Vulnerability in Adult Life – and how it affects Numeracy Practices

Findings from the German Level-One Survey 2018 and the Hamburg Numeracy Project

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Outline

• What do we mean by Vulnerability and Numeracy?
• Vulnerability has many faces: The LEO Level-One Survey
• The Hamburg Numeracy Project
• Conclusion: Much more than basic calculation!
What do we mean by Vulnerability and Numeracy?
Vulnerability

- Not a dichotomy, but a continuum (c.f. Castel 2000)
- Vulnerability of social groups that still participate but are at increased risk of exclusion (Streich 2009).
- In feminist discourse, vulnerability is regarded as a human condition (Butler 1998), although there are also groups here that are more precarious (Janssen 2017).
Numeracy ....

... how do we understand it?

1. Is numeracy merely the **easiest** part of mathematics, like basic calculation? (functional)
   -

2. Is numeracy only about **practical** uses and thus worth less than mathematics? (applied)
   +

3. Is numeracy just rough **estimation** and no real use of formulas and calculation? (estimation)
   +

4. Is numeracy just normative and **political** while mathematics is neutral? (critical)
   +
Numeracy - neutral and boring or critical and emancipatory?

• 1522 Adam Ries, second arithmetic book (preface): "So that the poor common man is not cheated when buying bread" (cf. Deschauer 2013, p. 155).

• **Roman numbers >> decimal system**

• merchants and crafts profited from it

• Bible translation (1522-45) and **Lutheran reforms** (1517), **Book printing** of both the Luthers bible and the Ries‘ arithmetic book at that time spread literacy and numeracy.

• **Aim: educate the people**, protect them from overexploitation by churches or merchants.
Vulnerability has many faces: LEO – Level One Survey (2018)
Vulnerability has many faces – LEO Level-One Survey 2018

**LEO**: n=7,192, representative for 18-64 year old, german speaking population

Literacy test (PIAAC Level 1 roughly equivalent to Alpha-Levels 1-3)

Literacy **Practices** and **Competences** (functional and critical (!))

Closer look: Literacy and Numeracy Practices mix!

Findings:

- Low income, precarious jobs, less knowledge on workers‘ rights
- **Financial N.**: difficulties with contracts, credit and tax declaration
- **Health N.**: Insecurity on health-related working and housing conditions,
- **Political N.**: insecurity concerning government, politics, trade unions
- **Digital N.**: Insecurity about online job/partner/apartment search engines, disinformation and data grabbing
FINANCIAL VULNERABILITY: MAKING ENDS MEET

Percentage of people who (tend to) cope poorly with their household income

Quelle: Universität Hamburg, LEO 2018 – Leben mit geringer Literalität
Basis: Deutsch sprechende Erwachsene (18-64 Jahre) (n=7.192).
FINANCIAL VULNERABILITY: VACATION AWAY FROM HOME

Percentage of people who, for financial reasons, cannot spend a week's holiday away from home each year.

- **Alpha 1-3**: 46.5%
- **Gesamtbevölkerung**: 17.9%

Quelle: Universität Hamburg, LEO 2018 – Leben mit geringer Literalität
Basis: Deutsch sprechende Erwachsene (18-64 Jahre) (n=7.192).
is not cheated when buying bread” (Adam Ries, 1522)
CRITICALLY SCRUTINIZING: FINANCIAL COMPETENCES

Percentage of those who consider the activity to be difficult or very difficult for themselves

So that the poor common man is not cheated when buying bread” (Adam Ries, 1522)

assess risk of online banking

- 26.9%
- 39.8%

assess (dis)advantages of instalment purchases

- 19.9%

Quelle: Universität Hamburg, LEO 2018 – Leben mit geringer Literalität
Basis: Deutsch sprechende Erwachsene (18-64 Jahre) (n=7.192).
DID YOU EVER SEARCH FOR INFORMATION ABOUT YOUR EMPLOYEE/WORKERS RIGHTS?

„So that the poor common man is not cheated when buying bread“ (Adam Ries, 1522)

Is it easy or difficult for you to assess how your working conditions affect your health?

