A NATIONAL PRESENTATION AT ICME 14 OF MATHEMATICS EDUCATION IN FRANCE

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The National Presentation of France: aims and underlying ideas

We propose to provide a global and synthetic description of the French educational context, making clear which specificities of this context directly influence mathematics education, and reflecting on its main strengths and weaknesses. The presentation will be structured around five themes representing important aspects of this educational context (current state and future directions), while of interest for the international community of ICME participants: (i) recent curricular evolutions; (ii) teacher education; (iii) research in mathematics education; (iv) the 50-year old original network of research institutes (IREM), an essential component of the mathematics education landscape in France; (v) popularization and enrichment activities, the number and variety of which regularly increases. For each theme, there will be a focus on recent evolutions or achievements. Moreover, we will try to emphasize the many international collaborations that the French community of mathematics education increasingly develops all around the world, including China in the last decade.

(i) Curricular evolutions: France has known several important curricular evolutions in the last few years [1], with for instance the introduction of algorithmics and programming in primary and secondary math curricula, and now the introduction of computer science as an autonomous discipline in high school. The movement has accelerated in the last year with a deep modification of the national frame for high school studies, and also the implementation of the recommendations resulting from the work of a large commission led by the Field medalist Cédric Villani, together with a national education inspector Charles Torossian [2]. We will present the main points of these evolutions.

(ii) Teacher education: in France, teacher training is regularly subject to reform, both the training itself and the structures in which it is provided, as well as the competitive examinations for teacher recruitment. For the past two years, the Ministry has been announcing reforms in favor of a more important in-service training offer that is more in line with the needs expressed by teachers. Mathematics has already benefited from some concrete measures, implemented following the publication of the Villani-Torossian report [2]: constellation work in primary schools and the creation of Labomaths in secondary schools

(iii) Research in mathematics education: besides some updating of the presentation of the French tradition in didactics of mathematics at ICME-13 [3], we will focus on recent advances linked to the development of research on teaching and learning at University level within the INDRUM network on the one hand and the development of the documentational approach to didactics and research on the collective work of teachers on the other hand [4].

(iv) The IREM network (Institut de Recherche sur l'Enseignement des Mathématiques): we will introduce participants to this 50-year old original institution which has supported the collaborative work of university mathematicians, researchers in mathematics education or history of maths, teacher educators, secondary and primary teachers, has allowed original forms of professional development, and acted as an interface between research and practice, and will show some of its recent realizations. Even if its original character deserves a specific focus, it is worth noticing that the action of the network regards all the themes addressed: the IREMs accompany curricular evolutions through the production of resources and teacher professional development activities, but also facilitate these evolutions, for instance their long term work on proof or on the history of mathematics [5], they have tight links with academic research in didactics and history of maths and they also participate to enrichment activities for pupils and teachers.

(v) Popularization and enrichment activities: we will choose a few examples illustrating the diversity of these activities, such as MATh.en.JEANS (https://www.mathenjeans.fr/) created 30 years ago and allowing, each year, thousands of primary and secondary students to develop a genuine research activity, in France and abroad; some outstanding quality website (https://images.math.cnrs.fr/), remarkable videos, and specific actions for girls activities, such as "Girls, Math and Computer science: A Luminous Equation", supported by Animath (https://animath.fr/) and the association Women and Mathematics (https://femmes-et-maths.fr/), not forgetting the launching of the Year of mathematics in France (academic year 2019-2020).

A document has been prepared which will be available in French, English, and Spanish on the website of the CFEM (http://www.cfem.asso.fr) together with videos and links to other resources.

We hope that, in spite of distant conditions of this presentation to ICME-14 due to the pandemic conditions, this presentation will allow a better knowledge of the field of mathematics education in France, and lead to new fruitful interactions within the international community.

