Archimedes 61 New Studies in the History and Philosophy of Science and Technology

Susanna Berger
Daniel Garber *Editors*

Teaching Philosophy in Early Modern Europe

Text and Image

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Archimedes

New Studies in the History and Philosophy of Science and Technology

Volume 61

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Teaching Philosophy in Early Modern Europe

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ISSN 1385-0180 ISSN 2215-0064 (electronic)
Archimedes
ISBN 978-3-030-84620-6 ISBN 978-3-030-84621-3 (eBook)
https://doi.org/10.1007/978-3-030-84621-3

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Acknowledgments

This book grew out of a conference held at Princeton University in 2015. We thank the speakers and our co-organizers Anthony Grafton, Jennifer Rampling, and Roger Ariew for their help in putting together this event. We also thank the Princeton Society of Fellows and the David A. Gardner '69 Magic Project Grant for their generous support. Finally, we are grateful to Jed Buchwald for his enthusiasm for this edited volume.

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Abbreviations

AT	René Descartes. 1964–1974. *Oeuvres...*, ed. C. Adam and P. Tannery, 2nd. ed. Paris: Vrin.
BGE	Bibliothèque de Genève
BL	British Library
BM	British Museum
BnF	Bibliothèque nationale de France
BRB	Bibliothèque royale de Belgique
BSG	Bibliothèque Sainte–Geneviève
CB	Pierre Bayle. 1999–2017. *Correspondance*, ed. Elisabeth Labrousse, Antony McKenna, et alia, vols. 1–15. Oxford: The Voltaire Foundation.
CSM	René Descartes. 1984–85. *The Philosophical Writings...*, vols. 1–2, trans. John Cottingham, Robert Stoothoff, and Dugald Murdoch. Cambridge, UK: Cambridge University Press.
CSMK	René Descartes. 1991. *The Philosophical Writings...*, vol. 3, trans. John Cottingham, Robert Stoothoff, Dugald Murdoch, and Anthony Kenny. Cambridge, UK: Cambridge University Press.
HAB	Herzog August Bibliothek
OD	Pierre Bayle. 1964–1968. *Oeuvres diverses*, vols. 1–4, ed. Elisabeth Labrousse. Hildesheim: Georg Olms Verlag.
PE	Eugene F. Rice Jr., ed., 1972. *The Prefatory Epistles of Jacques Lefèvre d'Étaples and Related Texts.* New York: Columbia University Press.

Chapter 1
Introduction

Susanna Berger and Daniel Garber

Philosophy was a central discipline in the early modern period. In the philosophy classroom in European universities, students learned how to reason and argue, how to think about morality and the greatest good, as well as physics and metaphysics, cosmology, biology, and the ultimate metaphysical categories of reality. Since virtually every educated European (at least the men) in the period went through this curriculum in logic, moral philosophy, natural philosophy, and metaphysics, no matter what they did afterward, understanding what was taught and how it was taught illuminates nearly every corner of literate culture in the period.

In particular, we believe that understanding how philosophy was taught is especially important for understanding the history of philosophy and the history of science in the period. In the sixteenth and seventeenth centuries, philosophy and what we now call science were part and parcel of the same cluster of knowledge, and were taught together in the universities. All of the thinkers of the period who are now standard figures taught in histories of philosophy, histories of science, and general intellectual histories, figures who make up the cultural legacy of early modern Europe, figures like Bacon (1617–1621), Descartes (1596–1650), Hobbes (1588–1679), Galileo (1564–1642), Leibniz (1646–1716) and Newton (1642–1727), all studied philosophy at school. How they learned and what they learned will certainly illuminate their thought for modern readers. Furthermore, one of the standard tropes among many of the figures whom we still read is their opposition to philosophy as taught at the universities. Descartes begins his famous *Discourse on the Method* with a satiric retelling of his days at school, and why he escaped as soon as

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S. Berger, D. Garber (eds.), *Teaching Philosophy in Early Modern Europe*, Archimedes 61, https://doi.org/10.1007/978-3-030-84621-3_1

he could; Hobbes's *Leviathan* is filled with diatribe against what students are taught at university, with a recommendation that they should be studying Hobbes's own writings instead. To understand what these figures were reacting against, to understand the way in which they thought that they were modern, we need to understand the experience of students in the early modern classroom. Moreover, some of the chapters that follow undermine and complicate the standard conception of a strict opposition to Aristotelian scholastic philosophy among the so-called new philosophers by showing how a number of anti-Aristotelian thinkers made use of Aristotelian argumentative tools and texts and by revealing how innovative, new ideas emerged within university settings typically dismissed by scholars then and now for their conservatism.

A number of disciplines have turned to the close examination of the teaching of philosophy in the period. Historians of art, visual culture, philosophy, and science have been researching how philosophy was taught and how students within the university were exposed to the new intellectual currents outside of the university.[1] *Teaching Philosophy* aims to build on emerging areas of scholarship, by exploring the roles of texts and images in teaching practices in philosophy in early modern Europe, with particular focus on France and Italy.

While the essays in this volume focus on the transmission of philosophy from a variety of different perspectives, there are some themes that we would like to emphasize. If Laurence Brockliss's *French Higher Education in the Seventeenth and Eighteenth Centuries. A Cultural History* (1987) can still be cited today as by far the most valuable synthetic account of French academic culture in the early modern period, the book's description of the role of visual representations in the pedagogical experience of French University students leaves something to be desired.[2] Brockliss writes,

> Teaching-aids were few and far between. From the beginning of the period it was customary to hang a map of the world on the door of the rhetoric classroom, but the practice did not become commonplace in the lower classes until the eighteenth century. It was only then too that a blackboard and chalk began to appear. For most of the period, the stone walls were left bare and covered with whitewash.[3]

Research in the histories of science, philosophy, and visual and material culture has started to call into question such perfunctory dismissals of visual aids in early modern University culture. In particular, scholars have explored images—from frescoes to oil paintings to prints and drawings—pertaining to the ideas of the so-called new philosophers, such as Galileo or Newton.[4] Yet the functions of images in the transmission and generation of ideas pertaining to Aristotelian philosophy is only just

[1] See, for instance, Blair 1993; eadem 1997; eadem 2010a; Ariew and Grene 1997; Brockliss 1981a; idem 1981b; idem 1987; idem 1990; idem 2006; Garber 1988; and Schmutz 2008.