- (Eher) einfach: 65,5% (Eher) schwierig: 29,6%
- Keine Angabe/Weiß nicht: 4,8%
- Gesamtbevölkerung: 86,6%

Basis: Deutsch sprechende Erwachsene (18-64 Jahre), die angeben erwerbstätig zu sein, n= 5578.
Is it easy or difficult for you to judge how your housing contributes to staying healthy?

- (Eher) einfach: 84,0%
- (Eher) schwierig: 13,4%
- Keine Angabe/Weiß nicht: 2,6%

Basis: Deutsch sprechende Erwachsene (18-64 Jahre), n=7192, gewichtet.
Do you dare to take an active part in a discussion on political issues?

- ohne Schwierigkeiten: 25,5% (ohne Schwierigkeiten, 47,0% (Gesamtbevölkerung))
- mit gewissen Schwierigkeiten: 22,5% (ohne Schwierigkeiten, 28,5% (Gesamtbevölkerung))
- mit großen Schwierigkeiten: 21,1% (ohne Schwierigkeiten, 12,5% (Gesamtbevölkerung))
- gar nicht: 9,8% (ohne Schwierigkeiten, 28,1% (Gesamtbevölkerung))

Basis: Deutsch sprechende Erwachsene, n=7.192
Antwortmöglichkeiten: ohne Schwierigkeiten, mit gewissen Schwierigkeiten, mit großen Schwierigkeiten, gar nicht, weiß nicht
Do you have the confidence to represent your own opinion in a dispute with an office/authority?

<table>
<thead>
<tr>
<th>Schwierigkeiten</th>
<th>Ohne Schwierigkeiten</th>
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PROPORTIONS OF PEOPLE WHO DO NOT DARE OR ONLY WITH GREAT DIFFICULTY FEEL CONFIDENT TO HANDLE...

<table>
<thead>
<tr>
<th>Activity</th>
<th>Alpha 1-3</th>
<th>Gesamtbevölkerung</th>
</tr>
</thead>
<tbody>
<tr>
<td>...online job boards</td>
<td>36,0%</td>
<td>10,2%</td>
</tr>
<tr>
<td>...online partner searches</td>
<td>39,3%</td>
<td>13,5%</td>
</tr>
<tr>
<td>...online apartment search</td>
<td>32,9%</td>
<td>10,4%</td>
</tr>
</tbody>
</table>

Quelle: Universität Hamburg, LEO 2018 – Leben mit geringer Literalität
Basis: Deutsch sprechende Erwachsene, die zumindest gelegentlich das Internet nutzen (18-64 Jahre), (n=6.894).
PERCENTAGE OF PEOPLE FOR WHOM IT IS (RATHER) DIFFICULT TO JUDGE...

whether news on the internet is credible

- 44.1% (Alpha 1-3)
- 21.5% (Gesamtbevölkerung)

whether a text is advertisement or information

- 48.2% (Alpha 1-3)
- 25.0% (Gesamtbevölkerung)

why free online services collect user data

- 61.3% (Alpha 1-3)
- 42.5% (Gesamtbevölkerung)

Quelle: Universität Hamburg, LEO 2018 – Leben mit geringer Literalität
Basis: Deutsch sprechende Erwachsene, die zumindest gelegentlich das Internet nutzen (18-64 Jahre), (n=6.894).
As said before: Vulnerability has many faces – LEO 2018

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• Digital N.: Insecurity about online job/partner/apartment search engines, disinformation and data grabbing
The Hamburg Numeracy Project
Research projects within the Hamburg Numeracy Project

**Adult numeracy in Large-Scale Assessments**
Prof. Dr. Anke Grotlüschen
Alina Redmer
Luise Krejcik
(University of Hamburg)

**Numeracy of the post-war generation in Hamburg**
Prof. Dr. Christine Zeuner
Dr. Antje Pabst, Dr. Melanie Benz-Gydat, (University of the Armed Forces)

**Development of numeracy and literacy test items for Large-Scale Assessments**
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(Hamburg University of Applied Sciences)

**Numeracy practices and learning disability**
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**Numeracy and refugees**
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Maike Lüssenhop
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Findings

• Have demands for and complexity of numeracy practices risen or declined since the 1990ies?

