TU Delft

Dropout rates of regular courses and MOOCs

24-7-2016

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Outline presentation

1. *MOOCs at TUDelft*
2. *High dropout rates of MOOCs*
3. *Possible reasons for high dropout*
4. *Psychological assessment*
5. *Didactical solutions high dropout rate*
6. *Examples use of social media*

MOOCs at Technical University of Delft (DUT)

WHY **MOOCs ?** (Arno Smets-TUD)

MOOCs are not for everyone but for many

Pioneering Education

- Insight in learning behaviour
- New teaching tools
- Improving performance of students
- Cost effective
- Replacement for lectures
- Continuing education

Marketing

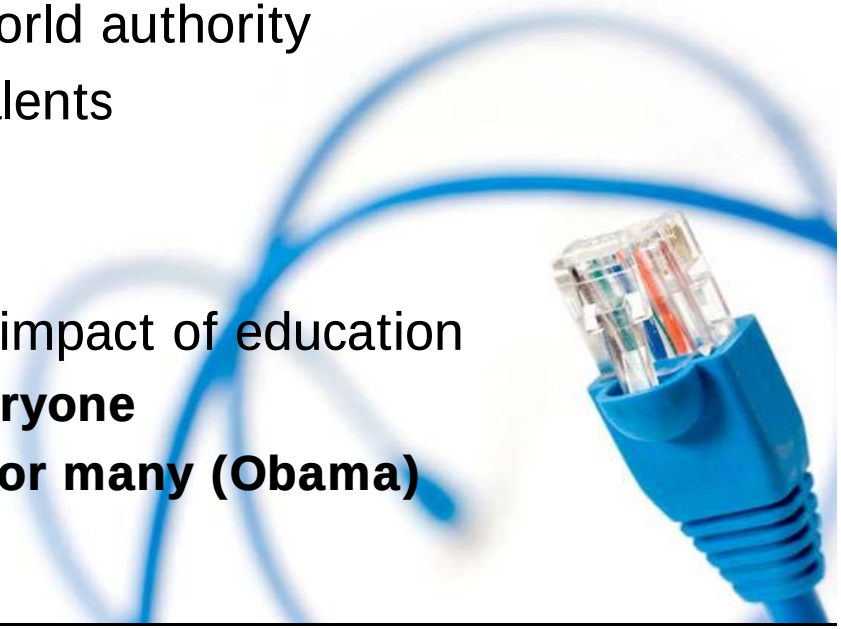
Showing world-top education
Positioning of Brand TUDelft
Claiming world authority
Scouting talents

Idealistic

Increasing impact of education

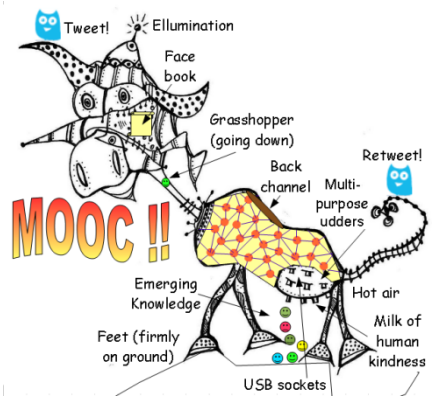
Equal educational opportunities for everyone

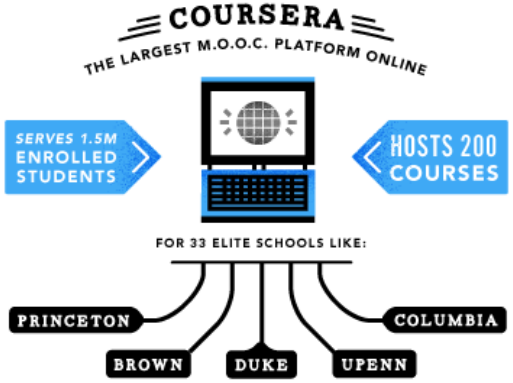
MOOCs are not for everybody but for many (Obama)



MOOCs platforms

Anke Mulder-TUD





Platform

(Anke Mulder-TUD)

- Harvard
- MIT
- Berkeley
- TU Delft
- Lausanne
- Wellesley College
- Georgetown University
- McGill

- Australian National University
- University of Texas Systems
- Rice
- University of Toronto

http://ocwconsortium.org

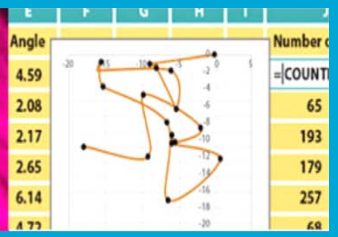
DelftX MOOCs


Next Generation Infrastructures


Next Generation Infrastructures


Drinking Water Treatment


Functional Programming



Data Analysis to the MAX()


Delft Design Approach

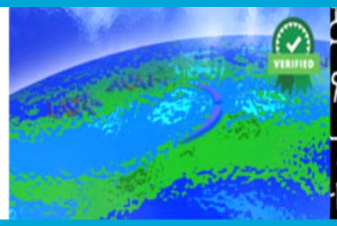

Industrial Biotechnology


Introduction to Solar Energy


Responsible Innovation


Treatment of Urban Sewage


Credit Risk Management


Introduction to Water & Climate


Creative Problem Solving


Aeronautical Engineering


The Basics of Transport Phenomena


Framing


Topology in Condensed

Pre-University


Circular Economy

TUDelft

Delft-Blue MOOCs centre (Frans van Dam-TUD)

Virtual University in the Netherlands

(Frans van Dam-TUD)

European MOOCs centre (Wikepedia)

Is it possible to set up a European equivalent of edX, Coursera, etc. ?

