Many eighteenth-century projectors believed in the potential of pedagogy, including its ability to improve lives and to radically reconfigure the structure of society. Despite an obvious inability to predict how effective their projects would be if implemented, those who managed to gain the support of state leaders very frequently peddled educational reform schemes they expected would generate real improvements, including heightened abilities to apprehend the quality of usefulness. This paper considers the relationship between pedagogy and expectations in a three-part reform project put forward by an early commercial advisor and projector named Paul Jacob Marperger (1656–1730). Keenly aware of the pedagogical dimensions of ongoing efforts to both generate useful knowledge and to cultivate skilled observers and makers of it, Marperger used his project to showcase his commitment to the incremental improvement of society via the creation of new training regimens for young people and adults. The paper studies how he linked his expectations to existing institutions, technologies and ongoing reform efforts, including new teaching methods and materials.

**Keywords:** projects; pedagogy; utility; cameralism; knowledge economy

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**INTRODUCTION**

A *Trifolium*, or clover leaf with three parts, is a special kind of herb that has been endowed with many applications and secrets. In the art of managing the household (*Haushaltungskunst*), the uses and applications of the clover seed have been fully tested and introduced in many places; in the same way, my *Trifolium*, especially when it involves the introduction of good policing and the improvement of the mechanical arts (through which the causes of merchants will also be advanced) will also not be without use in *Oeconomia Republicae*.¹

Eighteenth-century makers of projects frequently made bold claims. They bragged and exaggerated, quite deliberately, to get people’s attention and in their written descriptions of their projects they usually emphasized the ways in which their plans were useful, or poised

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to make real improvements with effects that could be seen, heard and felt in the world. As the entry in Zedler’s *Universalexikon* (first published in the German lands in the 1720s and ’30s) explains, ‘Makers of projects are people who uncover and introduce projects, which they often portray themselves as the originators of; they then work to convince others of the projects’ advantages through various presentations.’ They were, the entry continued, ‘individuals one must not necessarily listen to because, on the whole, they are liars’ and, to put it more succinctly than the lexicon entry does, they were mainly out to defraud.

There is much about the cagey figure of the eighteenth-century ‘project-maker’ that demands special scrutiny. They tended to rely on courtly patronage for their livelihoods and were increasingly invited to serve as economic advisors, referred to more and more often as ‘cameralists’ by the end of the century. As Andre Wakefield has explained, the ‘cameral sciences’ were ‘strategic sciences’, designed to train state officials and to help them succeed in their careers. As officials frequently tasked with managing—and growing—a German territorial state’s coffers, these individuals ‘existed at the nexus between science and economic development’; scheming and making projects became a primary mechanism by which they ‘promote[d] development through the systematic application of the natural and human sciences’. Wakefield also stresses that these individuals were frequently dishonest, were adept at overselling their ideas and were known for making promises they often could not keep.

Despite all of these caveats—or, perhaps because of them—the figure of the technoscientific-economist-projector-advisor remains an intriguing one to study. There is currently a growing literature on ‘project making’ in the eighteenth-century knowledge economy; scholars are increasingly attending to the variety and scale of project-makers’ schemes and plans, including their relationships to processes of knowledge making and discovering. A few have acknowledged the functionalist and intrinsically pedagogical qualities of some cameralist writings. However, those involved in newer conversations about projecting have tended not to make its strikingly pedagogical dimensions a primary area of consideration.

A key starting point for this essay is that pedagogy—the art of instruction or the craft of devising new methods, materials and theories of teaching—was central to the language of projecting and the cultivating of a project-maker persona. Why and how did project-makers, even when they intended to deceive, build pedagogical frameworks for inquiring, improving and discerning functions and uses? What exactly did they expect and how did they both create and articulate these expectations? What role did specific teaching texts and methods of instruction play in their plans?

Recent work on the links between teaching techniques, instructional texts and the history of science has demonstrated the value of ‘using education and pedagogy as [a] window onto how sciences have changed [over time] and how scientific roles have evolved’. It has also drawn much needed attention to the power of didactic writings and practices in various instructional venues. As Antonio Garcia-Belmar, Jose Ramon Bertomeu-Sanchez and Bernadette Bensaude-Vincent have shown in their study of scientific textbooks in early nineteenth-century France, these ‘offered their authors and publishers an influential venue for expressing creativity, both in how they chose to organize their material and how they approached the prevailing scientific and philosophical debates of their day’. Descriptions of teaching practices and lessons offer a range of insights into processes through which new knowledge was produced and disseminated.

Investigations of educational reform projects, lesson plans and scientific textbooks published in seventeenth- and early eighteenth-century German cities suggests that these
materials, too, were key venues for ‘expressing creativity’, also articulating and refining expectations for new goals and projects. In what follows, I build on the above conversations by considering the relationship between pedagogy and expectations in a three-part educational reform project put forward by an early commercial advisor and project-maker named Paul Jacob Marperger (1656–1730). He called it his Trifolium or the ‘golden clover leaf’.

Marperger published his project description, Trifolium Mercantile Aureum, or Dreyfaches Güldenes Klee-Blat, in 1723 while he was residing at court in Dresden. In it, he sketched out his ‘well-intended suggestions’ for opening a merchant academy, a commercial college (also referred to as a Mercantilische Informations-Collegium) and a variety of mechanical work schools in Saxony. His suggestions hinged upon a diagnosis of the problems currently besetting the existing educational establishment, which Marperger insisted were many. Opportunities to learn about Commercia, or commercial wares and things, did not exist at universities. Throughout Saxony, merchants, mechanics and handworkers were treated as foreigners, their expertise unappreciated, not to mention the fact that they tended to know very little about the commercial theories underlying the professions they practised. The reasons for this were complicated but were the result, Marperger argued, of a combination of material, political and moral causes that had fostered a general lack of interest in and attention to the ‘utility’ of most things in the world.

