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Mathematikdidaktische Konzepte in Rechenbüchern

Mit Adam Ries beginnt die Reihe der mathematischen Texte in deutscher Sprache, die sich in erster Linie nicht an Gelehrte, sondern an den „gemeinen Man“ (Kaufleute, Handwerker, Schüler, ...) wenden. Folgt den Autoren dieser Werke bestimmten didaktischen Prinzipien? Und wenn ja, wie kann man an diese gelangen? In einer vergleichenden Analyse mehrerer Werke aus den Jahren 1500-1750 wird versucht, über inner- und außersprachliche Merkmale sich diesen Konzepten zu nähern.

Dabei greifen wir auf Methoden der Mathematikgeschichte und Mathematikdidaktik (z.B. Schulbuchanalysen) sowie verschiedener linguistischer Theorien (z.B. historische Pragmalinguistik) oder der historischen Ikonographie zurück. Über die Auswahl der Inhalte wie ihrer Darbietung in Text und Bild lassen sich erste Annäherungen an die Intentionen der Autoren gewinnen.

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Mathematical Textbooks of the Early Modern Period



This poster presents a long-term project aiming at developing a framework for the didactical description and analysis of textbooks from the early modern period between around 1500 and 1800 and creating a database from the analysis. Comparisons with texts in other languages (Latin, ...) or about other subjects (architecture, medicine, ...) permit to describe communication patterns for mathematical teaching-learning situations.

- Based on information in the database one can work on questions like:
- (1) **The author:** What was their background (education, occupation...)?
 - (2) **Intended use:** Where, when, by whom and how should the texts be used?
 - (3) **Didactical concepts:** What do we learn about this by the analysis of textinternal characteristics, e.g. figures and figure-text relations?
 - (4) **Connections between (1)-(3):** (How) Do they relate?

History of mathematics

- regular conferences and proceedings in Annaberg (ed. Gebhardt)
- matrix for categorization of content-related elements (Holl 2023)
- handwritten arithmetic treatises in German (1400-1550) (Wiesinger, Jackel & Orban 2023)

Book-as-an-object related data

Author	Adam Ries	Johannes Widmann	Ambrosius Rhodius
Title	Rechenbuch auff Linien und Ziphren	Behende vnd hübsche Rechnung	Mathesis militaris oder Kriegsmathematik
Printer / publisher	Christian Egenolff Erben	Heinrich Steiner	Christian Tham (1623) Salomon Auerbach Erben (1630)
Location, year of print	Frankfurt am Main 1574	Augsburg 1526	Wittenberg 1623, 1630
Format	8°	8°	4°
Length	111 sheets	190 sheets	44 sheets (1623) 102 sheets (1630)