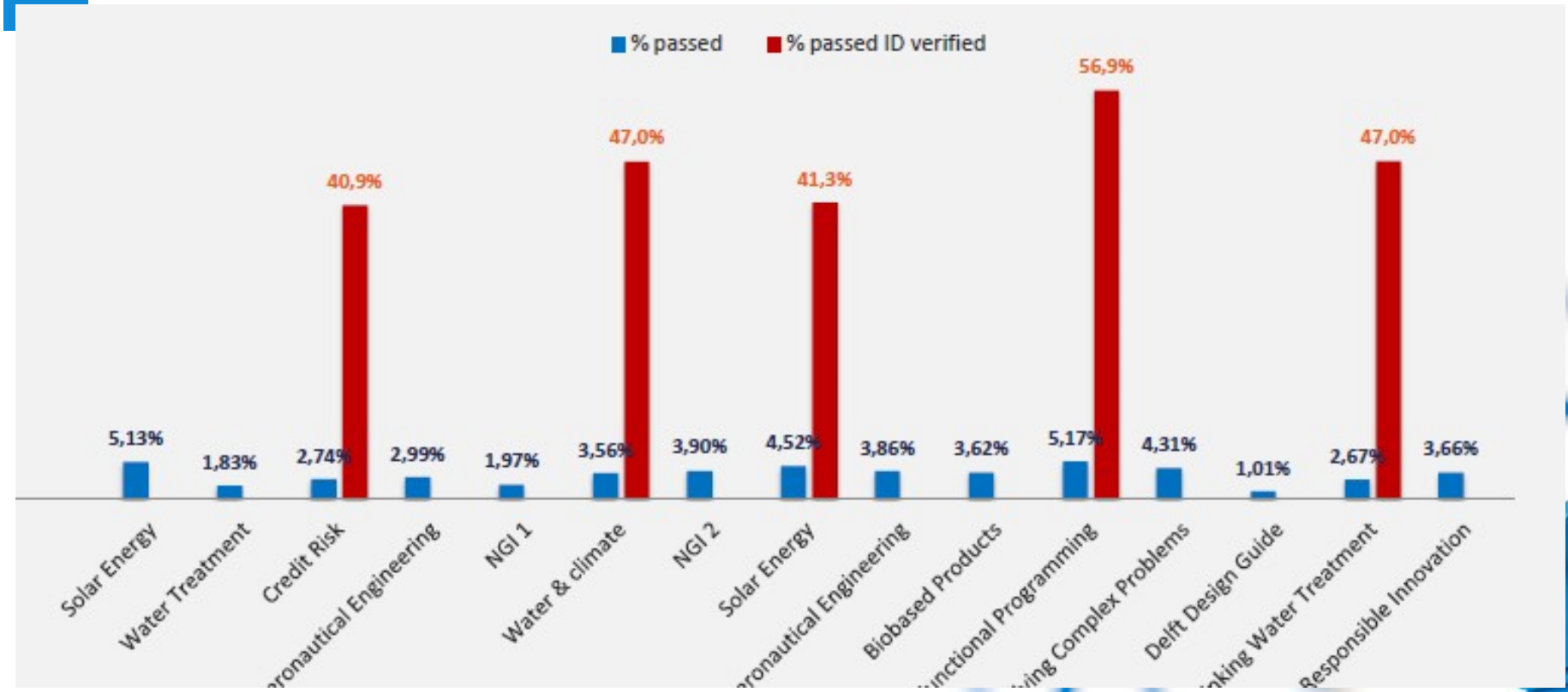
Why are dropout rates of MOOCs so high ?

Two MOOCs as examples (TUD)

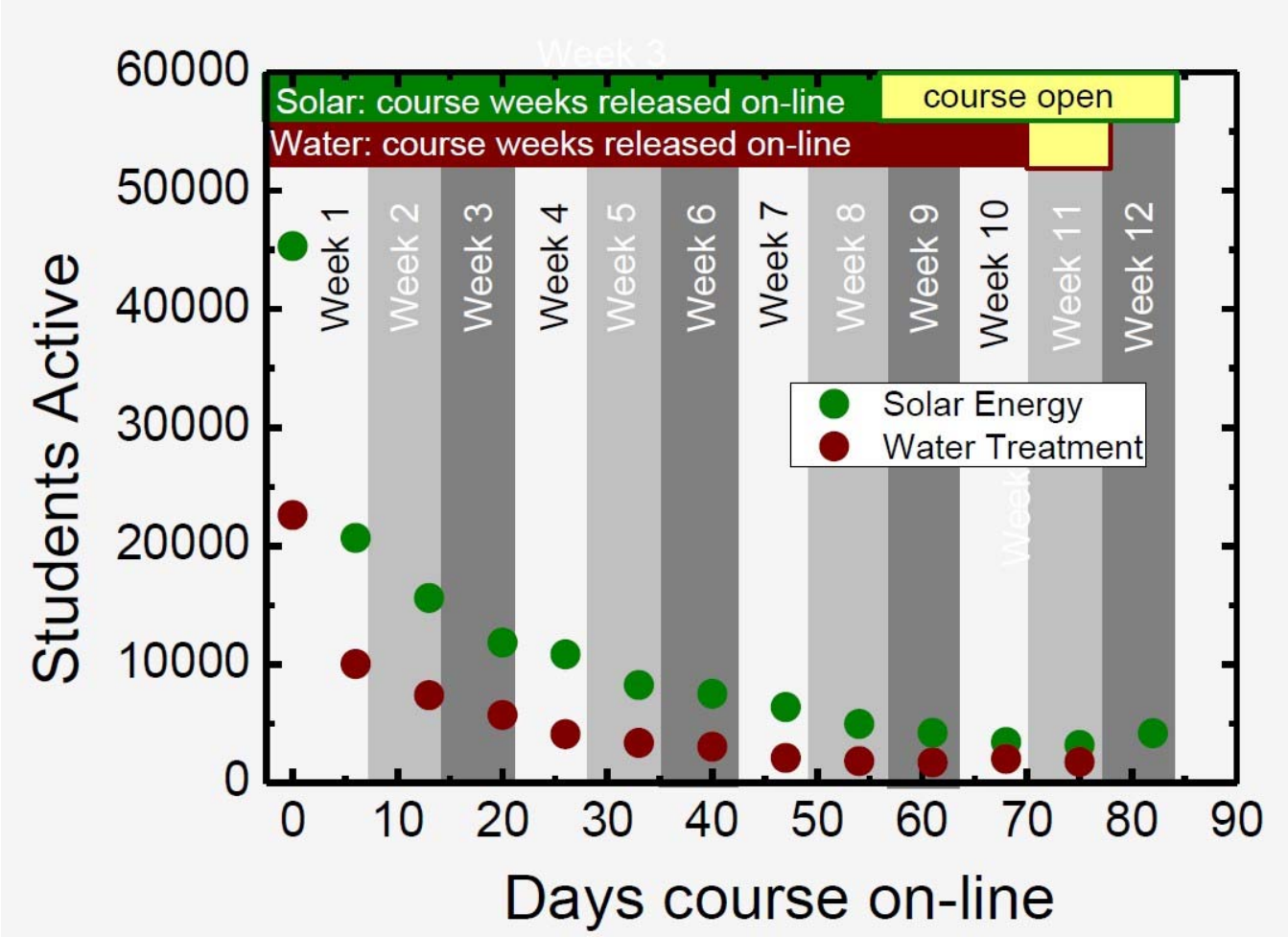
RESULTS (Arno Smets)