Trends regarding Numeracy Competences and Numeracy Practices:

• Numeracy Competences decline according to several surveys (Skills for Life UK 2003 / 2007, IVQ France 2004/2009, ALL 2000 / PIAAC 2012)
• Numeracy Skill Uses (a rough equivalent for numeracy practices) decline as well (Redmer, Dannath, ZDM (2),2020)

Why is that so?

• Technology, invisibility, math anxiety, feeling of irrelevance of mathematics
• No awareness for control society, big data, algorithmics, automatisation, extreme relevance of statistics for political claims
Vulnerability in terms of ageing

How do adults handle a lower level of income after retirement?

- Elderly apply **numeracy practices** more often around retirement (stats: Redmer and Grotlüschen 2019; qualitative interview with 64-93-year-olds; Benz-Gydat et al. (2), 2020).

- Retirement poses new challenges. This leads to **private accounting** and **systematic saving** (for new glasses or something unexpected).
Vulnerability in terms of Gender

• “Whatever women do they must do twice as well as men to be thought half as good. Luckily, this is not difficult.” — Charlotte Whitton, Novelist, Canadian feminist and mayor of Ottawa 1951

• European Women: chances of 60% (range: 39% Czech Rep, 79% Norway) to get a leadership position **compared to same-skilled men** in terms of **numeracy**, everything else being equal. n.s.d. in Greece, Germany, Ireland. (Heilmann, Lisanne M., (2020): “Reproducing social difference in the concept of ‘numeracy skills’” in: CERME Conference Proceedings).

• So, yes, it is still necessary doing things nearly twice as well to get a leadership position. Is that difficult? Well, yes, if you also care for the housework.
Numeracy practices in higher age (n=1338)

Frequency of calculating prices, costs and budgets

Frequency for reading financial statements

Women care for „small money“

Men care for „big money“

Source: Redmer 2019, on the basis of CiLL data (GESIS)
What does small/large money management mean?

It is about gendered power relations.

- Small money indicates responsibility for the household, everyday budgeting, paying caregivers and cleaners.
- Big money indicates breadwinning, handling mortgages, savings, tax declarations and more valuable possessions like cars or furniture.

Is that the same for younger generations?

- Division of labor shifts, for sure. Women more often enter the labor market, work, have their own income and handle „big money“. But:
- „Probably the most striking resemblance between all countries is the fact that regardless of women’s position in the labor market, women remain responsible for the family (Fuwa 2004). Regardless of their employment status, women still do more housework than men (Bianchi et al. 2000; Gershuny and Robinson 1988)“ (Lippe, Tanja van der, 2010, p. 42-46).
Over-indebtedness = not being able to pay back a debt over a longer period of time

Technological development makes numeracy invisible,
- making it easier to apply but
- harder to keep track of (Angermeier & Ansen, 2019; Gellert & Jablonka, 2007)

The tighter the budget,...,
- the more often people calculate prices, costs and budgets
- but not with technical devices (Grotlüschen et al., 2019)
Are debt and homelessness caused by not controlling your budget?

Table 2. Frequency of Selected Numeracy Practices by Vulnerable Subgroups.

<table>
<thead>
<tr>
<th>Numeracy practices</th>
<th>OECD (n = 5,465)</th>
<th>Germany (n = 217)</th>
<th>Unemployed (n = 4,068)</th>
<th>Employed (n = 562)</th>
<th>Long-term unemployed (n = 562)</th>
<th>Homeless or overindebted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculating prices, costs, or budgets</td>
<td>2.79 (0.03)</td>
<td>2.90 (0.03)</td>
<td>3.3 (0.12)</td>
<td>2.79 (0.03)</td>
<td>3.09 (0.07)</td>
<td>3.33</td>
</tr>
<tr>
<td>Using a calculator</td>
<td>2.82 (0.02)</td>
<td>2.79 (0.02)</td>
<td>2.67 (0.01)</td>
<td>2.79 (0.02)</td>
<td>2.3 (0.06)</td>
<td>2.22</td>
</tr>
<tr>
<td>NUMHOME (index)</td>
<td>2.00 (0.02)</td>
<td>2.05 (0.02)</td>
<td>2.05 (0.10)</td>
<td>2.00 (0.02)</td>
<td>1.69 (0.05)</td>
<td>NA</td>
</tr>
</tbody>
</table>

