

Instructional Materials for *Der Zahlenteufel*

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Der Zahlenteufel (chapters 1 and 2) by Hans Magnus Enzensberger

Topic: To create an enduring interest in math

Overarching Theme: Mathematic, Technology, Contemporary Life, Family and School Life

Global Goals: Students will understand that they are developing into independent readers who adapt to different texts and use appropriate reference sources as needed. Students will understand that they can scan authentic texts in order to locate desired information.

Essential Questions: What role does Math play in everyday life?

Targeted Proficiency Levels: A2-B1 / Intermediate Low – Intermediate High

Length of Unit: ten 45 minute periods or five 90 minute block periods

Knowledge and Skills:

Students will be able to interact with authentic texts.

Students will learn how to scan authentic texts for global understanding and search for specific information.

Students will learn about daily life and the importance of math.

Performance Task (Summative Assessment): Students will create a written or oral presentation explaining why the numbers zero and one are essential in understanding math and technology.

Standards and Modes of Communication:

Interpersonal Communication: Using the target language, students will interact with their partner to create their presentations and vocabulary activities.

Interpretive Communication: Students will reveal their understanding of the content (by reading the text, hearing the text read by the teacher or listening to the audio book) through their presentation.

Presentation Communication:

Written Presentational: Students will write a brief explanation in the target language about the mathematical problem (numbers one and zero) they have read.

Spoken Presentational: Students will orally present the chapters using their choice of presentational mode. (Role play, PowerPoint presentation, dialogues, comics, Prezi)

How Standards are addressed:

Culture: Students interact with a culturally rich authentic text. The topics addressed include anxiety, family life, daily routines, mathematics, fantasy world and fairy tales in the target culture.

Connections: Students analyze authentic target language literary works to connect with mathematics.

Comparisons: Students will compare new mathematical strategies with previously internalized strategies to acquire a deeper understanding. Students will compare linguistic features between their native language and the target language.

Communities: Students will use the mathematical terms and understanding beyond the school setting.

What needs to be taught to assure student success on the performance task:**Language functions:**

Structures: compound nouns, idiomatic phrases, quotations

Vocabulary: compound nouns, verbs (colloquialisms), idiomatic phrases, proverbs

Formative Assessments and Learning Activities:**Presentational Communication: pre-selected reading presentations**

Interpersonal Communication: Using the target language, students will interact with their partner to create their presentations and vocabulary activities. The instructor will formatively assess student performance by observation as students work collaboratively.

Interpretive Communication: Students will read individual pre-selected paragraphs in an authentic literary work. The instructor will read the summaries to ensure student comprehension. Classmates will hear all summaries to glean comprehension of the selected chapters. The instructor will provide comprehension questions.

Presentational Communication:

Written Presentational: Students will write a short monolog in the target language about the importance of the numbers one and zero and display their monologues for the class.

Spoken Presentational: Students will orally present their pre-selected paragraphs as directed by their task. The instructor will use a presentational grading rubric to assess performance. Students will orally present their monologs about the importance of zero and one in a gallery walk.

Practices and Perspectives of Culture: Students interact with a culturally rich authentic text. Topics addressed anxiety, family life, daily routines, mathematics, fantasy world and fairy tales in the target culture. The instructor will formatively assess cultural understanding during classroom discussions.

Resources: See attachment "Der Zahlenteufel-Resources" Appendix A

Lesson Plan

Title: *Der Zahlenteufel* by Hans Magnus Enzensberger

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Communities: Students will use the mathematical terms and understanding beyond the school setting.

Language Functions / Objectives: Students will learn how to interact with authentic texts and become independent readers. They will collaboratively prepare vocabulary lists, write summaries, and present pre-selected paragraph summaries from the text.

Assessments: Students will write a short monolog in the target language about the importance of the numbers one and zero and display their monologues for the class. Students will orally present their pre-selected paragraphs as directed by their task. The instructor will use a presentational grading rubric to assess performance.

