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Historical Documents, Part II
Two Documents on Mathematics

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Document No. 34[1]

A Method of Promoting the Mathematical Disciplines in the Schools of the Society

Modus quo disciplinæ mathematicæ
in scholis Societatis possent promoueri

In the first place a teacher (*magister*) must be chosen with uncommon erudition and influence (*authoritate*); for if either of these be lacking, the students (*discipuli*), as experience teaches, seem unable to be attracted to the mathematical disciplines. Now in order that the teacher should have greater influence over his students and the mathematical disciplines themselves be of greater value and the students may understand their usefulness and necessity, the [mathematics] teacher should be invited to the more solemn events (*acta*) at which doctorates are conferred and public disputations held, so that, if he be capable, he may also propose arguments and assist the disputants. For in this way the students, seeing the professor of the mathematical arts attending, with the other instructors, these sorts of events and sometimes even disputing, will be convinced that philosophy and the mathematical sciences are connected, as they truly are; especially since up to now the students seem almost to have despised these sciences for the simple reason that they think that they are not considered of value and are even useless, since the person who teaches them is never summoned to public events with the other professors.

It also seems necessary that the instructor (*præceptor*) should have a certain inclination and propensity for lecturing on these [mathematical] sciences, and should not be taken up with many other occupations; otherwise he will scarcely be able to help his students. Now in order that the Society may be able always to have capable

[1] Translation of Documents 34 and 35 by Dennis C. Smolarski, S. J. Translations compared with the partial translation of Document 34 found in A. C. Crombie, "Mathematics and Platonism in the Sixteenth-Century Italian University and In Jesuit Educational Policy," ΠΡΙΣΜΑΤΑ (Prismata): Naturwissenschaftsgeschichtliche Studien (Festschrift für Willy Hartner), pp. 62–94 (particularly pp. 65–66) and with the translations of Documents 34 and 35 found in the *Bulletin of the American Association of Jesuit Scientists* (Eastern Section), v. 18, n. 4 (May 1941) (For Doc. 34, "A Method of Promoting Mathematical Studies in the Schools of the Society," pp. [203]-[206]. For Doc. 35, "On Teaching Mathematics," pp. [206]-[208]). The latter translations were presented by Edward C. Phillips, S. J. and made by Edwin Cuffe, S. J. with the advice of Edward H. Nash, S. J.

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professors of these [mathematical] sciences, some men apt and capable of undertaking this task ought to be chosen who may be instructed in a private academy in various mathematical topics; otherwise it does not seem possible that these studies will last long in the Society, let alone be promoted; since, however, they are a great ornament to the Society, and quite frequently a discussion about them will occur in conversations and meetings of leading men, where they might understand that Ours are not ignorant of mathematical topics. Whence it happens that in such meetings Ours necessarily become silent, not without great shame and disgrace; as those to whom this very thing has happened have often reported. I omit mentioning that natural philosophy without the mathematical disciplines is lame and imperfect, as we shall show a little later.

This much has been said about the teacher of mathematical disciplines; now let us add a few words on the students (*auditores*).

In the second place, therefore, it is necessary that the students (*discipuli*) should understand that these [mathematical] sciences are useful and necessary for the correct understanding of the rest of philosophy, and at the same time that they are as a great ornament to all other arts, so that one may acquire *eruditio perfecta*; even more these sciences and natural philosophy have so close an affinity with one another, that unless they assist each other mutually they can in no way preserve their own dignity. For this to happen, it is necessary, first of all, that students (*auditores*) of physics should, at the same time, study the mathematical disciplines; this custom, up to now, has always been retained in schools of the Society. For if these sciences were taught at another time, students (*auditores*) of philosophy would think, and with some merit, that they are in no way necessary for physics, and so very few would want to understand them: since, nevertheless, among experts it is agreed that physics cannot rightly be understood without them, especially as regards that part which concerns the number and movement of the heavenly bodies (*orbes*), the multitude of intelligences, the effects of stars which depend on various conjunctions, oppositions, and other distances between them, the division of a continuous quantity into infinite [sections], the ebb and flow of the sea, winds, comets, the rainbow, the halo [of the sun and moon], and other meteorological phenomena, the proportions of motions, qualities, actions, passions, reactions, etc., concerning which mathematicians (*calculatores*) write much. I omit mention of the infinite examples in Aristotle, Plato, and their more illustrious commentators, which by no means can be understood without a moderate understanding of the mathematical sciences; indeed, because of ignorance of these [sciences], some professors of philosophy have very often committed many errors, and errors most grave, and (what is worse) they have even put them down in writing, some of which would not be difficult to bring forward.