	Water Treatment	Solar Energy
# Enrollments	**29.179**	**56.809**
# students accessed the course	**23.617**	**47.183**
# tried at least 1 HW	**5.917** (25%)	**9.580** (20%)
# Certificates	**534** (2,3%)	**2.912** (6,2%)
# perfect score	**2**	**162**

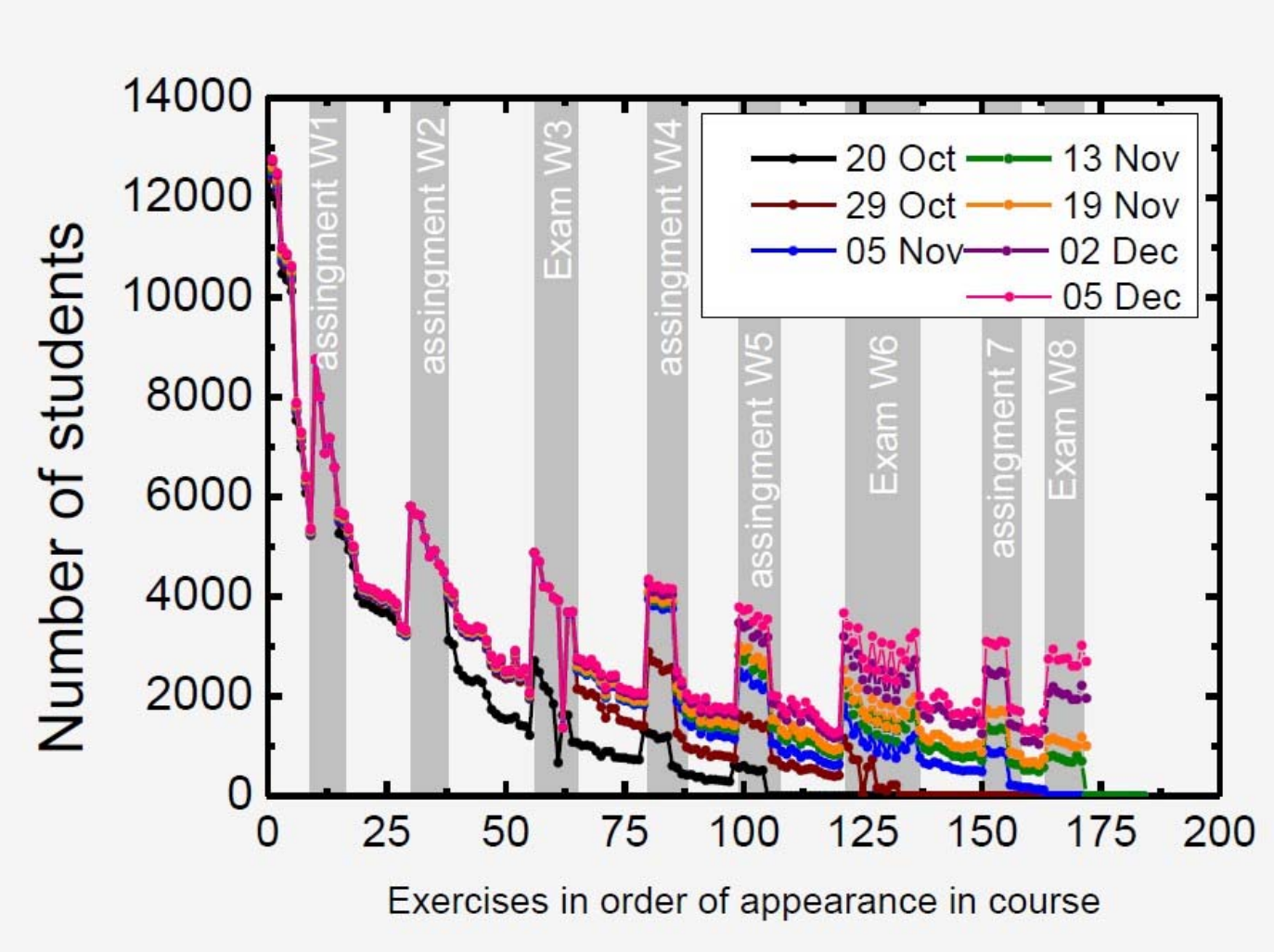
Pass rates dramatically increase when students pay $50 for n ID verified certificate (de Vries, Dexter, TUD)