Vocabulary and Functional Chunks: Students will learn vocabulary and verbs related to mathematics. As students continue with independent collaborative reading, they will self-select essential vocabulary, create an activity, and teach their classmates (Appendix B and C)

Materials: see Appendix A for examples such as:

Text: *Der Zahlenteufel* by Hans Magnus Enzensberger, websites, Google search for pictures, online dictionary, templates for storyboards, puzzlemaker.com, www.kahoot.it,

You Tube: Die Geschichte der Null, Die zehn besten Zahlen, (Technologie: Die Maus – Das binäre Zahlensystem)

Books: „A place for Zero: A Math Adventure“ by Angeline Lopresti (English picture book)

Worksheets: Double Bubble

Apps:

Conni Zahlen 1-10 (Euro 2.99)

Conni rechnen 1-100 (Euro 2.99)

Die Schlümpfe – Zählen und Rechnen lernen (Euro 2.99)

Mathemaschleck (kostenlos – English App Store)

Warm-up:

Game: Two Dice; with a partner students roll two dice and select a direction card from a pile (addition, subtraction, division or multiplication) and create an equation with the rolled dice numbers according to the card. (Appendix D)

Webquest: Students will find information about the author, Hans Magnus Enzensberger; the background for the story; and an additional texts by the author. Students will do research about important mathematicians including: Adam Riese, Leonardo von Pisa, Georg Cantor, Eratosthenes, Leonhard Euler, Carl Friedrich Gauß, Felix Klein, Johan van de Lune, Blaise Pascal, B. Russell und A.N. Whitehead, Pythagoras von Samos, Bertrand Russell.

Chapter 1:

Setting the Stage:

Vocabulary and Functional Chunks: Students will learn vocabulary and verbs related to mathematical terms. Through “Stiller Impuls” students match English and German mathematical terms, e.g. Primzahlen = prime numbers (Appendix C).

Anticipatory Guide: Students will work with a partner to create examples for the mathematical terms, e.g. Primzahlen = prime numbers = 2,3,5,7 etc.

Input/Introduction of new Language: Students will learn vocabulary and verbs related to mathematical terms. Through “Stiller Impuls” students match English and German mathematical terms, e.g. Primzahlen = prime numbers (Appendix C).

Anticipatory Guide: Students will work with a partner to create examples for the mathematical terms, e.g. Primzahlen = prime numbers = 2,3,5,7 etc.

Independent activity: Students will use two 45 minute/one 90 minute block of class time to read the pre-selected paragraphs with their partner, and collaboratively complete the designated tasks.

Enabling activity: Tasks include:

A: reading and interpreting the paragraphs and creating a picture and headline summarizing the content
– or

B: reading and interpreting the paragraphs and creating a dialog based on the content.

A group students present their work in a gallery walk to the class.

B group students present their dialogs to the class.

Formats could include PowerPoint, role play, dialogues and/or interviews, comics, storyboard, Prezi, etc.

Reflection on lesson:

Spotlight exit ticket - students use colored flash cards: green “Das habe ich heute gelernt...”, yellow “Dazu habe ich noch eine Frage...”, red “Das habe ich gar nicht verstanden...”

Chapter 2:

Create a Poster: Students will find information about roman numerals on the web to create a poster.

Setting the Stage: Students will play a card game with Roman and Arabic numerals. The teacher prepares two set of cards with identical Roman and Arabic numbers reflecting historic events e.g. first landing on the moon 1969 = MCMLXIX. Students can use previously created Roman numeral poster to solve the problem. Students research the selected events and create a time line with the cards and share their information with the class (Appendix D).

Input/Introduction of new Language: See Appendix B

Guided practice/participation: Students will be divided into groups of four and read the beginning of chapter two through roman numerals. Each group will then create a “Standbild” with their interpretation of their reading.

Visual and Audiovisual Material: Students will watch selected YouTube clips about the importance of zero and one in math (Appendix A).

Enabling activity: Class will be divided into two groups. One group will read page 35 through 36, other group will read page 37 through 38. Each group will summarize the content and share the information with the classmates, explaining the significance of zero.

Class Reflection on lesson: Exit ticket: students write two equations demonstrating the importance of zero.

Application: Students will write a short monologue in the target language about the importance of the numbers one and zero and display their monologues for the class. They will then orally present their monologues about the importance of zero and one in a gallery walk.

Extension Activities: Create learning activities from additional recommended resource list (Appendix A) Students could create an interview with Robert and/or Zahlenteufel. Students can create headlines for the selected reading passages. And students could create mistakes in equations that their classmates would correct.