[2] For such an assessment of Brockliss's book, see Schmutz 2008, 366.

[3] Brockliss 1987, 56.

[4] See, for instance, Reeves 1997; Bredekamp 1999; Freedberg 2002; Smith 2004; and Feingold 2004.

beginning to be examined.[5] More work remains to be done on both Aristotelian and anti-Aristotelian documents related to university culture in such forms as illustrated broadsides and thesis prints, manuscript lecture notebooks, *alba amicorum* (friendship albums), and printed books.[6] We would like to emphasize that the observation and generation of visual representations were important tools of philosophical thinking and instruction. Some of the chapters in the book uncover the relative merits of texts and images in the communication of philosophical ideas and show how both often worked in tandem to convey knowledge to students or to generate novel interpretations.

Furthermore, a number of the chapters that follow can be situated within a new area of cultural history that has developed over the last twenty to thirty years that investigates knowledge institutions and aims to understand how information has been structured and handled in earlier times.[7] Scholars have explored how collections and pedagogical aids functioned to organize the "information explosion" that historians have argued that Europeans were subject to from around 1550 to 1750 and whose sources have been tied to the growing number of printed books, world exploration and the finding of territories previously unknown to Europeans, the rediscovery of ancient texts, and an intense passion for the assembling of information.[8] This volume introduces visual analogs to textual modes of managing information that were used by Aristotelian and anti-Aristotelian scholars and students in the period. These could take the forms of, for instance, tables, dichotomies, or maps of philosophical knowledge. Moreover, just as cultural historians today are interested in how information and knowledge has been organized in the past, the chapters that follow reveal that early modern thinkers and educators themselves grew increasingly self-aware about the ways in which they were transmitting, gathering, and generating observations and insights. This heightened self-criticality and concern with didactic method is manifest from, for example, early modern reflections on the benefits and dangers of ingenuity as well as from an increased focus on the form of such pedagogical materials as philosophical textbooks and broadsides.

Chapters 2 and 3 center on the university textbook, a genre that Charles B. Schmitt helped to call to scholars' attention in an important essay published in 1988 in *The Cambridge History of Renaissance Philosophy*.[9] The term "textbook" is modern and may be understood as a book designed for employment in classrooms; a

[5] Berger 2017; and Vanpaemel et al. 2012.

[6] For sources on illustrated thesis prints, see Gieben 1993, 273–74 n. 2; and Rice 1999, 165 n. 1. On frontispieces, see Corbett and Lightbown 1979; and Remmert 2005. On images in student notebooks, see Vanpaemel et al. 2012. For important studies of images, texts, and instruments as vehicles through which knowledge was disseminated in early modern Europe, see Kusukawa and Maclean 2006.

[7] On information history, see Grafton 2010, 95–101; Burke 2000; and Blair 2003, 11–28. See the "Cultures of Knowledge" project at Oxford University: http://www.culturesofknowledge.org.

[8] Blair 2010b, 11.

[9] Schmitt 1988.

distinguishing characteristic of the textbook is its tendency to summarize.[10] In his essay, Richard J. Oosterhoff observes that Jacques Lefèvre d'Étaples's deepest impact on the history of thought in early modern Europe was through his textbooks that thousands of students used during their undergraduate education. The textbooks produced by d'Étaples (c. 1455–1536) and his circle were an early example of this genre to appear in print and, surprisingly, even such university critics as Thomas More (1478–1535) praised them; in accentuating the popularity of university textbooks in humanist circles, Oosterhoff counters standard oppositions between university and humanist cultures. Visual thinking infuses the textbooks of d'Étaples and his circle; the books feature inventive typography and a range of visual representations, from diagrams to tables. In his analysis Oosterhoff challenges Walter Ong's seminal assessment of the textbooks as works that hindered free thought and led to "the decay of dialogue"; to the contrary, Oosterhoff demonstrates how the textbooks' visual and material forms aimed to generate active thought.[11] Moreover, he reveals that their employment of dialogue elevated students as knowledge sources. He specifies that the textbooks promoted promising students as "ingenuous" individuals; that is to say such students were characterized by open natures and a readiness for serious studies, without relying on the privilege of noble birth.

Roger Ariew's chapter examines the popular philosophy textbook by Eustachius a Sancto Paulo (1573–1640) that drew admiration from both Descartes and Leibniz. In addition to discussing Eustachius's work, Ariew traces the rise and decline of synoptic tables in scholastic and Cartesian textbooks and posits that the inclination and subsequent disinclination for these schemas mirrored transformations in scholastic textbooks over the course of the seventeenth century more generally. Ariew ties the popularity of tables in the early 1600s to the abandonment of the commentary tradition; he argues that tables, which enable observers to see "at a glance" how topics pertain to one another, filled the void left by commentaries that had cited where particular subjects are discussed in longer texts. Ariew contends that the decline of the synoptic table towards the end of the seventeenth century advertised the rise of a new type of Cartesian textbook.

Whereas the chapters of Ariew and Oosterhoff explore summations of knowledge offered via textbooks, Susanna Berger's contribution considers summations of knowledge presented in philosophical broadsides. In particular, Berger examines broadsides designed by Martin Meurisse (1584–1644) and Jean Chéron (1596–1673) in collaboration with the engraver Léonard Gaultier (1560/61–1635) and the publisher Jean Messager (1572–1649). The prints of Meurisse, Chéron, Gaultier, and Messager feature an innovative combination of word and image that encourages visual thinking among their observers: Not only do the broadsides use the space of the page to chart theoretical relationships, but they also offer visual commentaries that enrich philosophical concepts.[12] These broadsides were employed as thesis

[10] Schmitt 1988, 792–804 (792).

[11] Ong 1983.

[12] Concerning visual thinking in philosophical broadsides, see Berger 2017.

prints for use in public examinations called disputations. In her chapter, Berger reflects on the ways in which these engravings relate to printed maps produced in this period. She argues that like maps, these philosophical engravings fabricate understandings of a field through the selective presentations of topics and a range of descriptive mechanisms that enhance the observer's comprehension, while advertising and advancing particular political interests. Her chapter includes a close analysis of a previously undiscussed section of a broadside summarizing natural philosophy and concludes with a consideration of the ways in which philosophical broadsides visualize the dangers of traveling beyond the known boundaries of learning.