By the early eighteenth century, an increasingly robust conversation about how to improve universities and to make educational institutions more useful was underway in many different cities across Europe. Keenly aware of the overtly pedagogical dimension of ongoing efforts both to generate useful knowledge and to cultivate skilled observers and makers of it, Marperger used his ‘golden clover leaf’ project to showcase his commitment to the incremental improvement of training regimens for children and adults. He linked his expectations to existing institutions, technologies and ongoing educational reform efforts, including experiments with teaching methods. These he viewed as an especially desirable and legitimate form of projecting.

I focus on how Marperger used his plans for educational reform as a way of structuring and imposing constraints upon his expectations for techno-scientific and commercial improvements. In so doing, he participated in a process of expanding opportunity—associated with economic ‘expansion’ or ‘growth’, terms used constantly today—by articulating expectations anchored in examples of endeavours that had already proven themselves useful in some tangible way. Marperger harnessed his expectations to a process of assembling evidence of what already existed and framing remedies to social, economic and political problems as intrinsically pedagogical ones, problems that stemmed from denying merchants, craftsmen and the general public access to information, including the opportunity to see and, therefore, to understand the things they made, traded and put to use.

Examples, Expectations and the Education of Merchants

In his influential book on the eighteenth-century origins of compulsory schooling in Prussia and Austria, James Van Horn Melton explained that cameralism ‘defined the individual and corporate components of society functionally, that is, in terms of their service to the whole’; it involved a mode of classifying or organizing that enabled an official of the prince’s
chamber ‘to legitimate their own social position’ while popularizing strategies for
determining the worth of particular social groups (and professions) that hinged on
wholesale assessments of their economic contributions. Melton concludes that ‘the
strong pedagogical undercurrent found in cameralism’ was a corollary of a ‘mechanistic
and functional definition of the social order’; it thereby promoted a vision of education
and schooling focused on ensuring ‘that each subject developed into a productive member
of society’.

Although it is not always easy to discern, there is a difference between envisioning
education as a tool for making people productive—or training them to understand their
value as inextricably linked to the amount and quality of work they perform—and
envisioning education as a tool for promoting awareness of a person’s or an object’s
intrinsic ‘usefulness’. Writing in the first decades of the eighteenth century, before the
mid- and late eighteenth-century moments studied by Melton, Wakefield and others,
Marperger presented a vision of education in his Trifolium that was indebted to a
particular way of determining the value of things and people. Indeed, in the early years of
the eighteenth century, describing someone (or something) as ‘useful’ did not necessarily
involve making a judgement about their economic output, or measuring the impact of the
work they performed. When Marperger used the term, he seems to have meant something
more like ‘the good which something has in its nature overall . . . the immediate good one
observes in people’. Hence the pedagogical dimensions of Marperger’s plans were
linked to functionalist and theological ideas. Indeed, a key starting point for practitioners
and advocates of natural theology, for example, was that everything had been created for
a reason and nothing (and no-one) was useless. Marperger’s plans also portrayed society
as a market at a moment when it was not yet widely considered to be a conceptual space
where ‘the world’s goods, services and desires interacted with the flow of money and rise
and fall in value’. Instead, as Vera Keller has explained, it was a place where
communities made and traded in desirable Commercia and some individuals—such as
Marperger—put forward ‘theories of interest’.

Born in 1656, Paul Jacob Marperger was the grandson of a Lutheran minister from Bernau
bei Neumark (in the Oberpfalz) and the son of a Swedish military general who had returned
to the Neumark after the Thirty Years’ War (1618–1648). After moving to Nuremberg,
Marperger’s father began a new career as a merchant and made plans early on for his son
to study theology at the University of Altdorf. Young Paul Jacob had enrolled in the
university by the age of ten; however, plans changed and he was ultimately apprenticed to
some merchant friends of his father’s in Lyon—then the centre of Europe’s silk-weaving
industry. During his time in Lyon, Marperger became familiar with a variety of
merchant advice manuals, or guidebooks; these were often produced ‘in house’, with
firm-specific guidelines for young clerks or apprentices, but by the middle of the
seventeenth century many had reached a much broader audience. He later described
himself as indebted to Jacques Savary’s The Perfect Merchant or General Instruction
regarding the mercantile trade of France and foreign countries; Savary was a member of
Colbert’s ‘Conseil de la Reforme’, and had been charged with revising commercial laws
and French mercantilist policy more generally. Indeed, many of Marperger’s aspirations
and career as an itinerant commercial advisor should be considered with the example of
Savary in mind. He frequently cribbed from Savary in his own book, The well
instructed merchant young person, and many of Savary’s ideas found their way into the
Trifolium, including a particular way of likening the teaching of merchants to the craft of
After training in Lyon, Marperger travelled across continental Europe, pausing in Geneva and Vienna before venturing into Russia and Scandinavia. By the 1680s he was living in Hamburg, where (in addition to marrying and having two sons) he produced ‘a wide variety of mostly unpublished projects, or Consilia’ and began to cultivate a reputation as a political economist, poised to advise heads of state on matters of commerce and manufacturing. He was invited to enter the service of the Danish king in 1699 and from this point on managed to remain a courtier and professional project-maker for the rest of his life; his reputation spread to the court of Brandenburg-Prussia, centred in Berlin. In 1708 he joined the Berlin Academy of Sciences at the invitation of Gottfried Wilhelm Leibniz (1646–1714) and
Daniel Ernst Jablonski (1660–1741), who made it known that they were interested in Marperger because of his expertise in ‘commercial things’. A special area of focus for him in this period was the creation of an early Lexicon of the curious and real things of nature, art, mining and trading (Curieuses und Reales Natur- Kunst- Berg- Gewerck- und Handlung Lexicon); it was reissued at least six times between the first edition of 1714 and 1731 alone. By the early 1720s, Marperger had been called to Dresden, where he became a commercial advisor to the Elector of Saxony, August II the Strong (1670–1733).