For the same reason, instructors of philosophy should be skilled in the mathematical disciplines, at least moderately, lest they run onto similar obstacles with great shame and loss of the Society's reputation in letters.

I do not mention that professors would in this way gain great influence over their students, if they [the students] understood that they [the professors] treated with

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dignity the places in Aristotle and other philosophers that pertain to the mathematical disciplines. From this it will also happen that the students will better understand the necessity of these sciences. To this end, it would be a great help if the instructors of philosophy abstained from those questions which are of little help in understanding things of nature, and very much detract from the opinion (*auctoritas*) about mathematical disciplines among students, such as those [questions] in which they teach that mathematical sciences are not sciences, do not have proofs (*demonstrationes*), abstract from being (*ens*) and good (*bonum*), etc.; for experience teaches that these [questions] are a great hindrance to students, and are not at all useful; especially because the instructors can hardly teach them (which is known from what others have said more than once) without bringing these sciences into ridicule.

It would also be useful if, in private conversation, teachers were to encourage students to learn these [mathematical] sciences, impressing on them their necessity, and not, on the contrary, leading them away from the study of these [sciences], as many have done in previous years. In this way, there will be removed every disagreement that is observed by externs to exist among Ours, when a teaching such as this is heard in schools.

Moreover, the scholastics will be greatly inspired to study these [sciences], if in every month all the philosophers gather in some one place, where one of the students will offer a brief appreciation of the mathematical disciplines, and then with one or two others will explain some problem of geometry or astronomy; this also will be pleasant to the students and of use for the humanities, and such problems are found abundantly; or, let him explain some mathematical passage from Aristotle or Plato, for such passages are not isolated among their works; or, even let him offer new proofs of some of the propositions of Euclid, thought out by himself; in these places, let praise be given to those who best solve the problem proposed, or who commit the fewest false syllogisms, which occur not rarely, in the invention of the new proofs. For it would happen thus, that they would become not a little eager for these studies, when they see such honor given to them, and at the same time would understand the eminence of these same studies, and they would make greater progress in these things through this exercise.

It is possible, however, to allow for this exercise perhaps the time of one morning or afternoon discussion in a month, which is not crucial for the instructors of philosophy; since this happens at most merely seven or eight times in a year, or the morning time of one day of vacation, or at least at the hour at which the mathematical disciplines are customarily taught.

Furthermore, around the end of the course of philosophy, those who wish to receive the honor (*laurea*) of master or doctor ought to be examined about mathematical topics, in the customary way of some other academies; at this examination, let there be present along with the other professors of philosophy, the professor of the mathematical disciplines.

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In the hand of Father Brunelli. Written by the hand of Father Christopher Clavius and must be observed diligently.

Document No. 35

On Teaching Mathematics

De Re Mathematica Instructio

It was proposed last year that, for the advancement of mathematical studies in our Society, which were already almost neglected, those who were to lecture on this science were excused from teaching grammar for this reason, that during the first year after finishing the course of philosophy, they might study this [science] more thoroughly at home, and then teach publicly for one or two years; this [proposal] in fact was seen to be useful; it even has begun to be done in part, and its greatest usefulness will be not only for fostering this discipline, but also for adorning and augmenting it for other [disciplines]; and finally it has been demonstrated [to work], and all bear witness to this fact. But one thing seems to be troublesome about this matter. Namely, the most talented men (among whom are those who for greater service of our Lord and the good of the Society should be chosen for a ministry such as this) usually complete philosophy as adolescents, since, generally, those having the greatest age have barely attained 24 years. In addition, it seems not to be expedient for them (during the year in which they teach) that, since this ministry requires the space of one hour or two, they use the remaining [time] at their own discretion, as it seems [to happen]. Neither does it benefit the school (which is burdened and disappointed and in which the teachers are practically boys), nor does it benefit the good name of the Society to be always using human beings such as these for explaining the more important disciplines.