References

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[2] Rapport Villani-Torossian
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ICME14：法国数学教育的国家展示

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法国国家展示：目标和基本思想

我们将对法国在教育领域的背景作一个全面而综合的描述，明确这一背景的哪些特性明确影响了数学教育，并反思它主要的优缺点。我们的展示将围绕五个主题展开，它们分别代表了法国教育背景（在现在和未来）的五个重要方面：(i) 近期的课程改革；(ii) 教师教育；(iii) 数学教育研究；(iv) 具有 50 年历史的、具有首创性的研究机构网络(IREM)——法国数学教育版图的一个关键的组成部分；(v) 科普和兴趣活动，其数量和种类呈规律性的增长。对于每一个主题，我们将把重点放在它近期的演进或成就上。另外，我们将试图强调法国数学教育社群在世界范围内逐步增强的国际合作，包括它和中国在最近十年的合作。

(i) 课程改革：近几年法国有几项比较重要的课程改革措施，比如在小学和中学引入算法和编程[1]，现在又把计算机科学作为高中的自选科目。去年，随着全国高中学习框架的深刻改变，连同以菲尔茨奖得主赛德里克·维拉尼（Cédric Villani）和国家教育督察员查尔斯·托罗斯（Charles Torossian）为首的工作组的意见的落实[2]，这些改革已经加速。我们将介绍这些改革的一些要点。

(ii) 教师教育：在法国，教师培训经常是改革的对象，包括培训本身，培训的组织架构，以及教师竞聘考试的相关政策。在过去的两年里，教育部一直在宣布改革计划，以支持更重要的在职教师培训，也更匹配教师所表达的需求。数学已经从維拉尼—托罗斯的报告[2]发表后实施的一些具体措施中受益，如小学的群星计划（教师工作组计划）和中学的数学实验室。

(iii) 数学教学研究：在 ICME-13[3]的基础上，我们将对法国的数学教学传统做更进一步的补充。除此之外，我们将一方面关注 INDRUM 框架内开展的关于大学数学教与学的研究的相关进展，另一方面关注文档纪录教学论的发展和教师集体工作的相关研究[4]。

(iv) IREM （Institut de Recherche sur l'Enseignement des Mathématiques，数学教育研究机构）网络：我们将向与会者介绍这个有 50 年历史的原创性机构网，它在过去几十年年支持了大学的数学家、数学教育或数学史的研究者、教师教育者和中小学教师之间的合作，开创了一种特殊的专业发展形式，充当了连接教育研究和教学实践的枢纽；我们还会介绍这一网络下最近的一些成果。除了它的原创性值得关注，我们还要注意该网络的行动与这里的其他所有主题都相关：通过创造资源、组织教师专业发展活动（尤其是它们在数学证明和数学史领域的长期工作），全国各地的 IREM 见证并推动着法国的课程改革[5]，它们和数学教学及数学史的学术研究有着紧密的连接，并且也参与一些针对学生和教师的兴趣活动。

(v) 科普和兴趣活动：我们将选择几个例子来说明这些活动的多样性，如 30 年前创建的 MATh.en.JEANS 网站（https://www.mathenjeans.fr/），每年都组织成千上万的中小学生在国内外开展真正的研究活动；还有一些高质量的网站 （https://images.math.cnrs.fr/），精彩的视频；以及一些专门针对女生的活动，比如由 Animath（https://animath.fr/ ）和女性与数学协会（https://femmes-et-maths.fr/）支持的项目—— “女孩、数学和计算机：一个闪耀的方程”；最后，别忘了 2019-2020 年度在法国首次举办的数学年。

在 CFEM （http://www.cfem.asso.fr）的网站上，我们提供了一份文档（有法语、英语和西班牙语三个版本）来介绍法国的数学教育概况，连同一些视频和资源链接。

尽管因为疫情的原因，我们在 ICME-14 中的展示是通过远程的形式来实现的，但我们希望这次展示能够使大家更好地了解法国的数学教育，并且引发新的、富有成效的国际交流。

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