

# The Foundation and Development of the GDM

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In 1890, the *Deutsche Mathematiker-Vereinigung* (DMV / Association of German Mathematicians) evolved as an independent organisation out of the Mathematics and Astronomy Division of the *Gesellschaft deutscher Naturforscher und Ärzte* (GdNÄ / Society of German Naturalists and Physicians) founded in 1822. The division was “to be given broader scope for its activities, which encompass all the academic interests of mathematics” (Bremer Beschlüsse (18. 9. 1890) as cited in Gutzmer, 1904, 27). The mathematicians in the *Scientific Committee* of the GdNÄ formed an important link in this process.

This all the same loose integration of the mathematicians’ association into the framework of the large and extensive naturalists’ society must be classified as a particularly fortunate move. For on the one hand the mathematicians’ association is not restricted in the least in its autonomy and freedom of movement and on the other hand the opportunity presents itself through the naturalists’ society to place greater emphasis on mathematicians’ academic and professional interests with the aid of the naturalists’ society and to come into scientific contact with related disciplines (Gutzmer, 1904, 4 f).

It was above all university mathematicians, teachers in senior schools, which in the first decades were particularly well represented, and mathematicians in industry and administration who became members of the DMV at that time.

Gutzmer (1904, 8) wrote in retrospect in 1904:

The question in general of teaching, which since about a decade has gained general and fundamental importance especially in the field of mathematics too, has constantly enjoyed the association’s interest.

He made reference here to some 30 papers which had appeared on this topic in the annual reports in the first years (Gutzmer, 1904, 9 f).

## Organisations Associated with Mathematics

Up until 1920, the DMV remained the only national association of mathematicians in Germany. Out of it developed in 1921 the *Reichsverband deutscher mathematischer Gesellschaften und Vereine* (Imperial Federation of German Mathematics Societies and Associations), which had assumed above all an advisory role in questions concerned with mathematics teaching in schools and higher education, and one year later the *Gesellschaft für angewandte Mathematik und Mechanik* (GAMM / at that time Society for Applied Mathematics and now International Association of Applied Mathematics and Mechanics), which first and foremost discussed and fostered research in applied mathematics.

In the 1920s, the annual meetings of the DMV, which now devoted itself increasingly to pure mathematics, were still organised together with these two societies as well as with the *Deutsche Physikalische Gesellschaft* (DPG/German Physical Society) and the *Gesellschaft für Technische Physik* (Society for Technical Physics) founded in 1919 (Tobies, 1986, 122 f.).

The foundation of new societies gradually led to certain professional groups, e.g. physicists, soon being represented in the DMV to a far lesser degree than in the first decades of the 20<sup>th</sup> century. Max Planck, Albert Einstein, Arnold Sommerfeld, Werner Heisenberg and Wolfgang Pauli, for example, were still members of the DMV (Toepell, 1991).

As the field of mathematics became more and more specialised, mathematics teachers, who in those days mostly taught physics as their second subject, increasingly joined forces from the middle of the century onwards in special professional associations - such as, in particular, the *Deutscher Verein zur Förderung des mathematischen und naturwissenschaftlichen Unterrichts* (MNU/German Association for the Promotion of Mathematics and Science Teaching) which had equally already been founded in 1890, in the *Gewerkschaft Erziehung und Wissenschaft* (GEW/Education and Science Workers' Union) founded in 1948 or in the newly formed mathematics groups of the philologists' associations. As a consequence, it became less and less possible for the DMV to fulfil its founding purpose of also integrating grammar school (Gymnasium) teachers (Tobies, 1991, 43).

Amongst the members of the DMV in the 1950s were also numerous East German mathematicians. From 1962 to 1990, these mathematicians established their own mathematics society, the *Mathematische Gesellschaft der DDR* (MGDDR/Mathematics Society of the GDR). At the end (1990), the society had about 1,350 members, including a large number of teachers who had joined up in this part of Germany with university mathematicians.

## Elementary School Teacher Training

A professional group not addressed so far was the mathematicians who were engaged in elementary school teacher training. The training of elementary school teachers took place from the end of the 18<sup>th</sup> century into the 1920s at teacher training colleges. When these were no longer regarded as in keeping with the times, in the Weimar Republic what were known as "educational academies" (such as in Prussia) and "educational institutes" (such as in Saxony) were introduced, which were affiliated to universities or technical colleges (Griesel, 2000a, 16). This type of training, which had a strong educational science and music focus, resumed after 1945. An awareness of mathematics education/the didactics of mathematics as an independent academic field was, however, not yet able to develop.