Note. OECD = Organisation for Economic Co-operation and Development. Not available (NA) because not all variables have been used in this survey. Means of frequencies on a scale from 1 (never) to 5 (every day) and standard errors are in parenthesis.

Table 2. Frequency of Selected Numeracy Practices by Vulnerable Subgroups, DOI: (10.1177/0741713619841132)
Vulnerability in terms of Forced Migration

How confident do Syrian refugee students feel towards mathematics?

• TIMSS (2011): None of the Syrian and Jordanian students reached the highest level (Luessenhop & Kaiser 2020).

• But: *attitudes* and *appreciation for learning mathematics*, as well as the reported *self-confidence* in mathematics in Iran, Jordan, Lebanon and Syria, are higher than in the comparative countries (ibid.).

• Survey population from 2011 is now in their early twenties and fall into the largest age group of post-2015 refugee migration (ibid., p. 8).

• A corresponding qualification is particularly necessary for entry into vocational education and training and the labour market.
Numeracy in the Sustainable Development Goals

SDG 4, "Ensure inclusive, equitable and quality education and lifelong learning opportunities for all"

- school education (4.1),
- early childhood education (4.2),
- vocational and higher education (4.3),
- competences for good work (4.4),
- gender justice and inclusion (4.5),
- universal literacy and numeracy (4.6): "By 2030, ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy" (SDG 4.6)
- global citizenship (4.7).

Global Alliance for Monitoring Learning (GAML) - UIS/UIL start massive testing industry, datafication, monopolisation of definitions and instruments instead of indigenous knowledges.
Conclusion: Much more than basic calculation!
We do not only need functional numeracy like basic calculation.  

**We need critical numeracy in every single domain!**

**Political Numeracy:**

- **NOT:** „go and vote“ (one of the parties who equally don’t do anything for you)
- **BUT:** oppose government control, scrutinize evidence-based monitoring, compile stats for claiming equal rights, negotiate social benefits, oppose low taxation of companies and super-rich, advocate for inclusion of disabled in the statistics, advocate for AET for low numerate adults (Krejcik et al.)

**Financial Numeracy:**

- **NOT:** „save and get along with your money“ (even if one can’t make a living on social benefit)
- **BUT:** negotiate salaries (Yasukawa 2018) and social benefits, tell advertisement from information (LEO 2018), see how companies try to trick with understandable contract offers (Evans, Yasukawa, Mallows, Creese 2017), see gender relations in money management (Redmer 2019, Lave 1988)
We do not only need functional numeracy like basic calculation.

**We need critical numeracy in every single domain!**

**Health Numeracy:**

- **NOT:** „Five green leafy vegetables a day!“ or „eat apples and go running“ (as if it were your fault when you get ill)
- **BUT:** oppose giving tracking system data to health insurances (Yasukawa, Evans, ZfW (3)2019), advocate for better housing (LEO 2018), criticize fast food chains in low-income neighborhoods, claim regular working hours and less time pressure

**Digital Numeracy:**

- **NOT:** „use online banking“ „use online government services“ (and don’t ask for a person that explains things to you)
- **BUT:** ensure data ownership (Alexa!), understand how algorithms feed our filter bubbles and how to hack them (Smythe, 2017), oppose recruiting algorithms in HRD (Smythe, Grotlüschen in prep.) and learning analytics in Universities
Upcoming Publications & Special Issues (in English/German)
Thank you for your attention!

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Zeuner, C., Pabst, A., & Benz-Gydat, M. "I have to do something for my body and also for my mind": Numeracy practices as a strategy against vulnerability in old age - First results of an explorative study. ZDM, 2020.