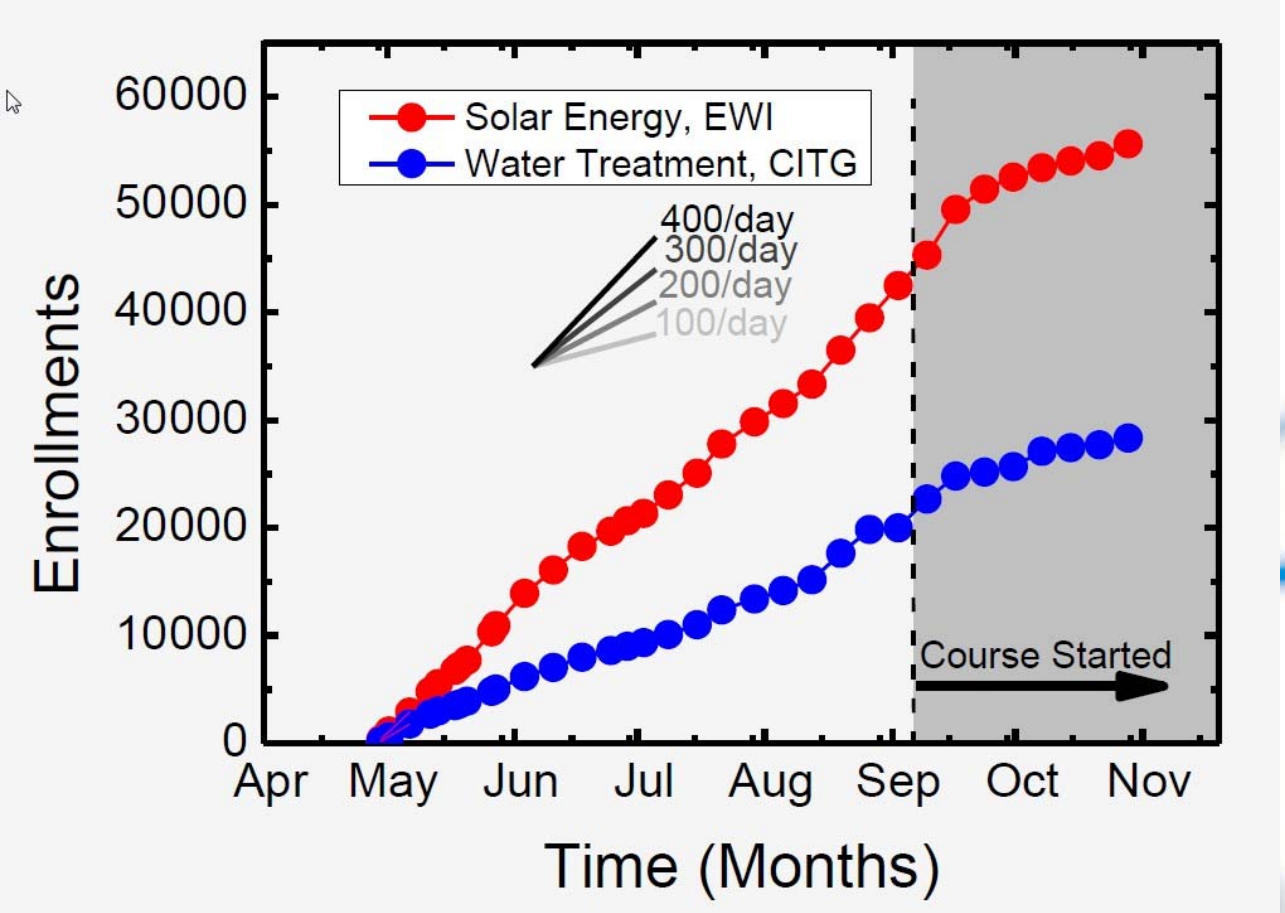
Students activities (Arno Smets-TUD)

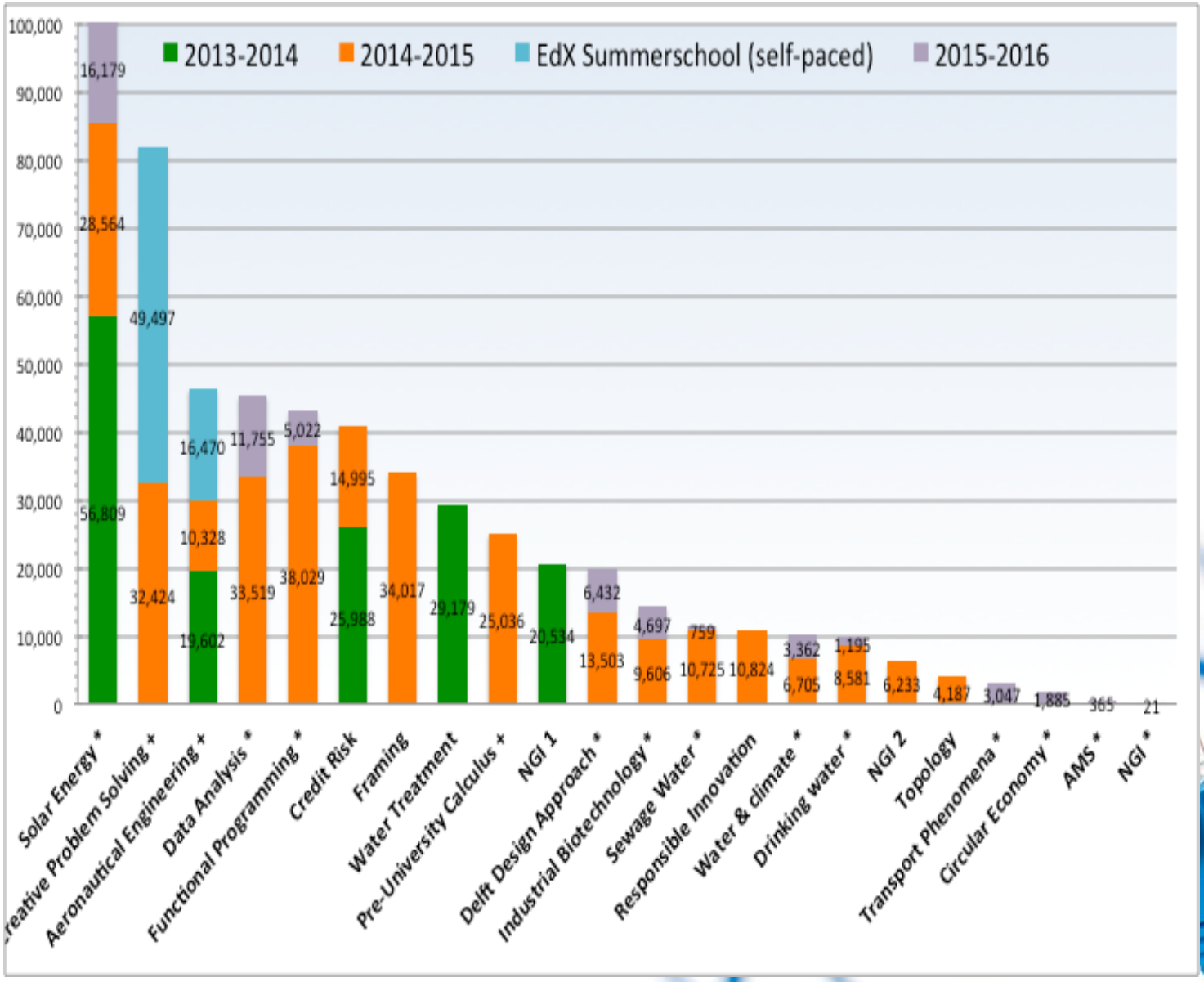


Progress Work Students (Arno Smets-TUD)