For this reason, it possibly should happen that those who are chosen for this ministry [of teaching mathematics], after completing the course of philosophy, should study for an entire year at home these things which they would have taught at that time as has already been determined earlier, then right away to study theology, and then finally to teach the mathematical disciplines for the length of time which they would have taught earlier: for, in addition, men who are already of a mature age, both priests and theologians, would give honor to a chair [of mathematics] rather than degrade it, and are able to be trusted to themselves more assuredly in making use of their spare time. In addition, these advantages, not commonplace, would exist:

First. They [the students] would be able to be present at philosophical disputations, whether at the monthly [public] ones or even at private ones, and by participating [in them] to be helped themselves and stimulated, and even to help others. But if they teach before they are theologians, it would not be possible for this to occur. And, though they excel in talent, being merely students of philosophy, it would scarcely be possible for them to be able to offer anything worthwhile at a disputation, and

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perhaps it may [even] be annoying to the teacher of philosophy to be challenged by them [the students] and to dispute with them.

Second. Regarding that time which remains after the task of teaching: By this very fact – that they have already studied theology – it would be more useful if they would spend [this time] in studying philosophy again and in understanding a text of Aristotle, than if perhaps they had previously devoted their attention most diligently in this same study. For, age itself offers more judgment, and the study of theology both sharpens and stimulates talent in a wonderful way. Moreover, it seems to be more proper to the Society for the glory of our Lord, that our scholastics make progress in studies to the greatest extent as can occur, especially by using the same time and effort.

Third. During this time, they [the students] can also be in charge of philosophy repetitions at home, and by this labor lighten the load of the [philosophy] teachers, who otherwise would now have even a heavier burden than before. In this way, this [proposal] will be a great asset.

Fourth. This [proposal] is far better accommodated by studying mathematics. For in school they [the students] have already heard about the first six books [of Euclid], so they can start studying from the seventh until the twelfth [book] inclusive; then [they can] add the spherical elements of Theodosius, and some topics from the Conics of Apollonius; this can easily enough be done in one year if they attend two lectures each day, which also should be done; then, also, during the four year period of theology, in the same way as the future teachers of grammar are given practice in domestic academies whenever there is nothing scheduled after the mid-day meal, so these [future mathematics teachers] also for an hour after the mid-day meal, at the same time [as the others], when the teaching has finished, should have classes in the theory of planets, gnomonics, the astrolabe, something from Archimedes and from algebra, with the material distributed as in a cycle (*orbs*), and thus will come to their teaching better instructed; this will be as an ornament and useful also for the remaining studies.

It is most proper that those especially be chosen who, other things being equal, are outstanding in talent, diligence, and in their liking for these [mathematical] sciences, and in the way of teaching to all others, but not those who will surpass others in agreeableness (*gratia*). And the judgment of these matters is to be sought in earnest from those who oversee them in these respects. For it sometimes happens that some, either because they are not thus inclined or because by nature they have not been made for this study, advance well enough in other subjects, but are ill-suited for mathematics.

This one thing is seen to present a difficulty to this practice: We need mathematics teachers (for whose training all this is to be done), yet we do not see from where we will be able to get those who will teach in the meantime, while those who will [eventually] teach mathematics complete their own studies. Truly this should not inhibit this [proposal]; this year there are theologians completing their studies among

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whom there are those who have never taught, and who willingly would study mathematics that others may teach, who are able to take their place in the meantime; and lest, while one is teaching, another uselessly wastes time, they [the students] can, in the meantime, revisit their own studies in the *Ordo Studiorum* and our Constitutions.

In the hand of Fr. Brunelli. Must be observed.

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