Appendix A — *Der Zahlenteufel* Resources

Literatur:

- Auszug 1. Kapitel
http://www.dtv.de/_pdf/blickinsbuch/62015.pdf?download=true

Videoressourcen:

- Die Geschichte der Null
https://www.youtube.com/watch?v=O4_id-i64Fw&feature=youtu.be
- Die zehn besten Zahlen
<http://www.youtube.com/watch?v=jz4ILTQ0HQ8>
- Die Maus – Das binäre Zahlensystem
https://www.youtube.com/watch?v=9l-l_dD6gPQ
Das kleine Ein-mal-eins:
<https://www.youtube.com/watch?v=8sLc9zpvN-8>
Das Ein-mal-Eins mit Hits von Nena
<https://www.youtube.com/watch?v=n9gKotqYAgo>
Brüche addieren – mit vedischer Mathematik (Mathe-Song)
<https://www.youtube.com/watch?v=WS4esRS09iA>
Donald im Land der Mathemagie
https://www.youtube.com/watch?v=agy_TYEW30Y

Arbeitsmittel:

- Double Bubble Arbeitsblatt
- Spiel mit Würfel und Arbeitskarten (Subtraktion, Addition, Multiplikation, Division)

Apps für iPad und iPhone:

- Conni Zahlen 1-10 (Euro 2.99)
- Conni rechnen 1-100 (Euro 2.99)
- Die Schlümpfe – Zählen und Rechnen lernen (Euro 2.99)
- Mathemaschleck (kostenlos – English App Store)

Weitere Literatur:

- „A place for Zero: A Math Adventure“ by Angeline Lopresti. Ein englisches Bilderbuch welches sich mit dem 'Stellenwert' der Null beschäftigt
- „Von Null bis unendlich – die geniale Welten der Mathematik“ von Johnny Ball
"Wie groß ist unendlich?: Knobengeschichten und Denkspiele aus dem Zahlenuniversum" von Christoph Drösser
"Christian und die Zahlenkünstler: ein Mathe-Krimi" von Albrecht Beutelspaner
"Mathe Magie: Verblüffende Tricks für blitzschnelles Kopfrechnen und phänomenales Zahlengedächtnis" von Arthur Benjamin und Michael Shermer (englischer Titel: Secrets of Mental Math)

Weitere Artikel:

- "Null: nicht - oder nichts?"
<http://kira.dzlm.de/132>

Appendix B (für Lehrer) — Wortschatzliste (Seitenangaben dtv Ausgabe Taschenbuch)

Angsthase, der (14)
Anstrengung, die (24)
Aschgraue, das (20)
aufblähen, blähte auf (20)
auslassen, ausließ (36)
ausrechnen, rechnete aus (22)
bieten lassen, ließ sich bieten (42)
Brei, der (24)
brüllen, brüllte (42)
brummen, brummte (25)
bucklig (32)
durcheinanderkommen, kam durcheinander (20)
einfallen, einfiel (21)
Einmaleins, das (38)
elkelhaft (10)
entziffern, entzifferte (33)
fabrizieren, fabrizierte (41, 42)
funkeln, funkelte (14)
Geruch, der (9)
gewöhnlich (41, 44)
glimmrig (11)
Hälfte, die (20)
harmlos (17, 39)
hellwach (30)
Heuschrecke, die (11)
hinzufügen (17)
hoch [hier im Sinne von potenzieren] (40)
hochragen, hochragte (11)
hopsen [hier als multiplizieren, malnehmen] (38, 40)
Kichern, das (29)
Kindesmisshandlung, die (14)

klebrig (22)
krumm [hier im Sinne von ungerade]
misstrauisch (21)
Motte, die (29)
murren, murrte (30)
nächsthöher (17)
Nachtfalter, der (29)
nix (34)
plagen, plagte (14)
Propeller, der (17)
Protest, der (12)
protestieren, protestierte (22)
raffiniert (32)
recht haben, hatte recht (17)
reinlegen, reinlegte (14)
Rutsche, die (9)
rutschen, rutschte (10)
Sauerampferblatt, das (11)
etw. satt haben hatte satt (9)
schätzungsweise (16)
schlaftrunken (9)
schmieren, schmierte (auch hinschmierern S.42) (18)
schnappen, schnappte (25)
Schnurrbart, der (16)
schräg (29)
schrumpfen, schrumpfte (34)
schweißnass (9)
schwellen, schwoll (16, 42)
schwindlig (17)
Spazierstock, der (15)
streiten, stritt (42)
summen, sumnte (29)
trampeln, trampelte (14)
Trottel, der (42)