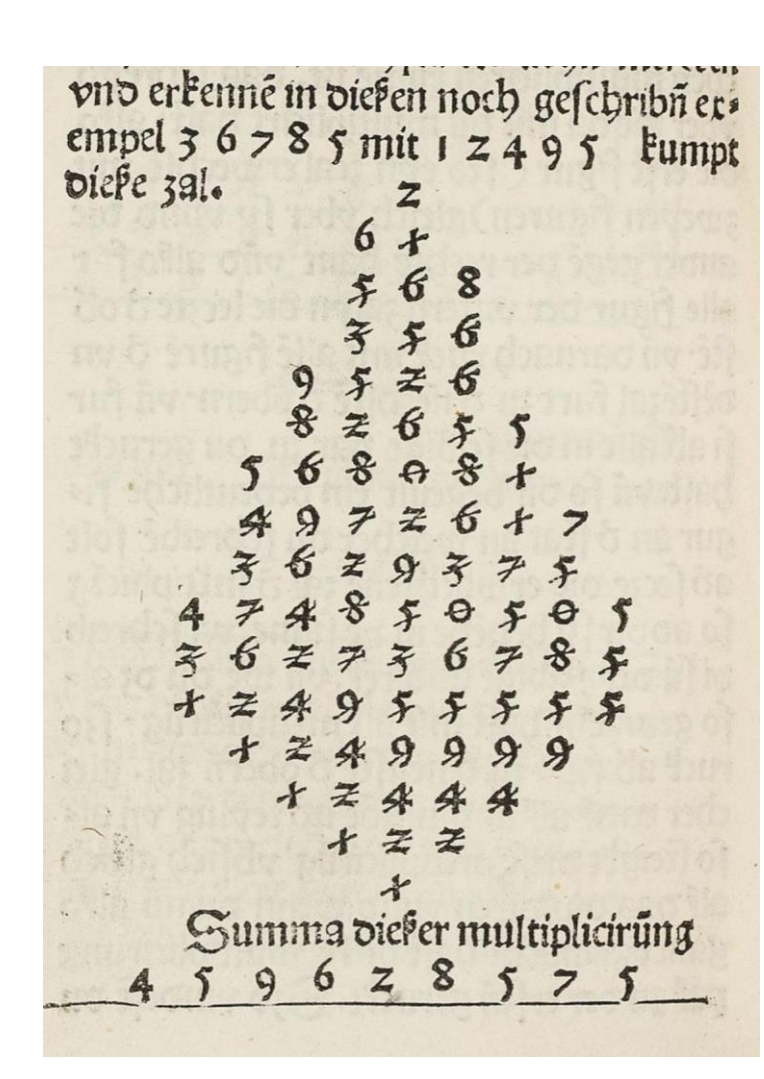


History of (mathematics) education

- “lack of worked-out theoretical categories for analysis” (Karp 2014, 12); “contextual analysis of historical textbooks” (Schubring 2022, 7)
- pedagogical knowledge in pictures (Keck, Kirk, Schröder 2006; Pictura Paedagogica online <https://pictura.bfb.dipf.de>)

Contextual aspects

Biographical data	1492-1559 Erfurt, Annaberg	? 1460 - ? 1498 Eger, Leipzig	1577-1633 Wittenberg, Prag
Profession / occupation	employee in mountain administration in Annaberg arithmetic master	lecturer at the university of Leipzig	professor for mathematics
Education / acquaintances	? books and manuscripts from libraries, among others Widmann, Köbel	? university studies at Leipzig	Kurfürstliche Schule Grimma university studies at Wittenberg Brahe, Kepler, Linnaeus, Pitiscus, Praetorius, u.a.
Teaching activities	arithmetic school	university	university, private lessons
Location / time of text production	Annaberg	? Leipzig	Wittenberg probably based on lecture notes



Historical pragmatics

- “addressers and addressees, [...], the physical and social setting of text production and text reception, and the goal(s) of the text” (Jacobs & Jucker 1995, p. 11)
- „language changes as a result of the changing communicative needs” (Taavitsainen & Jucker 2010, 15)

Communication frame (intended / implemented)

Adresses / recipients	pupils, merchants everybody	? merchants everybody	university students, guest
Where	in arithmetic school at home	? at home	at home
When		?	??
How	guided learning self-learning	self-learning	self-learning with sources for deeper insight
Goal	application (in trade)	application ? comprehension	application in war
Didactical Concept			

Example 1: presentation

Text	Figure
Stepwise description of the written addition procedure for general numbers: • how to write and arrange the given numbers (one above the other) • how to add up the place numbers • how to write the intermediate sums and how to proceed in case of a carry • how to read the sum	Three examples of fully conducted written addition with concrete numbers: • five-digits summands written one above the other • six-digits sums beneath lines that divide them from the summands

The text shows direct reference to the figure by saying “als folgende Exempel ausweisen”

Historical linguistics (of special purpose)

- historical lexicography (Reichmann 2012, <https://fwb-online.de/>)
- historical specialist texts (Gärtner 2000, Gabriel 2010, <https://kallimachos.de/fachtexte/index.php/Mathematik>)