Historians of European economy have long recognized that ‘agriculture, not industry, led the economy’ in the early eighteenth century; ‘its performance determined the success of industry and trade and influenced every aspect of society, politics and culture’. It is against this backdrop that Marperger’s choice of the ‘clover leaf’ as a symbol for his pedagogical project can be best apprehended. First, as the passage that opened this essay makes clear, clover was a kind of plant that had proven itself useful in various ways. It was at the heart of various schemes for efficiently feeding growing urban populations because it helped to restore nitrogen quickly to soil, and its various kinds were central ingredients in household recipes and remedies. The clover leaf is also a spiritual and geographical symbol: in many late medieval and early modern contexts it stood both for the Trinity and for structured representations of the world and its continents: Europe, Asia and Africa. Possibly the best-known representation of the ‘World in a clover leaf’ (Die ganze Welt in einem Kleberblat) was Heinrich Bünting’s mappa mundi, which depicts the world in a clover shape with Jerusalem at the centre. Of course the court of Dresden, or more generally the state of Saxony, was at the centre of Marperger’s Trifolium, but the use of the symbolism would have helped invest the project with a sense of sacred purpose.

Indeed, shortly after publishing the project in 1723, Marperger helped his son Bernhard Walther (1682–1746) to acquire a post as court preacher for the Elector of Saxony. Bernhard was a Lutheran theologian who had spent two years studying in the Prussian university town of Halle at the exact same moment that its students and professors were in the midst of cultivating its reputation as a ‘new Jerusalem’. Upon receiving the call to Dresden and joining his father there, he embarked on an active correspondence with the Pietist theologian and first director of the Halle Orphanage, August Hermann Francke; in one early letter he explained to Francke that one of his primary goals was to take up his duties in the spirit of Philip Jakob Spener, who had also served as a court preacher in Dresden. The confessional politics that the Marpergers encountered in Saxony were very different from those in Brandenburg-Prussia, where there were tensions between orthodox Lutherans, Pietists and Calvinists at court, but few Catholics. As Lutherans, they manoeuvred during a moment made awkward by August II the Strong’s highly controversial conversion to Catholicism and a court culture known for its elaborate feasts and festivals. August had converted in order to be elected King of Poland, where he ended up spending much of his time—and money.

My point, simply, is that the Trifolium was a project imbued with an array of spiritual, epistemological and sociopolitical meanings. Marperger envisioned it as a tool that would fundamentally alter how individuals understood their social roles and obligations to themselves, to each other and to the state. Like many other reformers, his goals for improvement hinged on promoting new ways of seeing things and people in the interest of bringing about social transformation, particularly of social roles. His emphasis on each part of the clover leaf’s three distinctive, yet equally important, contributions to the whole signalled an interest in reconfiguring relations between them and the groups that he
targeted for participation in the institutions described throughout. In other words, one part of the plan – the merchant academy, for instance – was no more important than the other two: the mechanical work school or the commercial college. The idea was that the components were equally useful and existed in a symbiotic or mutually reinforcing relationship to each other.

The first of Marperger’s three-part plan focused on the idea of a merchant academy, along with descriptions of training programmes for young merchants in practical mathematics, architecture and mechanics. Some scholars have described it as the first substantive proposal for ‘the systematic, formal schooling of businessmen and the widening of the university curriculum to include commercial sciences’. Marperger’s expectations in this part of the project hinged on two key observations about what already existed and, therefore, what could most easily come into existence in the near future. The first observation was that there were already plenty of academies operating in the world; the concept just needed to be applied or adapted to meet the needs of merchants. The second was that there were plenty of ‘learned merchants’—tradesmen who had studied at universities before taking up commercial careers and who were well poised to become the first members.

Marperger started the first section, or leaf, of the Trifolium with the following questions: ‘What is an academy and, were one to be established, what form would a merchant academy take?’ He reminded readers that, although the term derives from Plato’s Academy in Athens, in the German lands they were mainly ‘vocational schools for nobility’ or ‘courtly academies’ (Ritteracademien), which trained young noblemen for professions as a courtiers and soldiers, thereby introducing them to practical mathematics and architecture, including the sciences of fortification, and more. He also explained that the proliferation of artist academies (Mahleracademien) and their imposition of training regimens and standards on the profession of the artist was something that the merchant profession would similarly benefit from. Merchant academies would impose rigour and refine a set of principles for knowing and teaching accounting, bookkeeping and the art of merchant reckoning (der kauffmannischen Rechenkunst), including translating weights, measures and foreign currencies.

