"WHY DO I HAVE TO LEARN THIS?"

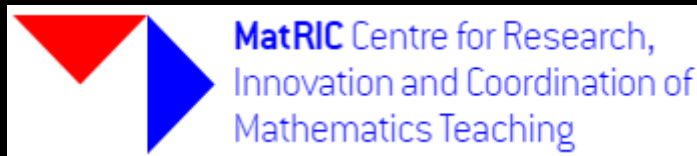# AN EXPLORATION OF 'RELEVANCE' IN MATHEMATICAL MODELLING EDUCATION

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STRUCTURE OF THE PRESENTATION

- Introduction

- Literature review

- Theoretical embedding (ChAT)

- Two illustrative cases

- Discussion/Conclusion

INTRODUCTION

- "Position paper" – not a report of an empirical data collection

- Relevance – in mathematical modelling education: What is it, what does it do, where do we find it?

WHAT IS RELEVANCE?

Relevance is about answering questions:

- 'Why do I have to learn this?'

or

- 'What is the value of this?'

Is this a definition?
Relevant to whom?

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"RELEVANCE" IN THE LITERATURE

KELLER (1983)

- Relevance is a student's perception of whether the content or the instruction of a course satisfies his/her personal needs, goals or career aspirations.

3 subcategories of relevance:

1. goal orientation: meet the learner's needs by providing statements or examples of the utility of the instructi...
2. motive matching: make the instruction resp... ...er motives and values)
3. familiarity: tie the instruction to the learners... providing concrete examples and analogies

Relevance as a connection

ERNEST (1994)

- Relevance is a ternary relation between three things: (R, P, G).

    - R is a situation, an activity or an object to which relevance is ascribed.

    - P is a person or group of people who ascribes relevance to R.

    - G is a goal which embodies the values of P in this instance.

- For example school mathematics (the object R) is said to be relevant "by many politicians and educational leaders (the group P) with the aim (the goal G) of increasing the mathematical competence and technologi... ated employment skills of the population (which is assu... ...nomic output and national prosperity)" (p. 315).

Ernest, P. (2004). Relevance versus utility: some ideas on what it means... Clarke et al. (eds.), *International perspectives on learning and teaching ma...matics* (pp... Göteborg: National Center for Mathematics Education, NCM.

Missing: Who is engaged in the activity?

NISS (1994): RELEVANCE PARADOX

- The objective relevance of mathematics in society contrasts with its subjective irrelevance as perceived by many students.

- The function of mathematics in society contrasts with mathematics in the classroom

- Students experience a lack of connection (subjective irrelevance).

Wedege (2007) did research on adults learning mathematics

Distinction between
Why do <u>we</u> have to learn this?   and   *Why do <u>I</u> have to learn this?*

RELEVANT IS **NOT** THE SAME AS

- **enjoyable**
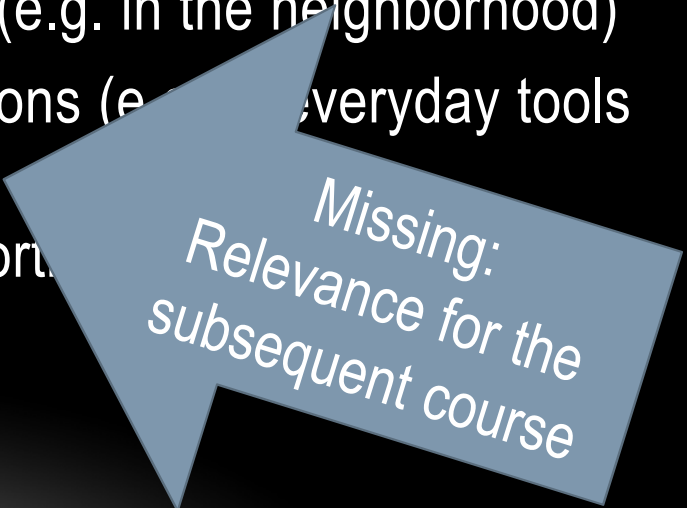
- **meaningful**

- **interesting**

SURVEYS ON RELEVANCE OF MATHEMATICS

- Many 14–16-year-olds think that the mathematics they are taught at school is useful only in mathematics lessons and for examinations.

- The extent to which students think that mathematics would be useful in their future careers (in the workplace) depends upon which school they attend rather than on their career aspirations.

Onion (2004), Musto (2008)

RESEARCH ON RELEVANCE IN ADULT LEARNING AND CORPORATE TRAINING

- There is a strong correlation between perceived relevance and motivation to learn.

- Establishing relevance by:

  - showing how theory can be applied in practice (e.g. in the workplace)

  - establishing relevance to local cases (e.g. in the neighborhood)

  - relating material to everyday applications (e.g. everyday tools such as phones)

  - finding applications in current newswort an eclipse..).