In the chapter by Dominco Collaciani and Sophie Roux, we turn to another kind of pedagogical text, the thesis booklet, which like the thesis print was employed in disputations. Their chapter offers a close analysis of the mathematical thesis booklets defended at the Jesuit college in Paris, the Collège de Clermont between 1637 and 1682. Because the Jesuit *Ratio Studiorum* placed much more severe restrictions on the philosophy curriculum than on the mathematical, the mathematical theses ranged over a much wider variety of material than the philosophical theses did, and ventured into the consideration of issues then under discussion in the wider intellectual community, including Copernicanism and Cartesianism. Collaciani and Roux focus on the treatment of optics in these thesis booklets. They show the way in which the thesis booklets put themselves into the dialogue between Aristotelian ideas of sense perception and some of the newer theories then under debate, including Cartesian theories. They also emphasize the way in which optical experience and optical devices are reflected in the many engravings found in the thesis booklets, bringing these visual tools and experiments into the theses and into the classroom. And finally, they show the evolving attitudes toward Descartes, as he moves from one among many *novatores* in the beginning of the period studied to a central but somewhat dangerous figure by the end.

Raphaële Garrod's chapter offers a close analysis of an emblem on ingenuity from Antoine de Bourgogne's emblem book *Mundi lapis lydius...* (*Compass of the World*, 1639), which was owned by the library of the Jesuit College of La Flèche, Descartes's *alma mater*. Emblems consisted of three components: a motto (*inscriptio*), an image (*pictura*), and an epigram in prose or verse offering an explanation (*subscriptio*).[13] Insofar as they juxtapose word and image, emblems exemplify the early modern fascination with combining visual and textual modes of thinking. In de Bourgogne's emblem on ingenuity, text and image work in tandem to encapsulate an ambivalent attitude towards this notion that, Garrod argues, was prevalent in Jesuit culture at large. On the one hand, the emblem presents a condemnation of extreme ingenuity as excessive subtlety and on the other, it celebrates ingenuity as a stylistic, witty performance.

[13] For a bibliography of emblem books, see Praz 1975. The literature on emblems is vast and growing; see, for instance, Saunders 2000; and eadem 1999–2002.

The next two chapters center on the teaching practices of particular philosophy professors: the focus of Chap. 7 is Calvinist professor Jean-Robert Chouet (1642–1731) and that of Chap. 8 is Pierre Bayle (1647–1706), a French Calvinist philosopher and the author of a seminal biographical dictionary. Ann Blair and Anja-Silvia Goeing's contribution studies eight student manuscripts produced between 1667 and 1685 from physics classes taught by Chouet, whose instruction the authors speculate was representative of philosophy pedagogy at the time more generally. Blair and Goeing consider what the manuscripts show concerning shifts and continuities over the course of Chouet's teaching career. Although the authors observe that explanatory images are not central to Chouet's physics teaching, they argue that the manuscripts evince a concern with visual modes of ordering information: Not only do they contain such forms identified with printed books as title pages, tables of contents, and alphabetical indices, but the students also emphasized distinct parts of the lectures by varying the size and thickness of letterings and through the inclusion of blank spaces.

Martine Pécharman turns to the instruction of Bayle at the protestant Academy of Sedan from 1675 through 1681. Although visual representation played an important part in much philosophical teaching of the early modern period, it certainly was not central to all philosophical instruction—it plays, for instance, no role in Pécharman's discussion of Bayle's pedagogical practice. In her chapter, Pécharman examines Bayle's philosophy course in terms of its relationship to Bayle's later philosophical development, but also and especially in its own right. As she reveals, Bayle manipulates the argumentative instruments of scholastic dialectic in order to defend anti-Aristotelian ideas in physics. Bayle is not alone in deploying this stratagem: Hobbes, although not an Aristotelian, made use of Aristotelian concepts to promote his anti-Aristotelian ideas.[14] Perhaps both Bayle and Hobbes adopted this rhetorical move from Quintilian, who notes: "It is sometimes also possible to take some remark or action of ... your opponent or your opponent's advocate in order to strengthen your point."[15] For Bayle, moreover, a knowledge of Aristotelian logic was a precondition to championing the ideas of the new philosophers.

Chapters 9 and 10 move to philosophical instruction in Italy. In her essay, Renée Raphael studies teaching notes and published philosophy courses to expose the ways in which experiments were presented to students during the second half of the seventeenth century at the Collegio Romano. Here, as well, images play a relatively minor role; Raphael observes that it was common to find compendia pertaining to natural philosophy instruction at the Collegio without any illustrations, although some textbooks from the late seventeenth century featured visual representations of the world systems and Raphael discusses a number of sketches. In her chapter, Raphael presents a slew of different descriptions of experiments from pedagogical texts that feature a ranging degree of textual and visual details. Because most professors did not present sufficient information for students to recreate the

[14] Berger 2017, chapter 5.

[15] Quintillian 2014, vol. 2, Book 5, chapter 11, 455.

experiments, Raphael concludes that it is improbable that the descriptions of experiments in the courses functioned either as accounts of experiments professors had themselves witnessed or as stimuli for the students' own experimental practice. She establishes that insofar as professors did include some textual particulars and visual representations of experimental practices and tools, they did so in order to demonstrate their own expertise as readers of the most up-to-date literature.

Although visual representations play a relatively minor role in the discussions of teaching practices in the chapters by Pécharman and Raphael, they are at the core of Alexander Marr's contribution. Here, Marr presents a drawing made in Rome by the French artist Simon Vouet (1590–1649) as well as an engraving made after the drawing by Johannes Tröschel (1585–1628), a printmaker from Nuremberg; the images show eight satyrs debating around a table that displays an anamorphosis of an elephant. Marr speculates that the design was originally intended to function as the upper half of a thesis print. He maintains that it should be interpreted as a Christian allegory of the "virtue of knowledge." Marr's chapter builds on Garrod's considerations of ingenuity in relation to early modern pedagogical culture, insofar as he posits that the image celebrates a "collective ingenuity" that was typical of philosophical endeavors and creativity in the visual arts in the courtly culture of early modern Italy.

Teaching Philosophy breaks new ground in a number of ways. Firstly, it seeks to bring text-based scholars in the history of philosophy together with social and cultural historians to examine the interaction between tradition and innovation in the early modern classroom, the site where traditional views of the world were transmitted to the generation that was to give birth to modern philosophy and science. Secondly, it draws together scholars who are centered on ideas and words with other scholars who focus on the role of images in the classroom and the intellectual world in this central period of history. We hope that it will advance our comprehension of how philosophy was understood and transmitted in this rich and crucial era. In this way we hope to enrich our grasp of an important aspect of the background to the emergence of modern thought in one of the most fertile periods of European intellectual history.