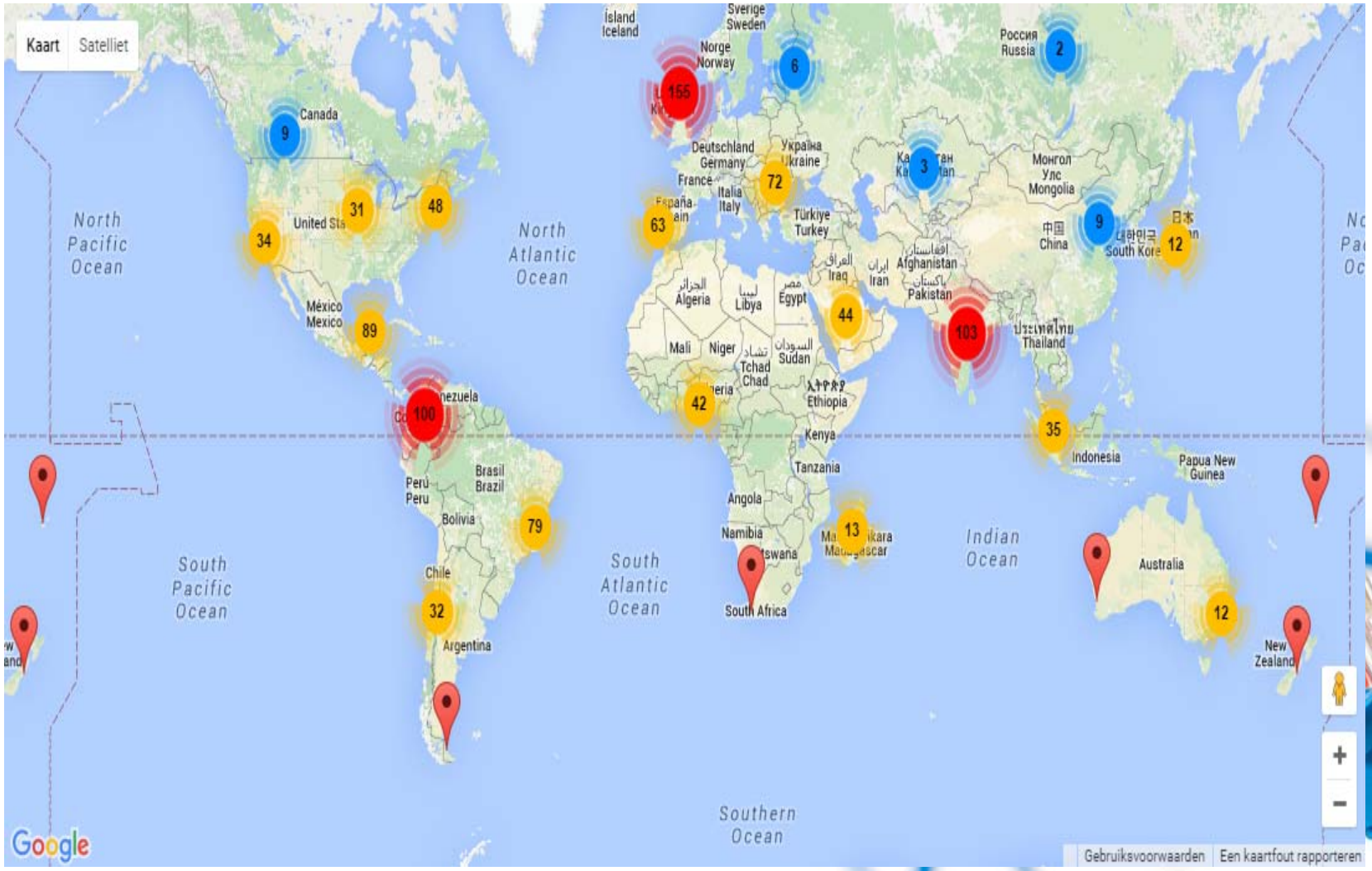


Evolution Enrollments (Arno Smets)