überflüssig (16)
umständlich (21, 40)
unausstehlich (42)
unendlich (16, 44)
Unendliche, das (16)
unheimlich (14)
unmöglich (46)
Unsinn, der (35)
unvernünftig (44)
Unverschämtheit, die (25)
Viertel, das (19)
verflixt (36)
verschlucken, verschluckte (9)
verschwinden, verschwand (21)
verständnislos (42)
sich wehren, wehrte (10)
wert sein (41)
widerlich (30)
winzig (20)
wirbeln, wirbelte (15)
zerfließen, zerfloss (24)
zerplatzen, zerplatze (25)
Ziffer, die (35)
x-beliebig (41)

optionaler erweiterter Wortschatz

abhaben können, konnte abhaben (19)
abkriegen, abgekriegt (19)
etw. abnehmen, etw. abgenommen (21)
altmodisch (33)
benommen (44)
Betrug, der (10)
beruhigen, beruhigte (38)
brüten, brütete (12)

eingebildet (44)
enorm (30)
entsetzlich (16)
Friedhof, der (33)
genüsslich (38)
geschmiert (40)
griffbereit (10)
grundfalsch (42)
Halm, der (14)
heranrobben, heranrobbte (34)
hernehmen, nahm her (22)
hervorstößen, hervorstieß (25)
klappen, klappte (24)
Knauf, der (15)
niederlassen, niederließ (12)
patschen, patschte (23)
Pipifax (44)
reichen, reichte (11)
Reklame, die (18)
selbstzufrieden (32)
sonderbar (22)
stöhnen, stöhnte (33)
übermütig (44)
unappetitlich (9)
verächtlich (38)
verdächtigt (18)
wanken, wankte (10)
zerlaufen, zerlief (18)
zermalmen, zermalnte (12)
zerquetschen, zerquetschte (44)

Redewendungen

aufs Glatteis führen (36)
aufs Kreuz legen (26)

blutiger Anfänger (25)
den Geist aufgeben (24)
der Groschen fällt (42)
sich im Kreis drehen (44)
mein lieber Schwan! (14)
meinetwegen (19)
Pfui Teufel!(24)
wie aus der Pistole geschossen (37)
Zeit totschiagen (12)
zu Kräften kommen (46)

Appendix C — 1. Arbeitsphase - Stiller Impuls: (45 Minuten)

Stiller Impuls: (10 Minuten)

Karten werden an der Tafel angebracht oder auf dem Boden ausgelegt. Die Schüler erhalten einen „Redeball“ der still an den nächsten Freiwilligen weitergegeben wird. Dieser Ball zeigt den nächsten Schüler an, der das nächste Kartenpaar ohne zu reden finden soll. Ball wird solange weitergereicht bis alle Paare gefunden wurden..

1. Karten mit deutschen Mathebegriffen den Karten mit englischen Mathebegriffen zuordnen

Mathebegriffe:

Addieren (addition), Subtrahieren (subtraction), Dividieren (division), Multiplizieren (multiplication), Brüche (fraction), gerade (even numbers) und ungerade Zahlen (uneven numbers), Primzahlen (prime numbers), Dezimalzahlen (decimals), Hopsen / Potenzieren (exponents), natürliche Zahlen (natural numbers), imaginäre Zahlen (imaginary numbers), rationale Zahlen (rational numbers), negative Zahlen (negative numbers), Null (zero), Kanten (edge), Linien (lines), Knoten (knot), Ecken (vertex), Vielecke (polygons), Winkel (angle), Unendlich (infinite), Würfel (cube), Wurzel (radical), Stellenwert (place value)

2. Partnerarbeit: Beispiele zu jedem Vokabular aufschreiben (10 Minuten)
3. Beispiele aufteilen in leicht, mittel und schwer (grün, gelb, rot) (5 Minuten)
4. Anschliessende Besprechung des neuen Vokabulars und Sicherung durch Aufschreiben. (10 Minuten)

Appendix D — 2. Arbeitsphase - Spiel: (45 Minuten)