As evidence that the kinds of individuals needed to teach in these academies already existed, Marperger drew attention to the catalogue of ‘learned merchants’ he had published in 1717. Here he had defined learned merchants as exemplary tradesmen who contemplated and applied principles from the ‘learned world’ of philosophy and politics to their commercial endeavours, devising ‘moral and mercantilist rules’ in the process. Usually they had studied at a university after having worked as merchants, or vice versa, and in the process they forged a unique combination of expertise. Since the most successful merchants spoke several languages, they were adept at a kind of applied philology. Similarly, these individuals had a command of physics because they had to understand the ‘power, properties and workings’ of nature in order to understand their wares (Waaren). They were proficient in the study of commercial law, often acting as legislators and judges; they devised or oversaw the construction of new instruments and new techniques for measuring and calculating, and were often able mechanics and geographers.

Additionally, they were masters of ethics, adept in the art of civil conversation, oration and letter writing. Marperger’s catalogue contained descriptions of 100 individuals who were living examples of the ‘learned merchant’ archetype. Among them was Johann...
Joachim Becher (1635–1682), whose accomplishments as a commercial advisor for Emperor Leopold I Marperger described in some detail. Drawing attention to exemplary individuals, to models and archetypes, had become an increasingly popular pedagogical technique in this period. What is remarkable here, however, is the emphasis on merchant exemplars, who were noteworthy not only for their learning and commercial success but also because of the standards of virtuous behaviour they exhibited. This behaviour emerged in and through their exchanges with other merchants and vendors; it was not determined by a set of theoretical principles or sacred guidelines.

Marperger’s discussion of learned merchants, including his expectation that they would soon assume new roles as moral, political and economic exemplars, hinged on synthesizing a variety of real-life examples. He also made the observation that there were plenty of teaching texts and programmes for training young merchants in existence that simply needed to be marshalled in support of his endeavour. These texts included the mathematical writings of Tobias Beutel (1627–1690), a prominent court secretary and the director of Dresden’s famous ‘cabinet of curiosity’ or ‘cabinet of arts’ (Kunstkammer). Indeed, by the turn of the seventeenth century, Dresden’s Kunstkammer had become famous for its collection of wonders and scientific instruments, reflecting its creator’s ‘interest in cartography, mapmaking and mathematics’. Beutel published a widely read description of the collection, and his curatorial efforts served as a foundation for August II the Strong’s efforts to turn the collection into a public museum called the ‘Green Vault’ in 1723, the same year that the Trifolium appeared.

In fact, Marperger linked his expectations for standard, multifaceted training programmes for merchants to a variety of already existing collections, texts and programmes. Apart from Beutel, other texts that could be mustered in support of his endeavour were Christian Starcken’s Museum Mercatorio Arithmeticum, Friederich Secken’s Curieuse Rechen-Schul and Christian Schlessler’s Arithmetischer Haupt-Schlüssel (1720). Programmes similar to the merchant academies he envisioned included a writing, computing and bookmaking school run by Johann Tobias Storch in Leipzig. In the city of Nuremberg, which he knew well, Marperger described a flourishing assortment of schools focused on teaching arithmetic, computation, bookkeeping and other skills essential to entering the banking and trading professions. In the ‘world famous city of Augsburg’, he reported, there were countless schools led by ‘merchants with awakened senses’ (Sinn-reichen Kauffleuten) who offered lessons in the ‘old and new mathematics and mechanics’ using a variety of newly developed teaching texts and techniques. The same was true in Hamburg, where one actually found societies for teachers of arithmetic; Marperger explained that in these venues teachers discussed their teaching strategies and devised new kinds of materials and lesson plans.

The final part of Marperger’s description of a merchant academy in the Trifolium offers striking evidence of the pedagogical strategies he placed at this heart of this three-part project. Here he moved beyond descriptions of exemplary teaching texts, individuals and academies and included a schedule for how and when various topics would be taught during a typical week of instruction: ‘We will divide the entire merchant academy into different classes, periods or Collegia, in which one from 8 to 10 o’clock in the morning, five days a week, only arithmetic will be taught in a special room, in another bookkeeping.’ Prospective students would be asked to choose one or the other, to embark on a six-month course of study and then to swap, completing both in a period of one year. Why include this kind of seemingly mundane detail? Again the approach to introducing a particular topic mattered as much as the content of the lessons themselves.
Marperger explained that, from 10 a.m. to 12 noon, four days a week, one group would study the ‘art of writing’ and the other ‘various Curiosia and important things’. These ‘important things’ could include on Mondays an overview of the merchant profession: what is it, how to understand its utility and to practise it in an enjoyable way, where the most important trading places in the world are and the rights and customs there, also banks, exchange and the art of coinage, trading fairs, weights and measures, commercial courts, merchant statutes and rights and all other things it is important for qualified merchants to know.53

On Tuesdays they might include lessons in geography and the use of maps. On Thursdays the focus could be various speaking activities, including the uses of particular terms and the art of negotiation. Wednesdays and Fridays would involve studying commercial wares in the order they were presented in the collection or cabinet described in Marperger’s Merchant Storeroom (Kaufmanns-Magazin) (see Figure 2).54
The Merchant Storeroom served as crucial supplementary reading for this part of the Trifolium and offers insight into the rationale for the pedagogical techniques described in detail here. Marperger was careful to note that the text was intended to instruct young merchants-in-training in the ‘useful sciences’ of medicine, botany, chemistry, pharmacy and mining. It presented them with a virtual ‘chamber of materials’ and a rubric for instantly apprehending the uses of different wares:

first, all Simplicia from the three kingdoms of nature, namely the vegetable, mineral and animal; after this the Composita and finally the Artificialia, and as much as possible, whenever time permits, specific manufactured products should be presented, along with the tools and instruments used to make them in small, artfully constructed models.55