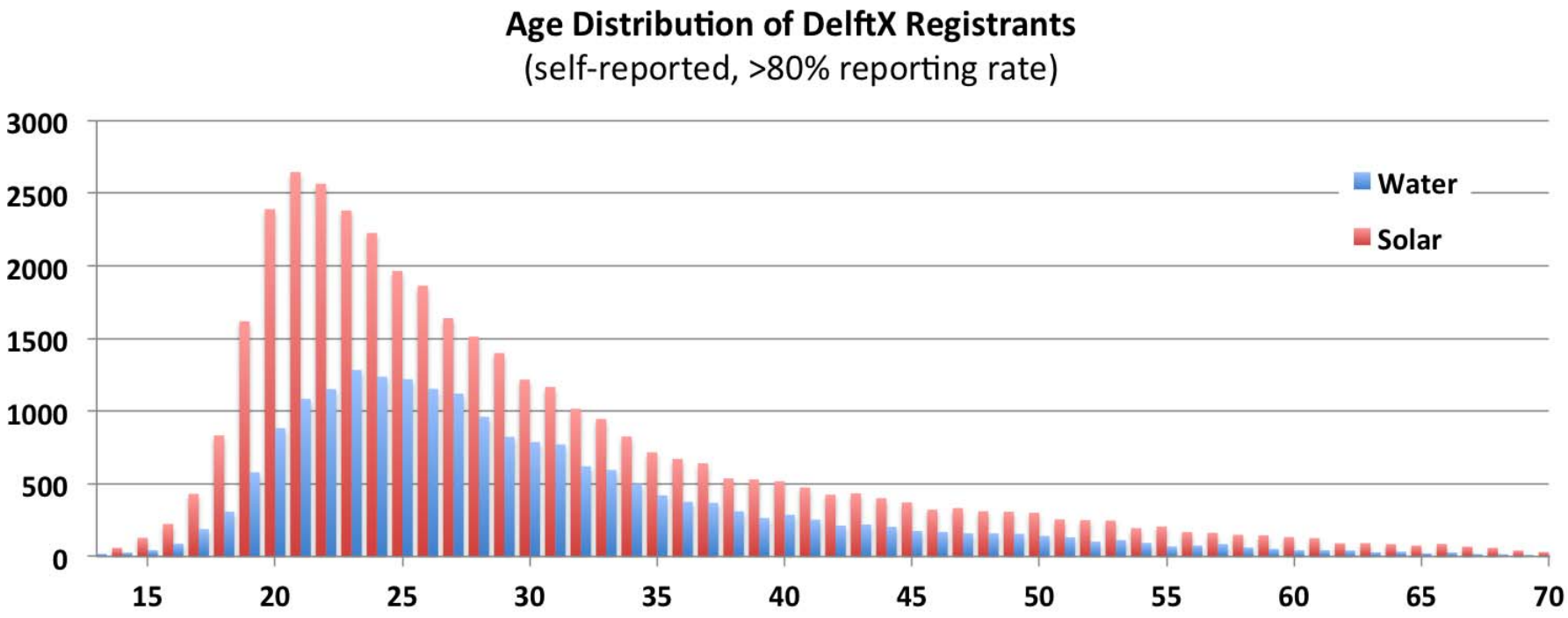



2013-2014
2014-2015
EdX Summerschool (self-paced)
2015-2016
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
16,179
28,564
56,809
49,497
32,424
19,662
16,470
10,328
11,755
33,519
5,022
38,029
14,995
25,988
34,017
29,179
25,036
20,534
6,432
13,503
4,697
9,606
759
10,725
10,824
3,362
6,705
1,195
8,581
6,233
4,187
3,047
1,885
365
21
Solar Energy *
Creative Problem Solving +
Aeronautical Engineering +
Data Analysis *
Functional Programming *
Credit Risk
Framing
Water Treatment
Pre-University Calculus +
NGI 1
Delft Design Approach *
Industrial Biotechnology *
Sewage Water *
Responsible Innovation
Water & climate *
Drinking water *
NGI 2
Topology
Transport Phenomena *
Circular Economy *
AMS *
NGI *

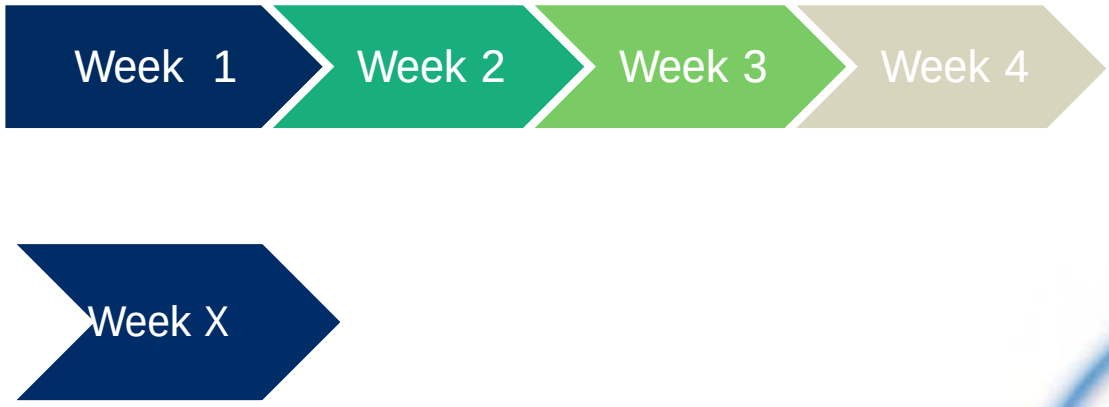
MOOCs worldwide (TUD)



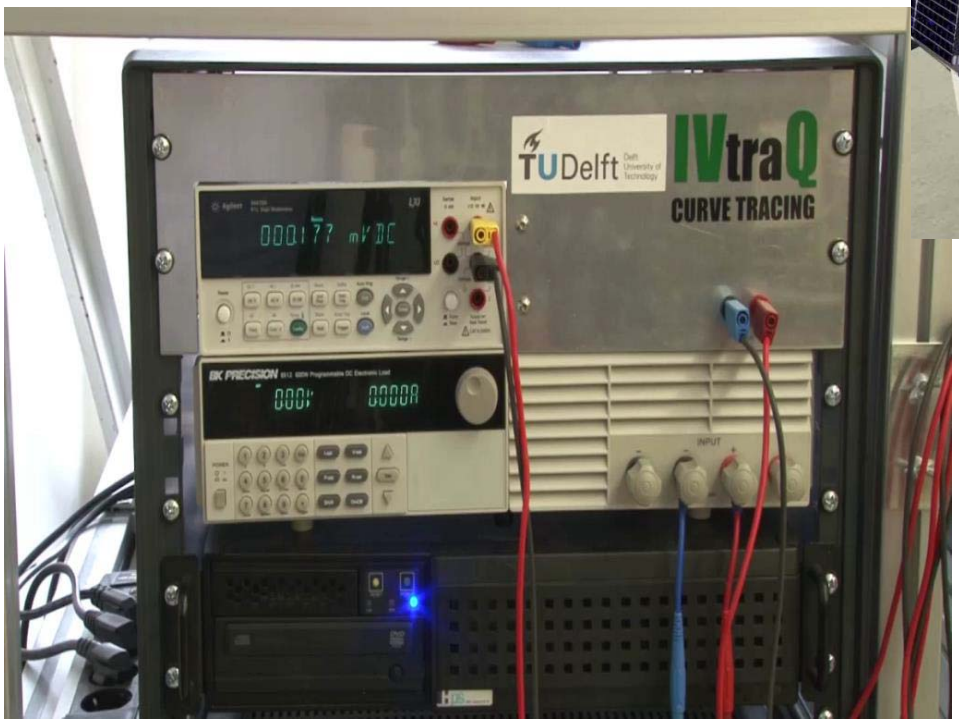
Age distributions (Arno Smets)

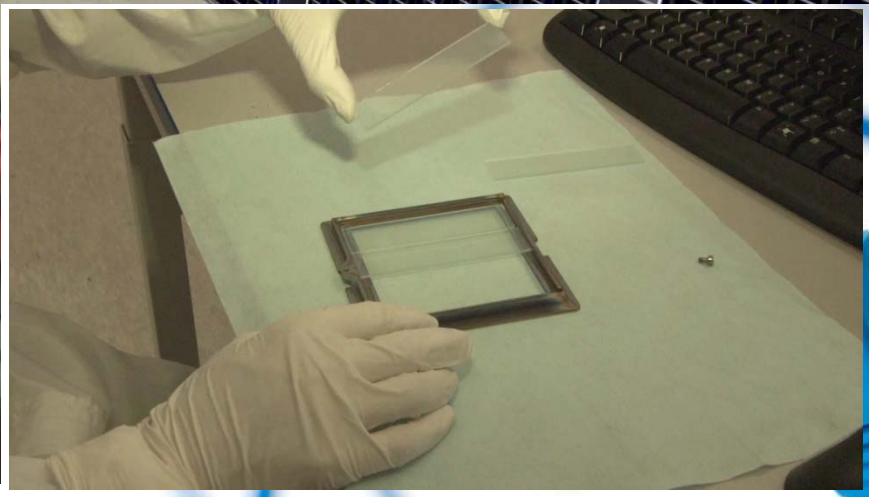


MOOC – design (Frans van Dam)