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Chapter 2
The Dialogue of Ingenuous Students: Early Printed Textbooks at Paris

Richard J. Oosterhoff

Abstract Dialogues and the "dialogic" often hold a privileged place in accounts of the Renaissance and early modern learning. University textbooks therefore are presented as a site of social control, imposing fixed formulas rather than stimulating independent judgment. This essay shows how the program of printed textbooks by the Renaissance Paris arts master Jacques Lefèvre d'Étaples (c. 1455–1536) and his circle were intended to support dynamic mental habits, in which students were expected to embody real knowledge. These university textbooks respond not only to a humanist fashion for dialogue, but also to a medieval tradition of "outsider" knowledge which sought to ensure that university habits answered broader social needs. This matters for understanding early modern universities, because Lefèvre's deepest influence on early modern intellectual culture was less on high humanist polemic and more on the thousands of students who used his textbooks as their path through the BA cursus, and on those writers who modelled their textbooks on his.

Keywords Dialogue · Lefèvre d'Étaples · Textbooks · Typography · Print · Virtue · Character difficulty · Labour · Genius · Ingenuous

In 1512 an anonymous scholar updated the "who's who" of European scholarship, the *De scriptoribus ecclesiasticis* (*On Writers of the Church*) of Trithemius, adding the name Jacques Lefèvre d'Étaples (c. 1455–1536).[1] The editor was probably French, since the expanded edition was printed in Paris and his additions mostly were of French authors. Jacques Lefèvre d'Étaples headed the list. He was the Paris humanist whose *Quincuplex Psalterium* (*Five-Fold Psalter*) (1509) and *Epistolae Sancti Pauli* (*Letters of Saint Paul*) (1512) were setting new standards in biblical scholarship. In 1512 Lefèvre was already a gray eminence, and younger humanists

[1] Trithemius 1512.

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S. Berger, D. Garber (eds.), *Teaching Philosophy in Early Modern Europe*, Archimedes 61, https://doi.org/10.1007/978-3-030-84621-3_2

such as Erasmus of Rotterdam challenged Lefèvre's authority in order to establish their own.[2] Most famously, in 1517 Erasmus would contest Lefèvre's reading of the New Testament letter to the Hebrews, suggesting that Lefèvre's scholarship was impaired by an imperfect mastery of Greek.[3] A measure of Lefèvre's stature in biblical scholarship was Francis I's slip in conversation with the great Greek scholar Guillaume Budé, mistaking Lefèvre for Erasmus.[4]

This is the image of Lefèvre, the "prince of French humanism," that Renaissance historians usually repeat. In *De scriptoribus ecclesiasticis*, however, Lefèvre was primarily praised as the "single glory of all France" (*totius Galliae unicum decus*) for his accomplishments as a writer of textbooks for the arts curriculum. Pseudo-Trithemius listed various introductions to Aristotelian logic, ethics, natural philosophy, and metaphysics. Another third of the list included books on arithmetic, music, and astronomy, Lefèvre's contribution to the mathematical arts of the quadrivium.[5] It was to these books that Thomas More urged students to go, instead of miring themselves in the sophisms of older textbooks.[6] Close study of book purchases in sixteenth-century Oxford and Cambridge show that these textbooks represented the new curriculum introduced by educational reformers.[7] These were republished repeatedly in Paris, and then excerpted and imitated by figures such as Symphorien Champier, Hieronymus Gebwiler, Matthias Ringmann, Pedro Ciruelo and by publishers in cities as different as Cologne, Alcalá, and Venice.[8] I would suggest that Lefèvre's deepest influence on early modern intellectual culture was less on high humanist polemic and more on the thousands of students who used his textbooks as their path through the BA cursus.

Lefèvre and his circle's textbook project was influential partly due to precedence—their textbook project, beginning in the 1490s, was among the first to reconfigure the whole arts curriculum using the new technology of print.[9] It was also distinctive in character. Despite being inextricable from the university, these books captured the admiration of university critics. As More's letter to Dorp makes clear, these textbooks were seen as an alternative to sterile formalism. Lefèvre was seen as a more direct route to real knowledge, one that would not ensnare students in intellectual folly—"supersophistical trifles," as More called them.

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[2] In 1501 Lefèvre noted that his student Charles de Bovelles was twenty, and that he was twice that age. On dating, see the comments and bibliography in Rice 1972, XIn1. Basic bibliography includes Renaudet 1953; Bedouelle 1976.

[3] This debate is recounted in Mann 1934 and most recently Schönau 2020.

[4] Bedouelle 1995, 23–42.

[5] Trithemius 1512, 215^{v}–16^{r}.

[6] More 1986, vol. 15, 22–23.

[7] Hannam 2007. On the curricular pressures of the sixteenth century: Curtis 1959; McConica 1979, 291–317.

[8] A near-complete bibliography of textbooks and editions by Lefèvre is in Rice 1972, 535–568. See also Lohr 1988, 138–142.

[9] I pursue this argument in more detail in Oosterhoff 2018, chap. 4. The delayed uptake of print for core textbooks is described by Corsten 1987, 83–123.

In what follows I will focus on dialogues in this body of texts. Dialogues and the "dialogic" often hold a privileged place in accounts of the Renaissance and early modern learning.[10] Even those who find the specifics of Mikhail Bakhtin's "dialogic imagination" overstated, nevertheless privilege dialogue as a space for dissent or democratic openness.[11] Early universities are usually associated with the hierarchies of scholasticism. University textbooks therefore are presented as a site of social control, imposing fixed formulas rather than stimulating independent judgment. As one instance, Walter Ong saw early modern print especially as a deathly force against dialogue, rendering philosophical textbooks as stolid structures of static reason.[12] My argument shall push in another direction. First I will outline Lefèvre and his circle's program of printed textbooks, and suggest that their visual and material structures were intended to support dynamic mental habits. Then I will show that their use of dialogue was motivated quite deliberately by a specific set of social ideals, in which students were expected to be a source of real knowledge. Finally, in the last section I will suggest how these university textbooks respond not only to a humanist fashion for dialogue, but to a medieval tradition of "outsider" knowledge which sought to ensure that university habits answered broader social needs.