He insisted that this kind of approach to teaching the art of commerce would help to instil in a few hours a more ‘fully realized understanding of wares’ (Waaren-Känntniß) than several years of trading practice.56

EXAMPLES, EXPECTATIONS AND THE DISTRIBUTION OF COMMERCIAL INFORMATION

As early as 1709, Marperger had come out with a lengthy treatise about the need for more Commercial Courts (Handels-Gerichte) and Colleges (Commercien Collegia) in the German lands.57 In it, he described several exemplary cities, such as Lübeck, Hamburg and other Hanseatic commercial centres, which he contended had succeeded in their efforts to effectively organize and monitor commercial activity.58 Leipzig, a thriving trading centre in western Saxony, also received special mention because of its ‘commercial court’, which Marperger described as a model worthy of emulation.59 It was exemplary, at least in part, because by 1700 Leipzig’s ‘non-guild merchants’ had, as Robert Beachy has explained, ‘initiated a successful reform process which the court embraced and promoted’.60 The goal had been to codify trade law in the interest of regulating ‘an expanding interregional commerce’, one that would benefit Leipzig and the entire Electorate.61 Commercial courts and colleges had key roles to play in both growing and codifying commerce in Saxony; yet there was still much work to be done.

At this point in his career, around 1709, Marperger was not yet residing in Dresden; in fact, he dedicated the Handels-Gericht treatise to Friedrich Wilhelm I of Brandenburg-Prussia and stressed his affiliation with the newly established Academy of Sciences in Berlin. The text contained an elaborate case for creating more commercial colleges and courts in Prussian lands too, and a series of guidelines to be observed in the process. After moving to Dresden, Marperger simply incorporated the Handels-Gericht treatise into the Trifolium, making it the focus of the second leaf. The move offers striking, yet not surprising, evidence of his status as a professional projector; basically, he was a free agent who was peddling his projects to the highest bidder.

It also indicates that he knew his advice on ‘commercial matters’ was valued, even sought after, within a territorial state well known since the sixteenth century for its ‘entrepreneurial outlook’ and success in the area of political economy.62 August II’s distant predecessor, Elector August I (1526–1586), had pursued a wide variety of economic enterprises and projects. He introduced new types of grain and cattle to Saxony and ‘purchased twenty-seven new farms in the first twenty-five years of his reign, which brought in new income and served as models for how states should be cultivated’.63 Perhaps most importantly, he
made mining central to Saxony’s economy and supported the development of the industry at all levels, from funding new workshops to developing mining equipment to experimenting with smelting methods in a metallurgical-alchemical laboratory located behind the Electoral palace in Dresden. During the seventeenth century, alchemical experimentation, including glassmaking, was a hallmark of courtly life in Saxony.

Historians of science and technology who have studied mining and its relationship to the histories of chemistry, metallurgy and the earth sciences have reached at least two general conclusions about the organization of mining industries in the German lands by 1700 that are worth considering here. First, these enterprises were highly localized endeavours: while embedded in the complex global systems that formed the heart of the period’s knowledge economy, communities of local experts imbued these industries with meaning and were rather protective of them. Second, state-initiated efforts to monopolize or to benefit from the expertise of mining communities were often constrained by ‘conflicts of interest’, including a lack of trust in state officials and vice versa. Marperger’s Trifolium originated within the apparatus of the court and its officials, but he was an outsider and relatively unfamiliar with small-scale, Saxony-specific enterprises. To become more familiar with them, one of the first things he did in Dresden was to hold weekly ‘office hours’ for textile (including linen) workers and any manufacturer who had a suggestion about how to improve local enterprises. The Trifolium’s appeal, then, resided largely in its status as a compendium of commercial information and recommendations assembled from Marperger’s relationships with various communities of local experts. While he stood to benefit by interviewing them, he claimed that they would benefit too, by having more opportunities to talk with and even to teach each other.

Marperger described a commercial college as a centre of ‘Mercantile information’ that was to be open to adults from all backgrounds interested in learning new skills or improving their understanding of particular enterprises, including mining. He noted that, in the Hanseatic commercial centres where these Collegia existed, there was already a successful method for distributing information, or educating the public, about commercial matters and endeavours. This method consisted of posting and making accessible answers to a series of questions, such as ‘What are the Commercial sciences (Commercia), where do they come from, what does it mean to undertake them, what things can hinder or ruin them, etc.’ The third leaf of the Trifolium also focused on facilitating the circulation of more information about Commercia through mechanical ‘work schools’.

As I stressed in my introduction, historians of science and technology interested in pedagogy have argued that lesson plans and descriptions of new training programmes were frequently exploratory, creative venues for their makers. They participated in both the transmission and the production of knowledge about the debates and questions they introduced to their frequently young readers. As we have seen, Marperger also invested a great deal of time and energy into drawing together the best teaching aids for young merchants, following the lead of Savary and other teachers of practical mathematics, accounting and bookkeeping. For the ‘method’ that formed the backbone of his plan in the second leaf of the Trifolium, he drew from those whom he had observed already at work in commercial colleges and courts. But when it came to devising curricula for the mechanical work schools he described in the third part of the Trifolium, many new challenges presented themselves.