The reform of school education at the beginning of the 1960s was accompanied by a shift in values. The elementary school, where instruction lasted eight years and focussed on everyday practical skills, was abolished; primary schools and nine years of compulsory schooling were introduced. All population groups were to have equal access to a broad, science-based education.

The related objective of giving teachers academic training at least for specific types of secondary schools (*Hauptschulen* and *Mittelschulen*) led to the educational academies and institutes being converted into *Pädagogische Hochschulen* (teaching colleges which were later integrated into universities or in Baden-Württemberg were given a university structure) with a six-semester study programme and the right to award doctorates. This also meant the need for changes in personnel structure, in the course of which between 100 and 200 professorships for mathematics and didactics of mathematics were established from 1965 to 1975, as well as an excellently equipped *Institut für Didaktik der Mathematik* (Institute for the Didactics of Mathematics) in Bielefeld. The “Modernisation of Mathematics Teaching” was imminent. The general expansion of all subject didactics at universities and research institutes in the Federal Republic of Germany underlined at the same time the importance of these disciplines for the education system.

Professors had the *three-fold task* of ensuring on the one hand practice-based instruction for students (lectures, seminars, and supervision of school internships), on the other hand practice-oriented research and development in the discipline and finally education-oriented services (such, for example, as further and advanced teacher training measures, active involvement in curriculum planning committees, public relations work in the area of education policy).

At the *University Open Day on Education* in 1966 in Berlin, there was an informal gathering of those university lecturers who felt responsible for the didactics of mathematics. There arose a desire to create a forum in which research results, theories and developments could be debated and organisational matters discussed. The group thus decided to stage what was referred to as a *Bundestagung für Didaktik der Mathematik* (a national conference for the didactics of mathematics which was later renamed “Jahrestagung” or annual conference). With the first annual conference in 1967 in Osnabrück, a tradition evolved which has been preserved up until today. Whilst the first conferences were still organised by mathematics and didactics of mathematics lecturers engaged at teacher training colleges, in 1981 participants met for the first time at a university and in 1982 for the first time (in a German-speaking country) abroad, in Klagenfurt (Austria). The 50th Annual Conference was held in 2016 in Heidelberg with over 800 delegates.

*Beiträge zum Mathematikunterricht*, the extensive conference transcripts from these events on the topic of mathematics teaching, document the diversity of research work in this field.

## What Led to the Foundation of the GDM?

When the DMV was founded, it was already stated that its purpose was to ensure that the mathematics-related “proceedings at the annual conferences be prepared in a scientific and more thorough manner than to date” [Gutzmer, 4]: An argument which also contributed significantly to the foundation of the *Gesellschaft für Didaktik der Mathematik* (GDM/Society of Didactics of Mathematics). Anyone who has organised larger congresses knows that a series of such conferences requires long-term planning

and coordination. In addition, the financial risks should be borne not by a single individual but instead by a solidarity group.

A further problem emerged in particular during the years around 1970 when mathematics teaching was reformed: All too often the media, as representatives of general public opinion, lacked informed interlocutors, that is, a suitable institution to approach with their many questions about new mathematics teaching.

In addition to these two rather external reasons came something which – in the field of mathematics – had equally expressed itself on the occasion of the DMV's foundation in 1890/91: Those working in the didactics of mathematics felt that the development of an own scientific awareness would benefit from the foundation of a corresponding scientific community. This was intended as a forum for an exchange on the didactics of mathematics as an academic discipline with its own characteristic paradigms, questions, theories and research methods, since – unlike mathematics – this young science of “the didactics of mathematics” could not yet look back on a centuries-old research tradition. The objective was to establish the didactics of mathematics as a *profession-related science* for mathematics teachers.

In 1974, one year after the foundation of the *Gesellschaft für Didaktik der Chemie und Physik* (GDCP/Society for Didactics of Chemistry and Physics), the decision to establish the GDM was adopted at the national conference on the didactics of mathematics in Oberwolfach (which at that time still took place annually). The close affiliation with the other subject didactics is today reflected by the umbrella organisation, the *Gesellschaft für Fachdidaktik* (GFD/Society for Subject Didactics), which was formerly part of the *Arbeitsgemeinschaft fachdidaktischer Gesellschaften*, the working group of subject didactics societies.