2.1 Movement of Mind and Page

By the time the Parisian redactor of Trithemius wrote in 1512, an entire generation of students at the Collège du Cardinal Lemoine would have been able to survey the whole arts cursus from textbooks written by Lefèvre, Clichtove, and other regents in the Paris college. These books included epitomes, introductions, paraphrases, commentaries and dialogues that seem roughly indexed according to the three years of the BA *cursus*, capped with a study of moral philosophy for licentiates preparing to take the MA. It is not entirely clear in what order these books were written, and they probably first circulated in manuscript within the college community. We can see this in Lefèvre's first printed publication of 1492, his *Paraphrases philosophiae naturalis* (*Paraphrases on Natural Philosophy*). But later letters show that Lefèvre considered his dialogues on metaphysics, though printed first in 1494, to have already been published in 1490, evidently in manuscript.[13] Indeed, many of Lefèvre's shorter epitomes, introductions, and dialogues may have originated as manuscript helps.[14] Their uncertain status in the 1490s suggest how experimental print was within university education of that decade.

[10] The topic has exploded since Hirzel 1895. Most relevant are Marsh 1980; Cox 1992; Hösle 2012; Traninger 2012.

[11] E.g. Goldhill 2008. The classic work is Bakhtin 1981.

[12] Ong 1958.

[13] Lefèvre mentions the date of composition in his edition *Aristotelis castigatissime recognitum opus metaphysicum*, 1515, 125^{r} (Rice 1972, 22).

[14] On this evidence, see Oosterhoff 2018, 87–95.

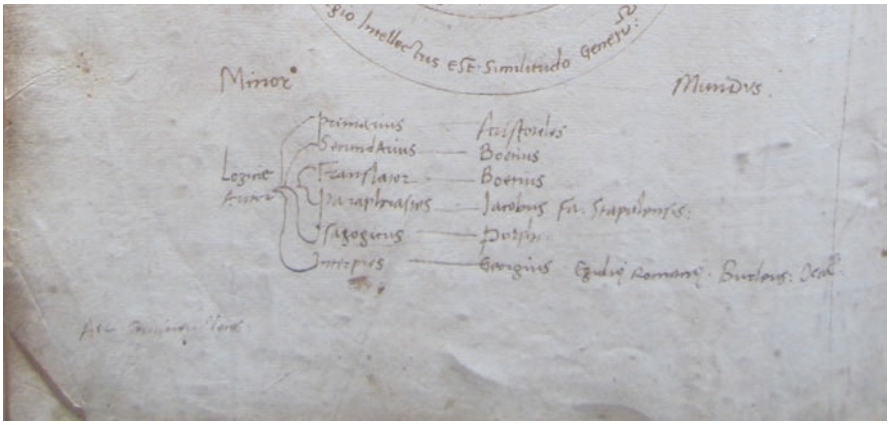

Fig. 2.1 Notes on the hierarchy of authors, by Beatus Rhenanus at the Collège du Cardinal Lemoine sometime between 1503 and 1507. Lefèvre, *Libri logicorum* (*Books of Logic*) (Paris: Hopyl and Estienne, 1503), Bibliothèque humaniste de Sélestat, K 1047, guard page, detail. (By kind permission of the Maire de Sélestat)

A student-driven manuscript circulation helps explain the goal of the most popular of Lefèvre's books, his brief "arts" or "introductions." They aimed not to replace Aristotle's own texts, but instead to facilitate access to them. This is especially clear for logic. Lefèvre's printed *introductio* to logic (1496) offered these as a kind of primer, which would help students avoid entanglement in the abstruse technicalities of the highly developed school logic that had become the staple of first-year university training in the fourteenth and fifteenth centuries. He advised tarrying only long enough to gain a sense of the terrain, "for it is enough to have touched on these things in passing (like scouts passing through enemy lines)."[15] The point of an introduction was to give just enough familiarity that one might successfully pass through the *cursus*, to give the more reliable authorities themselves the attention they deserved. Beatus Rhenanus, writing in 1503, annotated his copy of Lefèvre's logical textbook with a hierarchy of various authorities: Lefèvre was the paraphraste, positioned above mere commentators (*interpretes*) and below Aristotle himself (Fig. 2.1).

Such an ideal of knowledge shaped the structure and use of textbooks. To be sure, this was an intellectualist account of knowledge that privileged mental abstractions. Aristotle was the most prized authority because he offered the most resources for the sapiential vision of learning that Lefèvre taught. In his dialogues introducing the *Metaphysics* Lefèvre presented an account of wisdom that was encyclopaedic in scope: the student could become wise by gathering within himself the universal

[15] Lefèvre 1496b, sig. a1^{v} (Rice 1972, 39): "Satis enim est ea vel in transcursu (velut qui exploratores hostile agmen transcurrunt) attigisse."

statements of each knowledge domain.[16] Knowledge was properly a knowledge of essences or universals. At one point, Lefèvre described a kind of "hidden analogy" which underlay the whole of Aristotle's natural philosophy.[17] By this Lefèvre suggested that all the many modes of learning—whether lone propositions, broader paraphrases of arguments, or worried and developed in dialogues—could be distilled to essential propositions. Learning aimed to develop intellectual vision above all else.

It would be a mistake, however, to dismiss this intellectualist account of learning as therefore uninterested in the humbler everyday elements of teaching and learning, its practices, materiality, and visuality. Those historians who have studied these books have remarked upon the innovative typography and array of diagrams, tables, and visual aids that distinguish them.[18] The self-conscious attention to genre—paraphrases, dialogues, and so on—also reveals a sustained attention to the role of the senses and habits in helping student to learn. An Aristotelian account of the virtues, in which knowledge was a habitus, acquired through long, embodied habituation, reinforced the value of the entire structure of practice.[19] Thus the hierarchy of knowledge made it necessary to attend to details of textbooks, genre, and student habits. The goal of an *ars* or *introductio* was to make accessible the structure of more basic disciplines, so that students could rapidly acquire the habitus needed for ever higher learning.

For these reasons, Lefèvre and his students set special emphasis on mathematics. It was not that mathematics was the highest domain of study; in at least one place, Lefèvre set mathematical philosophy in itself on the lowest conceptual rung.[20] But precisely for that reason he set mathematics in the formative first year of the curriculum—unusually, at Paris—complaining that it had been a subject long overlooked within the university. Whereas medieval and Renaissance universities had always first set a student to logic in their first year, under Lefèvre's influence students began with mathematical learning.[21] This new profile of mathematics can be seen in the

[16] I offer a reading of this in Oosterhoff 2019, 73–95 (85–88). For more on metaphysics this context, see e.g. Faye and Hirstein 2002.