Marperger’s expectations for the Trifolium project were informed by specific examples of schools for training young mechanics, engineers and craftsmen. Generally speaking, these
schools still operated according to an apprenticeship-style mode of teaching and learning. The instructional aids were models, machines, instruments and materials. Those who knew how to use them usually offered instruction but Marperger was concerned that they tended to do this without an easily identifiable method, or in an ad-hoc manner. For example, a practitioner of mechanics might use a text such as Johann Friedrich Gleditschen’s *Theatrum Machinarum Universale* as a teaching tool, but it was likely not to be deployed systematically, or as a vehicle for distributing techno-scientific and commercial information in a way that could be easily replicated. For the third part of his *Trifolium* project then, Marperger described an assortment of craft-based instructional programmes currently operating yet determined by the machines, instruments, materials and traditions of particular professions. His ‘new idea’ was to adapt and strategically combine the most important elements of these programmes, to create venues where craftsmen could learn about the materials, instruments and techniques from a variety of professions and where merchants and other members of urban professional classes might also acquire training.

As the main example of the superior kind of universal mechanical work school he envisioned, Marperger pointed to the ‘mechanical and mathematical school’ or ‘school of the real’ (*Realschule*) founded by the Lutheran theologian and practitioner of the mathematical sciences Christoph Semler in the city of Halle (Saale) in 1708. Although its curriculum and teaching materials were eventually absorbed into the educational landscape of that city’s flagship educational ensemble, the Halle Orphanage, Semler’s school had marked an attempt to bridge what many believed to be an entirely natural and desirable gap between the cultures of the workshop and the classroom. Indeed, a signature feature of educational reform efforts throughout the seventeenth century had been its reformers’ preoccupation with ‘pedagogical realism’ and children’s inclination, regardless of their social background or standing, to learn how to apprehend the world in new ways via their encounters with ‘real things’, or to ‘put what they know into practice’. Seventeenth- and early eighteenth-century reformers, or projectors like Marperger, understood that one of the reasons why the gap between cultures of the workshop and the classroom was so pronounced was due to long-standing efforts to uphold rigid distinctions between head and hand in European society and culture. Those who ran workshops were supposed to be masters of *techne*—not *episteme*. That is, they had technical knowhow and an intimate knowledge of nature but ideally no knowledge of causes, no connection to the philosophical world of the mind or *episteme*. Latin schools and colleges functioned as exclusive gateways to Europe’s universities, as arenas devoted to the cultivation of minds—not hands. Artisans devised their own epistemologies rooted in the development and manipulation of new technologies and highly refined observational strategies. Yet, as Lissa Roberts and Simon Schaffer have explained,

> considerable energy was needed to make such hierarchies of head and hand ever seem plausible….Self appointed mental workers, such as philosophers, scientists, policy-makers and bureaucrats, then as now, claimed and constructed the dominion of their ‘understanding’ over handworkers and their crafts.

Efforts to clearly distinguish between ‘realms of mental and manual deeds and goods’ were ongoing and sanctioned efforts to uphold (and to justify) a hierarchical system of social orders, including the forms of education associated with each one. At the same time, contemporaries like Marperger knew that the venues associated with mind and hand informed and interacted with each other in powerful ways. Increasingly throughout the
seventeenth and early eighteenth centuries, artisan-engineers and handworkers were invited to universities to assist in ongoing efforts to further develop the mechanical and ‘experimental’ sciences. Professors of natural philosophy, mathematics and physics regularly ventured into the workplaces of artisans, seeking to acquire first-hand knowledge of materials, tools, instruments, machines and manufacturing techniques. In his own description of plans for the school he eventually founded in Halle, Semler had taken care to note that it was ‘organized in such a way that boys who want to go on to study [at a university] and those who are destined for the mechanical arts can both derive use from it’.

Marperger expressed his admiration of Semler’s efforts to create a Realschule or a venue that would foster collaborations across social groups and, more generally, help facilitate his broader goal of distributing commercial information. He structured his discussion of the third project component around six main questions: (1) how many kinds of these schools are there currently and how many should there be? (2) how should they be started and organized? (3) what should be taught in them? (4) what kinds of books, instruments and other kinds of props (Adminicula) belong to them? (5) what kinds of costs are involved in starting and running these schools? and (6) what kinds of protectors and directors do there need to be in place? To answer the first question, Marperger identified 10 genres of mechanical work schools he had observed operating in the cities through which he had travelled before settling in Dresden.

These types of schools included what he called ‘academies of mechanical arts and sciences’ (type one in his scheme), where painters, sculptors, engravers and architects learned alongside opticians and glass-makers, stone masons and polishers, makers of mechanical and geometrical instruments and more. A variation on this kind of ‘academy of mechanical arts and sciences’ (type two) included:

Schools for sailors in port cities, which teach the art of sailing or navigating . . . , the uses of sea charts, various compasses, globes, Tuborum and other navigational instruments, the tables and paper used in an Observatory, including how they are arranged and for what purpose.