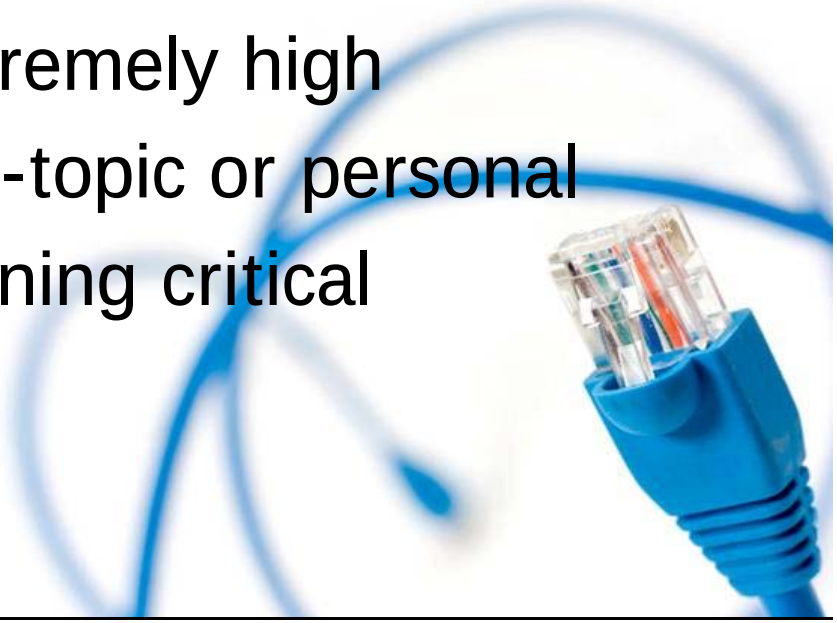
The power of video and animation





Learning Analytics-1

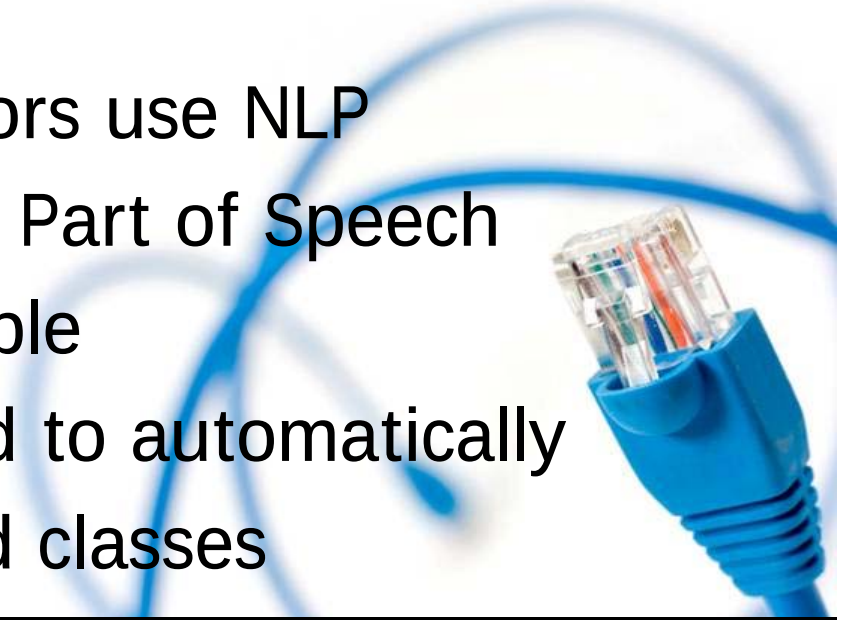
- Micro blogging sites such as Twitter can play a vital role in spreading information
- The volume and velocity of tweets posted during a course today tend to be extremely high
- Messages that are entirely off-topic or personal in nature, to messages containing critical information