[17] Lefèvre 1492, sig. b2^{r}: "Id insuper te latere non debet per totam Aristotelis philosophiam abditam latentemque esse quandam secretam Analogiam perinde atque per totum corpus sparsus fususque tactus est [cf. Cicero, *De natura deorum* II.56]."

[18] E.g. Klinger-Dollé 2016.

[19] This is made explicit in Lefèvre and Clichtove 1502a. See Oosterhoff 2018, 47–55, and Kraye 1995, 96–117.

[20] Lefèvre 1515, 1^{v} (PE 356). "Infimum mathematicum, ut quod de accidente sit; post quod ascendendo naturale ac physicum, ut quod de substantia est, sed mobili ac media. Post physicum vero sursum vergendo solum restat divinum philosophiae genus, ut quod de substantia, sed non mobili ac media verum…." (The lowest is mathematical philosophy, for its object is accident. Next is physical philosophy, whose object is substance, but mobile and median substance. We rise then to metaphysical philosophy, whose subjectis also substance, but immobile and wholly divine substance).

[21] I argue this from a study of Beatus Rhenanus' book purchases and annotations: see Oosterhoff 2018, 56–85 and Appendix.

suite of mathematical textbooks Lefèvre, Clichtove, and Charles de Bovelles published at Cardinal Lemoine. Mathematics here was not valuable as an end in itself, but as a foundation that served to correct the usual logical shaping of student intuitions and reasoning habits.

Lefèvre and those around him therefore found mathematics a good model for mastering the disciplines in general. Learning should begin with internalizing first principles or axioms.[22] This is clearest in his early mathematical textbooks of the 1490s, which follow the usual convention of using page layout to set off axioms or "elements" as the main text. Proofs and demonstrations were, in medieval mathematics, often treated as commentaries—easily modified or replaced by later writers.[23] Lefèvre, for instance, produced an edition of Jordanus' *Elementa Arithmetica* (*Arithmetical Elements*) (1496) that replaced most of the original proofs with his own. In more his basic mathematical textbooks, he pushed this convention to an extreme, entirely omitting proofs. His widely popular *Epitome in libros arithmeticos Boetii* (*Summary of the Arithmetical Books of Boethius*) was simply a collection of propositions that flowed from a set of first principles or "elements."[24] This could be condensed even further. The entire handbook on arithmetic could fit on one page, in a table or *formula* that reduced the discipline to a hierarchy of terms (Fig. 2.2). The figure would allow readers, Lefèvre pointed out, to "fix" the entirety of the discipline in the mind, before then moving to definitions, properties, and lastly to demonstrations.[25]

Such cognitive tools for arranging the elements of an entire discipline on a page, whether as lists of terms or propositions, features in most of Lefèvre's introductions, extending the idea of elements well beyond mathematics.[26] In his first printed book, the *Paraphrases philosophiae naturalis* of 1492, Lefèvre already had prefaced the book with a similar *formula* (Fig. 2.3). Then he offered lists of theses and *conclusiones*, numbered and indexed to their positions within the discursive paraphrases and dialogues of natural philosophy to follow. Therefore, the narrative priority of axioms and enunciations was closely linked with the brevity of these introductory textbooks: they enabled a student to move back and forth between condensed proposition and expanded discourse, from the flash of an idea to the process of thinking it through.

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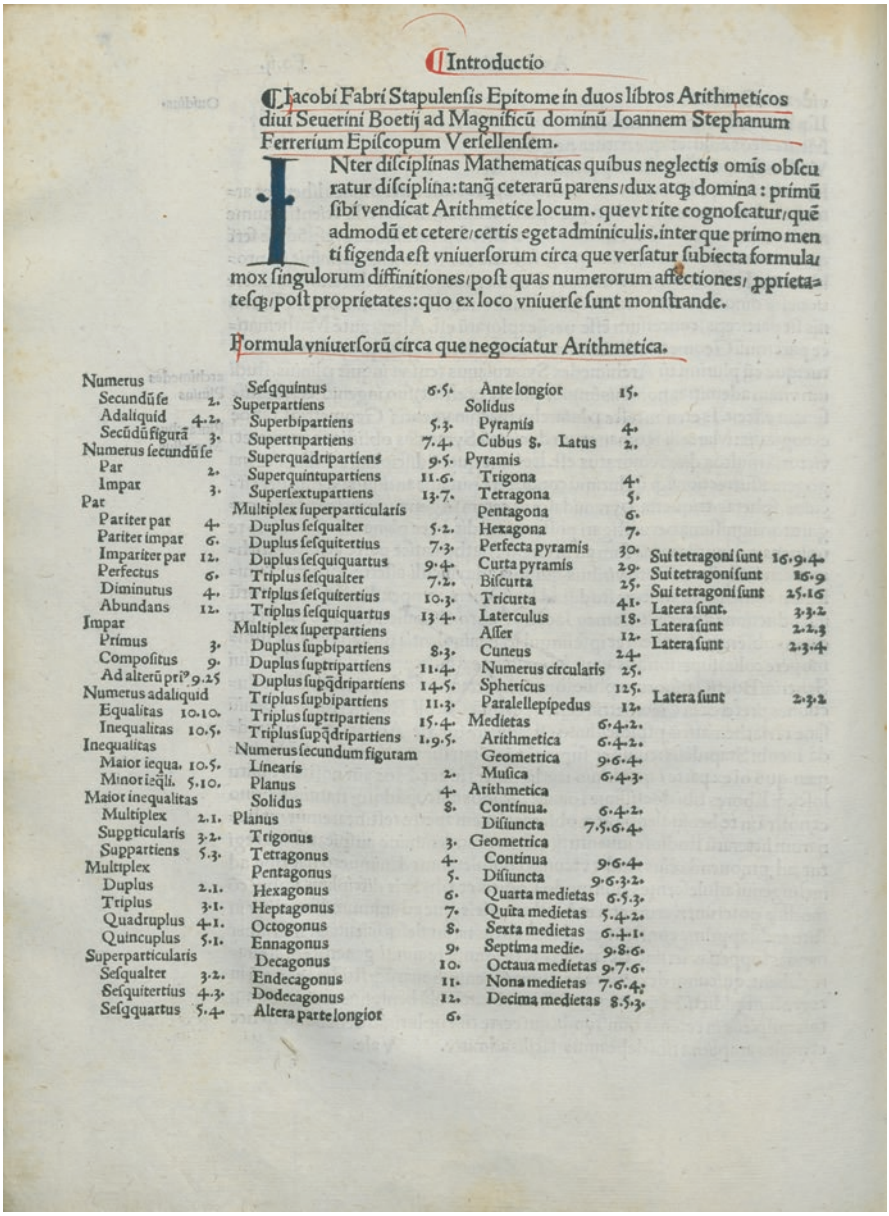
[22] Aristotle made a similar point several times: *Analytica priora* 46a3–27; *Analytica posteriora* I.7 (71b19–25); *Metaphysica* I.2 (982b11–28); see also 1000a6–10, 1000b21–1001a3, 1060a27–36, 1075b13–14. On the broader commitment to this approach, see Oosterhoff 2014, 1–19; idem 2018, 106–11.