Keller (1987), Kember, Ho & Hong (2008)

Missing: Relevance for the subsequent course

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Relevance of mathematics in engineering

- Asked higher year students to make a video to show the relevance of math for first year students

- E.g. the civil engineering video shows how math is applied in the construction of a high-rise building and touches on the topics of trigonometry, algebra, vectors, differentiation and integration
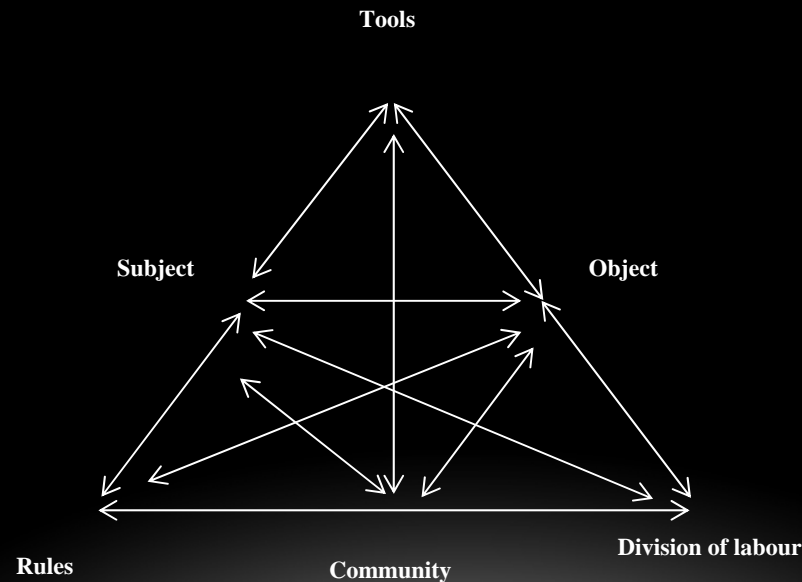
Loch & Lamborn (2015)

Relevance = use value

THEORETICAL FRAME

- 'Why do I/we have to learn this?' - motive for engagement

- Wells (2011) distinguishes between the motive of the activity (collective) and the motivation of the subject (individual).

- The structure of human activity system (Engeström, 1987)

Tools

Subject

Object

Rules

Community

Division of labour

- Relevance is located in the relationship between the subject and other elements of an activity system

SCHOOL

SOCIETY

RELEVANCE IS

- a property of an activity (task, topic, a chapter, an afternoon session, mathematics in general, etc)

- a judgment by somebody (me, students, teachers, society), who can be the subject of the activity or not

- Relevance is a connection to a motive that drives the activity (added value) with a perspective on the future

  - Short term: I need it for the exam (educational need, exchange value)

  - Long term: I need it later as engineer (professional need, use value) or: They need it to become critical citizens (person-need, use value)

DEFINING RELEVANCE

activity	carried out by	motive	relevance judged by

Two illustrative cases

CASE A: UNDERGRADUATE MATERIALS ENGINEERING MODULE

- Modelling tasks with an emphasis on the development of employability skills: group work, communication skills, presentation skills.

- Guest speaker from Rolls Royce who uses mathematics everyday (e.g. regression and other statistical methods).

- Modelling tasks are judged relevant for future career (use-value)

- Development of employability skills is judged relevant for future (use-value)

# 'RELEVANCE' IN CASE A

- Guest talk

DISCUSSION OF 'RELEVANCE' IN CASE A

activity	carried out by	motive	relevance judged by
Engineering modelling tasks	Students	acquiring useful skills – related to mathematics - that can make students more employable in the future.	• Lecturer • Most students
Talk by guest speaker	Guest speaker	(idem)	• Most students • Lecturer

	Relevant	Irrelevant
Interesting		Case A (some students)
Not Interesting	Case A (most students)	

CASE B: SECONDARY SCHOOL STUDENTS GO ON A "MATHEMATICS EXCURSION"

- Excursion "Railway Timetable" for secondary school students to a university

- Connect to mathematics used and created by research mathematicians

- Connects to Graph Theory (Discrete Mathematics)

- In 2007 the Dutch Railways (NS) renewed their time table with help of mathematics researchers from University of Amsterdam
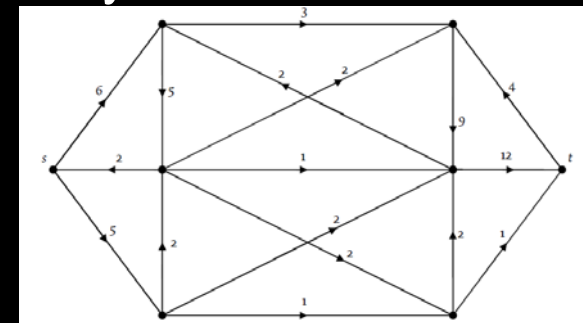
EXCURSION
"RAILWAY TIME TABLE DYNAMICS"

- Excursion to UvA for groups of pre-university students (grades 11-12), max 20 students

- Full day (10.00-15.00h)

- Supervised by UvA student

- Video conferencing with NS-spokesperson

- Laptops with planning software

- One task for the whole day:

EXCURSION
"RAILWAY TIME TABLE DYNAMICS"

http://www.youtube.com/watch?v=4V4k57oQdks

DISCUSSION OF 'RELEVANCE' AND 'BEING INTERESTING'

activity	carried out by	motive	relevance judged by
Excursion	Students	Learn about the use of mathematical research in society	Students, teachers, spokesperson of Railways, university staff

Interesting:

- Very!

	Relevant	Irrelevant
Interesting	Case B	
Not Interesting		

DISCUSSION

- Relevant ≠ interesting

Other parts of the activity can mediate relevance:

- An enthousiastic teacher can clarify connections

- Identity mediates relevance ("personal")

- Authenticity mediates relevance (outside of the institution)

- Modelling can mediate relevance, but not persé

- Future research

Thank you