On the 12th/13th of March 1975, the GDM was then founded at the Annual Conference on the Didactics of Mathematics in Saarbrücken. The society has a four-strong executive board (President, Vice-President, Secretary and Financial Officer) as well as a Scientific Council with a maximum of 15 members who advise and support the board in questions related to general scientific guidelines and objectives.

Presidents since the foundation of the GDM were: Heinz Griesel (1975–1979), Hans Schupp (1979–1983), Heinrich Winter (1983–1987), Gerhard Becker (1987–1991), Heinrich Bürger (1991–1995), Werner Blum (1995–2001), Kristina Reiss (2001–2005), Elmar Cohors-Fresenborg (2005–2007), Hans-Georg Weigand (2007–2013) and Rudolf vom Hofe (since 2013).

When the GDM was founded, the idea naturally arose of whether it might not be better – like in the MGDDR for example – to create a didactics working group within the DMV. This was, however, opposed by fears of becoming too dependent on decisions made by the DMV's steering committee. Didactics of mathematics is neither a sub-area of nor a supplement to mathematics. It is possible that didactics of mathematics specialists with an educational science or psychology background might even not have been able to become members due to the very strict DMV admission conditions at that time (see Griesel, 2000a, 21). A large number of didactics of mathematics specialists (including many DMV members) felt that their main concern of improving mathematics teaching was not sufficiently represented in the DMV at that time, whereby it should be taken into account that didactics of mathematics not only had to



The Mathematisches Forschungsinstitut Oberwolfach (MFO, Oberwolfach Research Institute for Mathematics) is an international research centre situated in the German Black Forest. The decision to found the GDM was made at MFO in 1974 (Photo: Florian-FTW, CC BY-SA 3.0)

consider the problems of teaching and learning at grammar schools (*Gymnasium*) but at all types of school, so in particular too at primary schools, other types of secondary schools (*Hauptschulen, Realschulen (Mittelschulen)*) and vocational colleges.

As there is no independent association of mathematics teachers in Germany either, there was no possibility for mathematics teachers and didactics of mathematics specialists to join together as in the USA, for example, with its *National Council of Teachers of Mathematics* (NCTM), an association with 90.000 members.

Following the expansion of subject didactics in the 1960s and 1970s, in the 1980s a clear countermovement developed. The not particularly pleasant *glut of teachers* became a buzzword in the media. There were drastic cutbacks in teacher training capacities, in particular in subject didactics. The systematic study of questions regarding educational processes and learning in the field of mathematics had a hard time in the face of the undisputed reputation of the mathematics discipline. Restrictive conditions and impeded development can, however, on the other hand also boost reflection about the actual quintessence of a young science, such as described in retrospect by Heinrich Winter, the president at that time (Winter, 2000, 38 f.).

The political change in Germany after the *fall of the Berlin Wall* also led in many instances to changes in academic structures. It was in particular the concern about the future of mathematics which in 1991 triggered a *structural reform* in the DMV. The opening up of the DMV on a broad scale foreseen in this context was a new signal for the didactics of mathematics which did not go unheard. Lisa Hefendehl-Hebeker reported on it in the Newsletter of the GDM (Hefendehl-Hebeker, 1991). In an open

letter (dated 2.4.1991) to Martin Grötschel, the then president of the DMV, Hans-G. Bigalke addressed the significance of the structural reform proposals for the GDM (Bigalke, 1991). These contacts rang in a new epoch of understanding and cooperation.

On this basis, the GDM's tasks and obligations in the field of education policy noticeably increased in the second half of the 1990s. Above all the TIMSS studies and PISA reports were a source of support and raised the media's awareness of mathematics and natural science teaching, so that their didactics were not only in greater demand but also integrated into education policy decisions.

## The GDM's Tasks

This leads to the question of the GDM's tasks. As Heinz Griesel writes, the GDM's founders had a *broad understanding* of the didactics of mathematics. It

was not regarded narrowly as part of mathematics, teaching or educational psychology but instead as an independent scientific discipline which is obliged to handle all those research and development questions which concern the teaching and learning of mathematics, and indeed for all types of school, but also outside the school environment (Griesel, 2000a, 22; see also Griesel, 2000b, 7).

In his view, those problems should be given priority in research that manifest themselves to teachers in their concrete work in the classroom, whereby these also include general and fundamental issues (vgl. Griesel, 2000a, 30).