1. Karten mit römischen und arabischen Jahreszahlen (Bezug zu geschichtlichen Daten) austeilen und Partner finden; d.h. arabische Zahl sucht römische Zahl
Optionale Hilfestellung: Poster mit den römischen Zahlen aufhängen
2. Im Internet den geschichtlichen Bezug recherchieren
3. Karten als Zeitleiste auslegen und Jahreszahl mit geschichtlichem Bezug vorstellen
4. Einzelarbeit / Arbeitsblatt (01AB Zahlenteufel Ausgangsticket)

Students will play a card game with Roman and Arabic numerals: teacher prepares two set of cards with identical Roman and Arabic numbers reflecting historic events e.g. first landing on the moon 1969 = MCMLXIX. Students can use previously created Roman numeral poster to solve the problem. Students research the selected events and create a time line with the cards and share their information with the class.

Appendix E — *Der Zahlenteufel* Rubric Written Presentational

Name _____ Punkte: _____/25 Note: _____

	Emerging 0 1	Progressing 2 3	Proficient 4 5	Outstanding 6
Comprehensibility	Text barely comprehensible	Text mostly comprehensible, requiring interpretation on the part of the reader	Text comprehensible, requiring minimal interpretation on the part of the reader	Text readily comprehensible, requiring no interpretation on the part of the reader
Structures	Predominant use of fragments, no or almost no cohesive devices	Use of mostly complete sentences, some repetitive, few cohesive devices	Emerging variety of complete sentences, though not always successfully, some cohesive devices	Variety of complete sentences, and of cohesive devices
Vocabulary	Limited or inaccurate use of vocabulary	Somewhat inadequate and/or inaccurate use of vocabulary, too basic for this level	Adequate and accurate use of vocabulary for this level	Rich use of new and familiar vocabulary
Mechanics	Makes excessive basic errors in subject-verb agreement, tenses, spelling, punctuation and/or capitalization	Somewhat inaccurate use of verbs, tenses, spelling, punctuation and/or capitalization errors may impede comprehensibility	Mostly accurate use of verbs, tenses, spelling, punctuation and/or capitalization, errors do not impede comprehensibility	Few or no errors in verbs, tenses, spelling, punctuation and/or capitalization
Content	Inadequate treatment of the topic, includes no or little supporting details	Mostly competent treatment of the topic, includes few supporting details	Effective treatment of the topic, includes some supporting details	Thorough treatment of the topic, includes many supporting details

Created by Debbie Hennel, Edited by Angelika Becker, Rubrics by Greer Trapkus-Harris

Appendix F — *Der Zahlenteufel* Rubric Spoken Presentational

Name _____ Punkte: _____/25 Note: _____

	Emerging 0 1	Progressing 2 3	Proficient 4 5	Outstanding 6
Pronunciation	Difficult to understand	Frequent errors	Comprehensible, good pronunciation	Comprehensible, excellent pronunciation
Communication in a realistic setting	Incomprehensible, inadequate, inappropriate	Generally comprehensible, limited in detail	Comprehensible for the most part, somewhat detailed	Comprehensible, Varied in detail Develops topic in detailed and very comprehensive manner with original thoughts
Vocabulary	Is difficult to comprehend, limited vocabulary, and /or used incorrectly	Some significant errors, adequate use of new vocabulary	Occasional errors do not impede comprehensibility, good and accurate use of vocabulary	Nearly free of errors, rich use of new and old vocabulary
Fluency	An awkwardness of expression, speech does not flow, incomplete thoughts, hard to follow	A limited ease of expression, speech flows smoothly only some of the time, occasionally hard to follow	A ease of expression, speech flows smoothly most of the time, complete thoughts, very comprehensible	An obvious ease of expression, speech that predominantly flows smoothly, completely comprehensible
Grammar/Verbs Appropriate for Level	Makes excessive basic errors using verbs, excessive errors with tense	Makes significant basic errors using verbs, significant errors with tense	Mostly uses verbs correctly, occasional errors with tenses, do not impede comprehensibility	Consistently uses verbs correctly, appropriate tense, very few other vocabulary errors

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Appendix G — Short Vocabulary List

Essential vocabulary for students

s. wehren (10)

rutschen (11)

hochragen (11)

glimmrig (11)

zermalmen (12)

funkeln (14)

überflüssig (16)

die Ziffern (21)

kichern (29)

buckelig (32)

hopsen (38)

zerquetschen (44)

übermütig (44)