Textinternal characteristics

Content	Arithmetics	Arithmetics	Mathematics for war (arithmetic, geometry,...)
Structure	– preface – introducing numbers and calculation methods – calculation rules – problems	– preface – introducing numbers and calculation methods – calculation rules – problems	– preface, – chapters: motivation and propositions – closing remarks
Text types	Explanation / instruction problem	Explanation / instruction problem	Explanation / instruction problem
Grammar		dependent on text types	
Lexicon		technical words (loan words from Latin)	
Speech acts		explain, define, instruct	
Figures	see illustrations on the right	in work	Visualizations (calculating schemes, constructions, illustrations) in the 1630 edition
Text-figure relations	in work	in work	in work

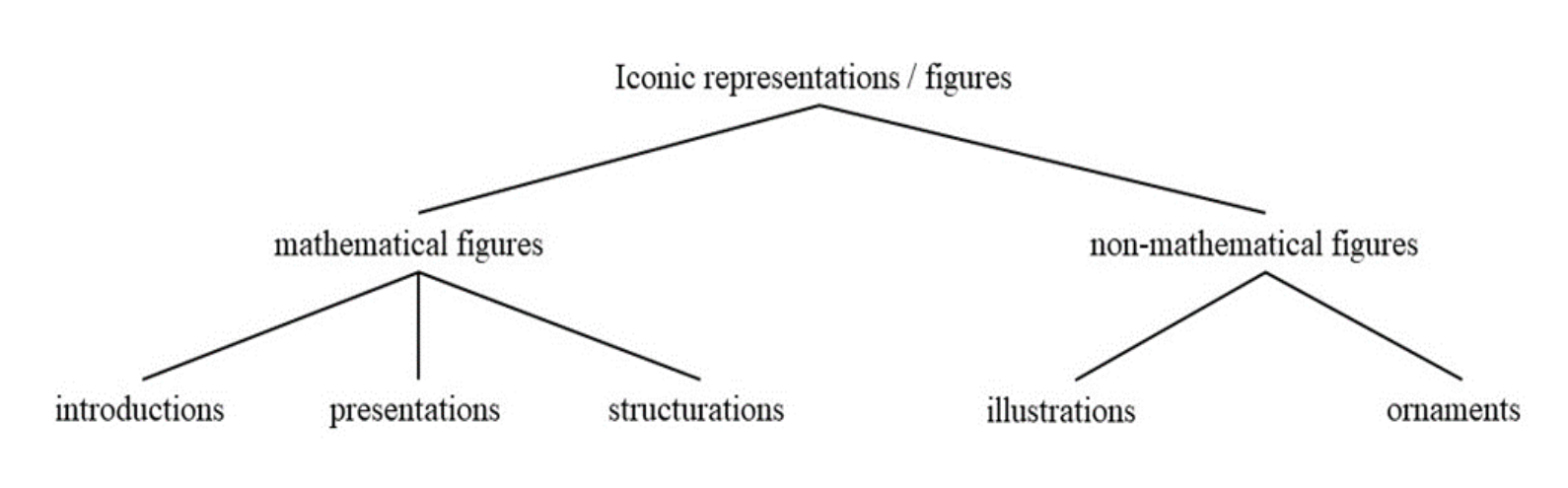
Example 2: structuration

Text	Figure
Exemplary task consisting of problem and incomplete solution: • verbal description of situation • question to be answered • detailed description of first step of solution procedure, applied to number 40, giving 11 as positive (plus) intermediate result • request to apply first step of procedure to number 48 • solution 36	Numbers and lines arranged in a certain schematic order: • numbers 40 and 11 in a row, symbol + in-between • numbers 48 and 33 in the row below, symbol + in-between • number 22 on the right between the rows

The text shows direct reference to the figure by saying “so it says:” (so stehet es also.)

Figures (and text relations)

- multimodal text linguistics (Stöckl 2016)
- cognitive psychology approach; „congruent, complementary and elaborative relations” (Ballstaedt 1998, 251-54)
- iconic representations in Renaissance reckoning books (Schmidt-Thieme & Hamann 2025)



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