[23] Goulding 2010, 151–54.

[24] Lefèvre 1496a. Later introductions to geometry and perspective published with Lefèvre's *Epitome* follow the same format: Lefèvre, Clichtove, and Bovelles 1503.

[25] Lefèvre 1496a, sig. b9^{r}: "primum sibi vendicat arithmetice locum que ut rite cognoscatur quemadmodum et cetere certis eget adminiculis inter que primo menti figenda est universorum circa que versatur subiecta formula, mox singulorum diffinitiones, post quas numerorum affectiones proprietatesque, post proprietates quo ex loco universe sunt monstrande."

[26] On the language of "elementating", see Oosterhoff 2018, 106–11, 117; Zepeda 2015, 48–76.



Introductio

Iacobi Fabri Stapulensis Epitome in duos libros Arithmeticos diui Seuerini Boetij ad Magnificū dominū Ioannem Stephanum Ferrerium Episcopum Vercellensem.

INter disciplinas Mathematicas quibus neglectis omis obscuratur disciplina: tanq̄ ceterarū parens/dux atq; domina: primū sibi vendicat Arithmetice locum. quevt rite cognoscatur/quē admodū et cetere/certis eget adminiculis. inter que primo menti figenda est vniuersorum circa que versatur subiecta formula/ mox singulorum diffinitiones/post quas numerorum affectiones/ pprietates q̄/post proprietates: quo ex loco vniuerse sunt monstrande.

Formula vniuersorū circa que negociatur Arithmetica.

Numerus
Secundū se 2.
Aduliquid 4.2.
Secūdū figurā 3.
Numerus secundū se
Par 2.
Impar 3.
Par
Pariter pat 4.
Pariter impar 6.
Impariter par 12.
Perfectus 6.
Diminutus 4.
Abundans 12.
Impar
Primus 3.
Compositus 9.
Ad alterū pri⁹ 9.25
Numerus adaliquid
Equalitas 10.10.
Inequalitas 10.5.
Inequalitas
Maior iequa. 10.5.
Minor iēq̄li. 5.10.
Maior inequalitas
Multiplex 2.1.
Suppticularis 3.2.
Suppartiens 5.3.
Multiplex
Duplus 2.1.
Triplus 3.1.
Quadruplus 4.1.
Quincuplus 5.1.
Superparticularis
Sesqualter 3.2.
Sesquitertius 4.3.
Sesqquartus 5.4.
Sesqquintus 6.5.
Superpartiens
Superbipartiens 5.3.
Supertripartiens 7.4.
Superquadripartiens 9.5.
Superquintupartiens 11.6.
Supersextupartiens 13.7.
Multiplex superparticularis
Duplus sesqualter 5.2.
Duplus sesquitertius 7.3.
Duplus sesquiquartus 9.4.
Triplus sesqualter 7.2.
Triplus sesquitertius 10.3.
Triplus sesquiquartus 13.4.
Multiplex superpartiens
Duplus supbipartiens 8.3.
Duplus suptripartiens 11.4.
Duplus supq̄dripartiens 14.5.
Triplus supbipartiens 11.3.
Triplus suptripartiens 15.4.
Triplus supq̄dripartiens 19.5.
Numerus secundum figuram
Linearis 2.
Planus 4.
Solidus 8.
Planus
Trigonus 3.
Tetragonus 4.
Pentagonus 5.
Hexagonus 6.
Heptagonus 7.
Octogonus 8.
Ennagonus 9.
Decagonus 10.
Endecagonus 11.
Dodecagonus 12.
Altera parte longior 6.
Ante longior 15.
Solidus
Pyramis 4.
Cubus ſ. Latus 2.
Pyramis
Trigona 4.
Tetragona 5.
Pentagona 6.
Hexagona 7.
Perfecta pyramis 30.
Curta pyramis 29.
Biscurta 25.
Tricurta 41.
Laterculus 18.
Asser 12.
Cuneus 24.
Numerus circularis 25.
Sphericus 125.
Paralellepipedus 12.
Medietas 6.4.2.
Arithmetica 6.4.2.
Geometrica 9.6.4.
Musica 6.4.3.
Arithmetica
Continua. 6.4.2.
Disiuncta 7.5.6.4.
Geometrica
Continua 9.6.4.
Disiuncta 9.6.3.2.
Quarta medietas 6.5.3.
Quīta medietas 5.4.2.
Sexta medietas 6.4.1.
Septima medie. 9.8.6.
Octaua medietas 9.7.6.
Nona medietas 7.6.4.
Decima medietas 8.5.3.
Sui tetragoni sunt 16.9.4.
Sui tetragoni sunt 16.9
Sui tetragoni sunt 25.16
Latera sunt. 3.3.2
Latera sunt 2.2.3
Latera sunt 2.3.4
Latera sunt 2.3.2

Fig. 2.2 The table (*formula*) introducing an epitome of Boethian arithmetic, first published with Lefèvre, *Elementa arithmetica, etc*. (1496), h8r; here from Lefèvre, Clichtove, and Bovelles, *Epitome compendiosaque introductio in libros arithmeticos* (1503). ETH-Bibliothek Zürich, Rar 230, https://doi.org/10.3931/e-rara-30983 / Public Domain Mark