To give those engaged in the didactics of mathematics a possibility for greater personal fulfilment, the GDM has created an organisational framework which encompasses a number of *tasks*:

1. The most important tasks are the planning of the *annual conferences*, i. e. the already mentioned *Annual Conferences on the Didactics of Mathematics*, and the publication of the annual issues of *Beiträge zum Mathematikunterricht*, the conference proceedings (up until 2004 by Verlag Franzbecker Hildesheim/Berlin, since 2005 by WTM Verlag Münster as well as online under [www.mathematik.tu-dortmund.de/ieem/cms/de/home/bzmu\\_home.html](http://www.mathematik.tu-dortmund.de/ieem/cms/de/home/bzmu_home.html)). Together with the main presentations, the annual conferences form a "market of ideas, experiences and opinions" (Schupp, 2000, 33).
2. In addition, *working groups* on wide-ranging topics were established. Working groups on Geometry or Stochastics also exist, but these nevertheless are less focussed overall on areas of mathematics than on didactic research and thematic fields. The following working groups are currently active in the GDM:
  - Empirical Education Research in the Didactics of Mathematics (formerly: Comparative Studies in Mathematics Teaching)
  - Women and Mathematics
  - Geometry
  - Mathematics Teaching and Learning in Primary Schools
  - Didactics of University Mathematics
  - Interpretative Approaches in Education Research



The first issue of *Journal für Mathematik-Didaktik* (1980)

- Mathematics Teaching–Learning Laboratories
- Mathematics and General Education
- History and Teaching of Mathematics
- Mathematics Teaching and Digital Tools  
(formerly: Mathematics Teaching and Computer Science)
- Mathematics Teaching and Didactics of Mathematics in Austria
- Problem Solving
- Psychology and Didactics of Mathematics
- Semiotics, Signs and Language in the Didactics of Mathematics
- Stochastics in Schools
- Hungary
- Mathematical Networks & Connections

With the “GDM Switzerland”, in 2014 the first national GDM association evolved out of the long-established *Switzerland-Liechtenstein Working Group* following a corresponding amendment to the statutes.

Most working groups assemble – apart from within sessions at the GDM’s annual conferences – at their own annual (autumn) conventions in order to work together more closely.

3. With the *Journal für Mathematik-Didaktik* (JMD/Journal for Didactics of Mathematics), in 1980 the GDM established its own quarterly, peer-reviewed journal of a scientific standard. A committee comprising three persons elected by the GDM’s advisory council is responsible for its publication and in so doing sets the ship’s sails. The JMD has been published twice a year since 2010 by Springer Verlag; all previous

years have additionally been retro-digitalised and so all issues of the journal are available online for GDM members under SpringerLink. With the move to the Springer Verlag and as a sign of internationalisation, more English-language articles are being published, partly bundled in three special issues so far (*Empirical Research on Mathematical Modelling* (2010), *Early Childhood Mathematics Teaching and Learning* (2012), *Subject Matter Analysis from a Didactical Perspective* (2016)).

4. The *Mitteilungen der Gesellschaft für Didaktik der Mathematik* (MGDM), the GDM's newsletter, form the platform for an exchange of information between the executive board, advisory council, working groups and the members of the GDM. 101 issues have appeared since 1975 (firstly with about 32 pages each year, lately with about 160 pages). They are published by the respective secretary on behalf of the executive board and form a further discussion forum for the didactics of mathematics. They also contain information about working groups, developments in the area of education policy, memoranda, commissions, research projects, international topics and national and international conferences as well as book reviews.

5. Alongside the JMD and the newsletter as official publications of the GDM, the GDM supports the international journal *ZDM – Mathematics Education*. The ZDM was already established in 1969, about five years before the GDM, as the "Zentralblatt für Mathematikdidaktik", the central information and documentation portal for the didactics of mathematics in German-speaking countries. From 1980 to 1996, the ZDM appeared under the auspices of the *Fachinformationszentrum Karlsruhe* (FIZ/Leibniz Institute for Information Infrastructure).

Whilst the internationally renowned journal "ZDM – Mathematics Education" evolved out of the information part, from the documentation part followed the specialist online database *MathEduc* (formerly: MathDI) ([www.zentralblatt-math.org/matheduc/](http://www.zentralblatt-math.org/matheduc/)), which is still maintained today in close cooperation between the FIZ and the GDM. MathEduc is the only international reference database worldwide exclusively dedicated to research in mathematics education. Articles from over 500 pertinent journals and thematically relevant monographs and edited volumes with abstracts and partly also reviews are collected in this literature database on a regular basis.