In many of these venues, Marperger explained, practitioner-teachers realized that their pupils also needed some experience in the art of building ships, so they had changed the names of these educational venues to ‘marine and shipbuilding academies’. The third type of ‘mechanical teaching and work school’ (Mechanische Lehr u. Werck Schul) he had observed were schools for young carpenters, turners and makers of wagons, wagon wheels and other things made from wood; he noted that these professions required advanced knowledge of geometry and particular kinds of measuring instruments. They lent themselves to particular modes of instruction that individuals engaged in other professions would also benefit from. The fourth kind trained young people who worked with iron and who were preparing to take up professions as iron- and locksmiths, or as makers of weapons and gears. The fifth was for those working in copper, tin and brass, while the sixth was for smiths and spinners of gold and silver, and the seventh for those who cut and polished stones and made clocks and coins. The eighth kind focused on work with leather, making saddles especially; the ninth was for young makers of machines of all kinds, including mills, pipes and mining equipment. The tenth type of ‘mechanical teaching and work school’ served those training to work as chemists and distillers in apothecary shops and laboratories, as well as teaching ‘what there is to know about mining things’.

Marperger proposed that the state of Saxony should fund and oversee a newly standardized system of mechanical work schools that would combine various aspects of these 10 basic
vocational training genres. He provided many more details about what should be taught in them, how and with what books, instruments and teaching tools. His suggestions ranged from introducing young merchants to the craft of shipbuilding in these schools—especially techniques used to create storage compartments for holding various wares—to inviting professional clockmakers to give lessons alongside professional iron-, copper-, gold- and silversmiths (see Figure 1). Stone masons should be given opportunities to spend time with rare stones from the curiosity cabinets of merchants and other collectors. Since the art of mining (Bergwerck Kunst) was inseparable from the mechanical arts, the training programmes needed to include an introduction to a range of tools, including those essential for building pumps and bellows for channelling wind, stoking the fire and more.

CONCLUSION

It was many years later, in 1765, that Saxony’s highly regarded mining academy opened its doors in Freiberg, a centre of the state’s mining industry not far (roughly 30 kilometres) from Dresden. In some ways the institution was the product of a similar kind of overtly pedagogical and functionalist vision as the one that animated Marperger, and helped inspire the creation of several new mining academies in the second half of the eighteenth century. The Trifolium contained a kind of early blueprint for elaborated training programmes for young miners, mechanics, engineers or other ‘artisanal experts’; yet, as we have seen, the methods, materials and texts to be deployed in these programmes were part of a much more broadly conceived web of expectations. Studying these expectations and their relationship to real-life examples, as I have endeavoured to do here, reveals a productive and mutually reinforcing relationship between pedagogy and projecting culture in the early eighteenth century.

Although the Trifolium itself was never actually implemented in its entirety in Saxony, various components of the project were realized there and elsewhere, including the establishment of commercial Collegia in both Berlin and in Dresden. The ‘mechanical teaching and work school’ idea, which Marperger fully acknowledged was not his own but one that originated with Semler’s Realschule in Halle, spread like wildfire. Disentangling questions about the Trifolium’s implementation from its rationale and description allowed me to focus more on how Marperger structured his expectations for techno-scientific and commercial improvements that he hoped to see realized, including a new educational landscape with three distinct yet mutually reinforcing and overlapping components. A huge range of training programmes already existed; they simply needed to be strategically reconfigured and made more accessible to individuals from a range of social backgrounds. Far from disseminating and replicating, then, for this projector expectations anchored in examples of teaching techniques, exemplary texts, materials, individuals and venues were at the heart of what it meant to develop a project and to convince others of its merits.

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NOTES

3 Ibid.
4 A recent collection of essays on projecting culture begins with an excerpt from Daniel Defoe’s Essay upon Projects (1697); while contemporaries overwhelmingly described projectors as ‘cheats’ and ‘despicable’, Maximillian Novak explains that Defoe (and others) tried to change the meaning of the word: ‘for him [Defoe], projectors are people who find a way out of their difficulties by coming up with a novel idea’. See Maximillian Novak, ‘Introduction’, in The Age of Projects (ed. Maximillian Novak), pp. 3–25 (University of Toronto Press, 2008), at p. 3.
5 Andre Wakefield, The disordered police state: German cameralism as science and practice (University of Chicago Press, 2009).
6 Ibid., p. 25.
9 For example, James Van Horn Melton, Absolutism and the eighteenth-century origins of compulsory schooling in Prussia and Austria (Cambridge University Press, 2003), p. 113.

Marperger, *op. cit.* (note 1).


Savary’s training manual went through 30 editions between 1676 and 1800 and was required reading for those moving into commercial careers until the end of the eighteenth century. His son, who worked as the Inspector General of Paris’s Customs House, also produced a *Dictionary of universal trade and commerce*. See Harreld, *op. cit.* (note 26), p. 12.


Curieuses und Reales Natur- Kunst- Berg-Gewerck und Handlungs Lexicon (Leipzig: Gleditsch, 1714). The foundation for this early encyclopedia of the ‘curious and the real’ was Marperger’s earlier work, Der allzeit-fertige Handels-Correspondent (Hamburg, 1st ed. 1706). It also had a counterpart called the Reales Staats- Conversations- und Zeitungs-Lexicon. The two works are often attributed to Johann Hübner, who wrote prefaces for them, yet it was Marperger who produced the actual work. For a list of Marperger’s best known publications, see ‘Paul Jacob Marperger’, in Johann Heinrich Zedler, Grosses vollständiges Universal-Lexicon aller Wissenschaften und Künste 19 (Zedler, Halle and Leipzig, 1731–54), at pp. 862–863 [1658–1659].


34 Genevieve Carlton, Worldly consumers: the demand for maps in Renaissance Italy (University of Chicago Press, 2015).

35 Whitmer op. cit. (note 18).


37 Helen Watanabe-O’Kelly, Court culture in Dresden from Renaissance to Baroque (Palgrave, New York, 2002).

38 Ibid., p. 229. Saxony’s involvement in the Great Northern War (1700–1721) was expensive too and, like the court’s new focus on Poland, directed attention away from expanding economic opportunities within the Electorate.


