analyse resources for the classroom. The group produced:

- software tools, combined with equipment that can be manipulated manually, for developing the concept of numbers, cardinals and ordinals, in the Early Years (children aged 4-5) and Year 1 (children aged 5-6);
- teaching sessions using those tools;
- teaching sessions using the abacus, whether physical or [virtual](#), as well as a software programme that makes it possible to create exercises using a [configurable virtual abacus \(A1: miscellaneous / in collaboration with Sésamath'\)](#);
- software training tutorials.

These products were collected in two different kits: the “learning numbers for pre-schoolers” software programme and the “Chinese abacus in schools” programme. The group is currently pursuing its work by developing new resources and elaborating two Master’s programmes that build on the contents of each kit.

- Programme 1: equipment and software for developing the concept of numbers: maths games in the Early Years.
- Programme 2: equipment and software for developing the concept of numbers: the Chinese abacus, numbers and calculations from the Early Years to Key Stage 3.

See [group page](#) on the IFé’s Educmath website.

## 2014-2015 group members

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 Laetitia Bueno-Ravel, MCF ESPE (Manager)  
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 Estelle Moumin, CPC (Rennes)  
 Caroline Poisard, MCF ESPE  
 Gwenaelle Riou-Azou, ESPE Trainer

## MARENE group work presentations and publications

### Research publications:

- Besnier, S., & Bueno-Ravel, L. (2014). [Usage des technologies en mathématiques à l’école maternelle: le travail documentaire des enseignants](#), ReSMICTE (Review of Science, Mathematics and ICT Education), 8(1), 63-80
- Besnier, S. (2014). [Faire des mathématiques en préscolaire: usages et appropriation de jeux numériques par les enseignants](#). AQEP, vivre le primaire, 27(1).
- Bueno-Ravel, L., & Gueudet, G., Poisard, C. (2013). Mallette de ressources pour le numérique à l’école, in G. Aldon (ed.) Actes des journées mathématiques de l’IFE, Lyon June 2012

- Gueudet, G., Bueno-Ravel, L., & Poisard, C. (2014). Teaching mathematics with technologies at Kindergarten: resources and orchestrations. In Clark-Wilson, A., Robutti, O. & Sinclair, N. (eds.) *The mathematics teacher in the digital era, Mathematics education in the digital era vol 2* (pp.213-240) New York: Springer.
- Poisard, C., Bueno-Ravel, L., & Gueudet, G. (2011). Comprendre l'intégration de ressources technologiques en mathématiques par des professeurs des écoles. *Recherches en didactique des mathématiques*. 31(2), 151-189
- Riou-Azou, G. (2014). [Apports du boulier chinois en grande section de maternelle](#). *MathemaTICE*, 40.

### **Forthcoming publications:**

- Besnier, S., Bueno-Ravel, L., Gueudet, G., & Poisard, C. (to be published). Conception et diffusion de ressources pour la classe issues de la recherche. L'exemple des apprentissages numériques à l'école. Actes de la 17ème école d'été de didactique des mathématiques. Nantes, France.
- Besnier, S., Eysseric, P. & Le Méhauté, T. (June 2014). Mallette de ressources mathématiques pour l'école maternelle (MS-GS). 41<sup>e</sup> colloque international Copirelem, 18-20 juin, Mont de Marsan
- Bueno-Ravel, L. & Gueudet, G. (June 2014). Quelles ressources pour les professeurs des écoles et leurs formateurs? Apports de la recherche en didactique. Conférence au 41<sup>e</sup> colloque international Copirelem, 18-20 juin, Mont de Marsan
- Bueno-Ravel, L., Eysseric, P., Riou-Azou, G. & Soury-Lavergne, S. (June 2014). Mallettes de ressources mathématiques pour l'école, cycle 1- cycle 2. 41<sup>e</sup> colloque international Copirelem, 18-20 juin, Mont de Marsan
- Riou-Azou, G., Soury-Lavergne, S. & Zucchetta, H. (June 2014). Mallette d'outils mathématiques, le boulier et la pascaline. 41<sup>e</sup> colloque international Copirelem, 18-20 juin, Mont de Marsan

### **Kit project production and distribution:**

- [Presentation of work in progress on 10 July 2012 at the DGESCO](#)
- Presentation of work in progress on 10 July 2012 at the DGESCO
- Invitation to present the content of the package at the National seminar of primary inspectors responsible for the teaching of mathematics, 18-20 November 2013, at ESEN, Chasseneuil de Poitou (86). Presentation in plenary conference and during two workshops.
- In the magazine "Sciences Ouest", special edition dedicated to games. Presentation of the work of MARENE under the title, "Supporting maths in schools".
- Organisation of study days in 2103 and 2014 for "The Chinese Abacus in Schools" with the ESPE and IREM of La Réunion (local contact: D. Tournès)
- Educational activities in Finistère and Ille et Vilaine.

### **Resource production:**

- Production of a free software product: "Passenger Train" (go to link up the page)
- Production of a free software product: "Cars and Garages" (go to link up the page)
- Collaboration with Sésamath for the creation of a configurable virtual abacus for primary schools.
- Production of usage scenarios of the software products tested in class
- Production of tutorials for teachers that accompany the tested software

- Two Master's programmes that are currently being developed

## Supervision of research work

- D'hondt, D. (2013). *Appropriation du boulier chinois dans la pratique de professeurs en GS: deux études de cas concernant une ressource TICE pour la construction du nombre*. Master's thesis 2 RSPL, Quimper.
- Riou-Azou, G. (2013). *La construction du nombre en grande section de maternelle avec un boulier chinois virtuel*. Master's thesis 2 RSPL, Quimper.
- Besnier, S. (in progress). Thesis under the supervision of G. Gueudet
- Harel, C. (in progress). Master's thesis 2 RSPL, Quimper. Joint supervision of C. Poisard and L. Bueno-Ravel.

## References

Bueno-Ravel, L., Gueudet, G., & Poisard, C. (2009). [Exerciseurs au premier degré, au-delà de l'entraînement!](#) MathemaTICE, 17.

Gueudet G., Bueno-Ravel L., & Poisard, C. (2014). Teaching mathematics with technology at the kindergarten level: Resources and orchestrations in A. Clark-Wilson, O. Robutti, & N. Sinclair (Eds.) An International Perspective on Technology Focused Professional Development. Series: Mathematics Education in the Digital Era, Vol. 2 (pp.213-240), new-York: Springer

Gueudet, G., Soury-Lavergne, S., & Trouche, L. (2009), Soutenir l'intégration des TICE : quels assistants méthodologiques pour le développement de la documentation collective des professeurs ? Exemples du SFoDEM et du dispositif Pairform@nce, in C. Ouvrier-Bufferet, & M.-J. Perrin-Glorian (dir.), *Approches plurielles en didactique des mathématique* 161-173, Laboratoire de didactique André Revuz, Université Paris Diderot, Paris

Gueudet, G., & Trouche, L. (dir.) (2010), *Ressources vives. La documentation des professeurs en mathématiques*. PUR et INRP.

Poisard, C., Bueno-Ravel, L., & Gueudet, G. (2011). Comprendre l'intégration de ressources technologiques en mathématiques par des professeurs des écoles. *Recherches en Didactique des Mathématiques*, 31(2)

Soury-Lavergne, S., Gueudet, G., Loisy, C., & Trouche, L., 2011, [Parcours de formation, de formateurs et de stagiaires: suivi et analyse](#), rapport de recherche INRP-ENS Lyon.