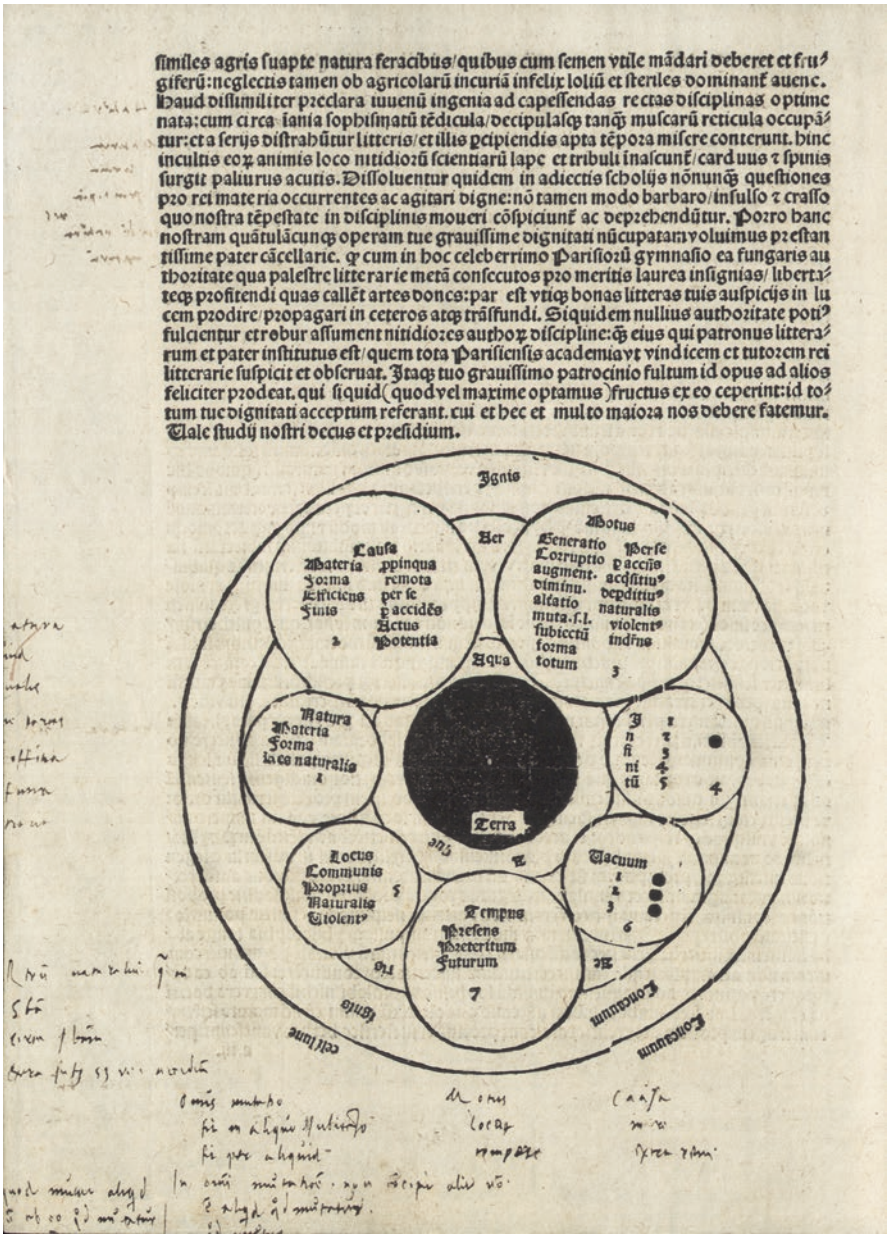


Fig. 2.3 The diagram introducing Lefèvre's *Paraphrases philosophiae naturalis*, first published 1492, b2r; here from Lefèvre and Clichtove, *Totius philosophie naturalis paraphrases* (*Paraphases on the Whole of Natural Philosophy*), *commentariis adiectis* (Paris: Henri Estienne [I], 1510). ETH-Bibliothek Zürich, Rar 6491, https://doi.org/10.3931/e-rara-25809 / Public Domain Mark

In use, these formal arrangements of ideas in space are not static but kinetic. In the same way that a mathematical proof and diagram coax their reader through a persuasive motion, towards the habitus of knowledge, these textbooks endeavour to help students perform the mental motions that belong to each discipline.[27] Visually, the Fabrist diagrams belong at the front edge of the sixteenth-century explosion of schematic representations of the disciplines.[28] Walter Ong famously associated such visual schemes with fixed knowledge and the decay of dialogue.[29] But the Fabrist textbooks invite the opposite response, aiming to stimulate the to-and-fro that belongs to dialogue.

2.2 Dialogues and the Ingenuous Student

The dialogues of Lefèvre also set in motion the sociability these textbooks were intended to support. The *Easy Dialogue on Physics* (1492) opens with a businessman putting his young son into the care of two teachers. The boy's first task is to read a book of "introductory physics" while his new masters take a short walk. After the boy has had a chance to examine the basic concepts, they review by pointing to a diagram in a book. In fact, the diagram turns out to be the very figure that introduces the volume in which the dialogue appears: the masters ask the boy to explain the concepts he has reviewed—nature, cause, motion, place, vacuum, and so on—and the dialogue then uses his answers and questions to direct the course of the lesson in Aristotelian physics. The mise-en-abîme suggests the mnemonic and dialogic function Lefèvre intended his *introductiones* to fulfill. I shall also suggest that, Lefèvre used dialogues to frame the character of the good student as open, ingenuous.

Lefèvre often used dialogue. Besides the two on physics, I have already mentioned the two on metaphysics. There are more. Very occasionally, he incorporated short dialogic sections into his commentaries, as he did in a page on Porphyry's *Isagoge*, entitled "Disceptatio de universali."[30] In his *De magia naturali*, published in manuscript during the mid-1490s, he included two books framed as dialogues between himself, his patron Jean de Ganay, and his student Josse Clichtove.[31] Admirers later incorporated Lefèvre as a voice in their own dialogues, such as those by Alain Varènes and Giulio Landi.[32] Pedro Ciruelo's brief dialogue on astronomy may have been modelled on Lefèvre's example—certainly he borrowed liberally

[27] Three arguments that this is the correct way to understand mathematical proofs: Mancosu 1996, Netz 1999, Wagner 2017.

[28] See especially Siegel 2009 and Berger 2017, references at 17–18.

[29] Ong 1958.

[30] Lefèvre 1503, 23^{v}.

[31] On these, see now Mandosio 2018.

[32] de Varennes 1512, Landi 1564.