40 Marperger, op. cit. (note 1), p. 3.

41 Ibid., pp. 11–12.

42 Paul Jacob Marperger, Erstes Hundert Gelehrter Kauffleut (Dresden and Leipzig, 1710).

43 Ibid., Vorrede (Preface), unpaginated.

44 Ibid., p. 7. For more on Becher, see Pamela Smith, The business of alchemy: science and culture in the Holy Roman Empire (Princeton University Press, 1995).

45 Whitmer, op. cit. (note 18); John D. Lyons, Exemplum: the rhetoric of example in early modern France and Italy (Princeton University Press, 1989).

46 Marperger, op. cit. (note 1), pp. 12–13, specifically Beutel’s Geometrischer Lust-Garten (1660 und 1677), Neue Arithmetica oder nützliche und schöne Rechenkunst (1663 and 1670), Arboretum Mathematicum (1669) and Dreyfaches Geographisches Kleinod (1680).

47 For the early history of Dresden’s Kunstkammer, see Alisha Rankin, Panacea’s daughters: noblewomen as healers in early modern Germany (University of Chicago Press, 2013), p. 136. See also Sven Dupré and Michael Korey, ‘Optical objects in the Dresden

49 Ibid., p. 15.
50 Essential texts that he associated with these venues included Sebastian Kurtzen’s Compendium Arithmeticae (1654), Ulrich Hofmann’s Arithemetica practica (1721) and various works by Georg Nicolai Schurtzen, Johann Kleemann and Daniel Schwenter, especially the last’s Geometria Nova & Acta (1667) and Deliciae Physico Mathematicae.
52 Ibid., pp. 26–27.
53 Ibid., p. 30.
54 Paul Jacob Marperger, Neu-eröffnetes Kaufmanns-Magazin (Hamburg, 1708, 1733).
56 Ibid.
58 For some early examples of the Handels Collegia studied by Marperger, see Scherner, op. cit. (note 57), pp. 118–119. He mentions Johannes Marquard (1610–1668) and various commercial courts in Paris, Antwerp’s bourse and Hamburg.
60 Ibid.
61 Ibid., p. 450.
62 Tara Nummendal, Alchemy and authority in the Holy Roman Empire (University of Chicago Press, 2007), p. 84.
63 Ibid., p. 83. He and his wife, Anna, introduced the potato and experimented with making dairy products ‘commercially viable in Saxony for export to her native Denmark’.
64 Ibid., p. 84.
69 Because of this part of his plan, some German scholars have viewed Marperger as the originator of the concept of vocational training, or adult education. See Erich Dauenhauer, ‘Die Begründung der deutschen Berufspädagogik durch Paul Jacob Marperger (1656–1730)’, Paedagog. Hist. 5, 5–13 (1965).
71 Recommended as an instructional text in ibid., p. 279.
72 Christoph Semler, Nützliche Vorschläge von Auffrichtung einer Mathematischen Handwercks-Schule bey der Stadt Halle (Halle, 1708); Christoph Semler, Neueröffnete Mathematische und Mechanische Realschule (Halle, 1709).
73 Whitmer, op. cit. (note 18).

Lissa Roberts, Simon Schaffer and Peter Dear (eds), The mindful hand: inquiry and invention from the late Renaissance to early industrialization (Koninklijke Nederlandse Akademie van Wetenschappen, Amsterdam, 2007), p. xiii: ‘Commentators have assigned mental and manual labor to two essentially different categories since at least the time of Aristotle: witness the classical opposition of episteme and technē.’ See also Pamela Smith, ‘Art, science and visual culture in early modern Europe’, Isis 97, 83–100 (2006).


Roberts et al., op. cit. (note 75), p. xiv.

Semler, op. cit. (note 72), preface (unpaginated).

Marperger, op. cit. (note 1), pp. 100–105. He also briefly mentioned the efforts of the mathematician Erhard Weigel to create mechanical work schools similar to the one that Semler started (ibid., pp. 105–106). For more on Weigel, Semler and the history of the Realschule, see Wolfgang Rudowicz, Die Entwicklung der realen Bildung in Deutschland von Beginn der Neuzeit bis zum Ende des II. Weltkrieges (Blaue Eule, Essen, 1992); Heinz Semel, Die Realienlehrprogramme im 17. und 18. Jahrhundert (Hamburg, 1964); Horst Wollenweber, Die Realschule in Geschichte und Gegenwart (Böhlau, Cologne, 1997); Nikolaus Maassen, Geschichte der Mittel- und Realschulpädagogik I Band: von den Anfängen bis Ende des 19. Jahrhunderts (Hermann Schrodel Verlag, Berlin, 1960).


Ibid., pp. 109–110; Carl Goldstein, Teaching art: academies and schools from Vasari to Albers (Cambridge University Press, 1996).

Marperger, op. cit., p. 110.

Toward the end of the Trifolium, Marperger included an index of all the books and instruments to be found in each of the 10 kinds of mechanical work schools described here.

Marperger, op. cit., p. 111.

Ibid., pp. 111–112: ‘und was von Bergwercks-Sachen zu wissen vorkommt’.


See note 80 and Martin Bruns, Zur schul- und bildungsgeschichtlichen Bedeutung der Realien und der Realienkunde (Lang, Frankfurt, 1993).