In addition to this international online literature database, a further online activity on which the GDM has been working for a few years is the Madipedia (<http://madipedia.de>), a central reference work for the didactics of mathematics in German-speaking countries in the form of a wiki. At present, about 600 persons and 860 dissertations on the didactics of mathematics are documented. In addition and amongst others, almost all working groups and the GDM's group of early career researchers are represented in the Madipedia with their own home-pages.

6. The support for early career researchers planned in the GDM from the outset only really started up at the beginning of the 2000s (benefitted by a better employment situation) amongst others through awards and regular *seminars for doctoral researchers*. These were modelled on the seminars for doctoral researchers of the MGDDR (Griesel, 2000a, 27). Since 2003, a new type of support for early career researchers has been added: the *GDM Summer School*, which wants above all to

allow an insight into various research methods with which the participants grapple more extensively in workshops and lectures. Only in the 2010s has the *Early Career Researchers Group of the GDM* become established as a self-organised group of doctoral and postdoctoral researchers, which since a few years has organised its own activities for early career researchers in the framework of the GDM's annual conferences and is generally also involved in the planning of the seminars for doctoral researchers and summer schools.

7. Associations also form in the hope of giving their members' official announcements and recommendations greater weight. Thus in the almost three decades of its existence, the GDM has released a series of various statements, for example on teacher training or mathematics teaching in specific types of schools. In order to increase its impact, there has been a growing tendency over the last years to issue such statements jointly with partner associations, such as the previously mentioned DMV (Association of German Mathematicians) or the MNU (German Association for the Promotion of Mathematics and Science Teaching). With the two joint commissions on *Teacher Training* and *School-University Transition* set up in recent years, GDM, DMV and MNU have meanwhile established a forum for an exchange of views on developments in education policy which concern all three associations outside the framework of urgent statements too, also in the hope of gaining influence on education policy not only in a reactive way but also by shaping it proactively.
8. Finally, the GDM also sees it as its task to provide assistance in the acquisition of *external funding*, for example through regular workshops on proposal writing in cooperation with the Gesellschaft für Didaktik der Chemie und Physik (Society for Didactics of Chemistry and Physics).

## Contacts and Partnerships

The conscious decision was made not to found the GDM as the "German" society for the didactics of mathematics. Located in the middle of Europe, it endeavours to do justice to European concerns. Most of the around 1,100 members are from German-speaking countries. From the outset, didactics of mathematics experts in Austria (at present 60 members) and Switzerland (currently 140 members) were involved in the plans for the GDM's establishment. The GDM regards itself as an open society for the didactics of mathematics which traditionally also has a large number of members outside German-speaking countries – above all in Eastern Europe – and makes a particularly valuable contribution to fostering international cooperation.

Alongside its contacts to the GDCEP and the MNU, in particular those to the DMV should be highlighted: For decades now, didactics of mathematics experts had introduced their own commendable section at the DMV's annual conferences and made a lively contribution with a sometimes smaller and sometimes more extensive range of lectures. Joint annual conferences of the GDM and the DMV moreover took place in 2007 (in Berlin) and 2010 (in Munich) and will take for the third time in Paderborn in 2018.

Collaboration by the DMV, GDM and MNU on the development of joint recommendations on “Standards for Teacher Training in Mathematics” was followed in 2008 by a permanent joint working group on “Teacher Training”, out of which then finally arose in 2011 the *Joint Commission on Teacher Training* already mentioned above. In the same year, a working group entitled *School-University Transition* was created, which is today run as the second permanent joint commission of the three associations. The partnership between the three associations in these commissions meanwhile goes far beyond just formulating statements on education policy and includes regular conferences which have also already led to several publications.

Cooperation with subject didactics societies has been institutionalised in Germany since 2001 in the *Gesellschaft für Fachdidaktik* (Society of Subject Didactics) as the umbrella organisation of subject didactics societies in Germany. In 2012, a corresponding organisation was set up in Austria in the shape of the *Österreichische Gesellschaft für Fachdidaktik* (Austrian Society for Subject Didactics), in which the GDM is likewise represented. Apart from regular conferences to foster an interdisciplinary exchange of ideas between didactics experts in all subjects and fields of activity as well as joint activities to support the next generation, here too one of the motives of this cooperation is a joint display of solidarity by all associations, in order to be perceived as an important factor in questions of education policy.

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