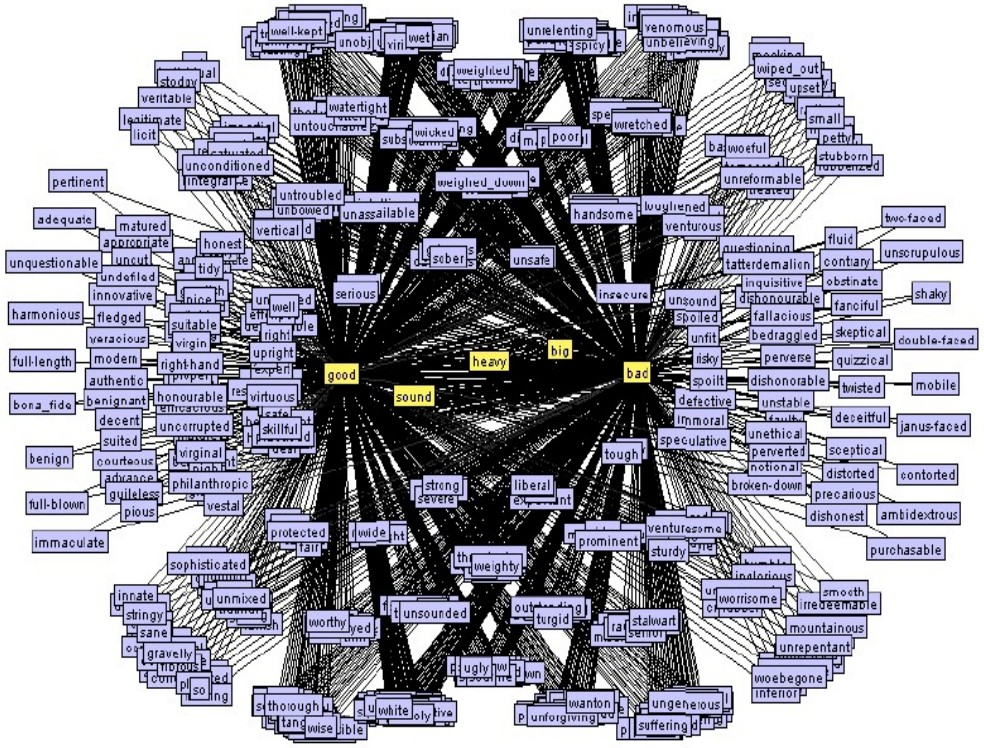
Learning Analytics-2

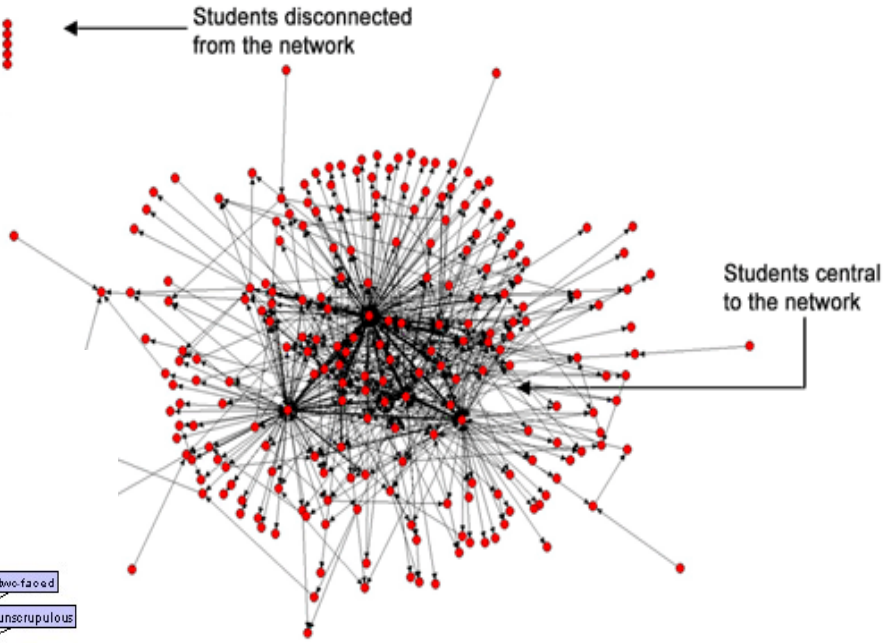
More than 200,000 unique tweets were selected by monitoring the Twitter Streaming API using the hashtag #MOOC-TUD a few days after launching the MOOC

- To process the data the authors use NLP technology, such as n-grams, Part of Speech (POS), and Verbnet for example
- Bayesian classifiers were used to automatically classify a tweet in pre-defined classes

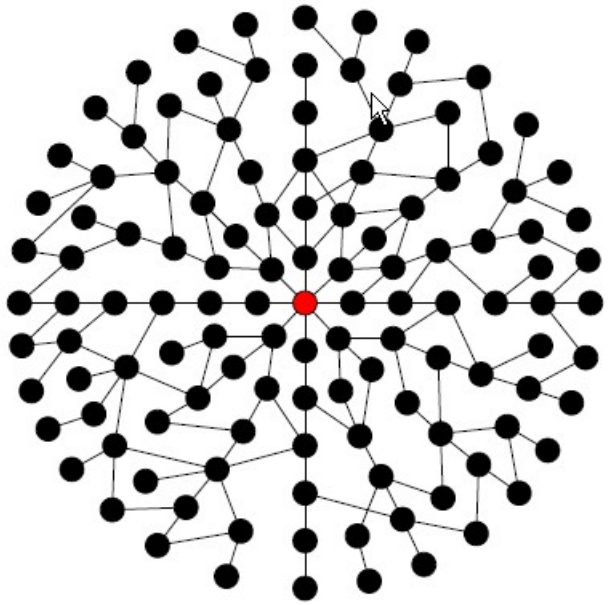


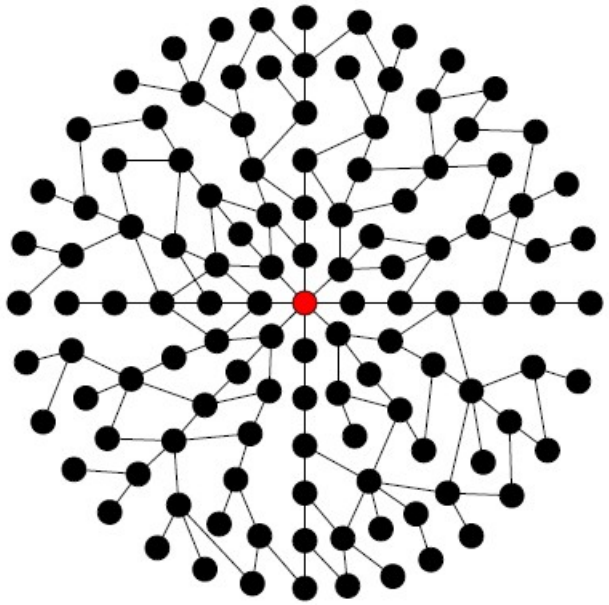
Analysis of Social Networks





Two projects-clusters in a learning network, which partners should be connected so that the whole network is fully connected?





1. *Special learning analytics software tools are needed to process data generated by MOOC students*
2. *How to store-process-analyze the big data, around MOOCs ?*

Possible reasons for dropout

1. *Self paced courses*
2. *Missing adapted didactic models*
3. *No entrance exam is required*
4. *Missing individual tutoring*
5. *Failing cooperation in student networks*
6. *Missing personal characteristics*

How to teach 21st century skills ?

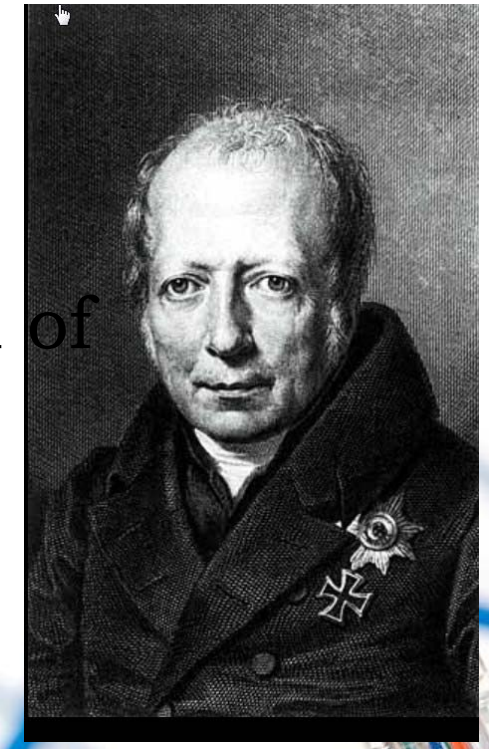
- *critical reflection*
- *cooperating*
- *networking*
- *creativity*
- *ability to handle big data*
- *ability to solve real life problems*
- *ability for life-long*

1. *Current education academic education focused on realization of qualification goals*
2. *How to include socialization and personal development?*

Report Minister of Science, Culture and Education

Bildung (Wikepedia)

First defined by Wilhelm von Humboldt (1767-1835)



Not only focussed on acquisition of knowledge

Abilities for critical thinking

Ability for moral judgement

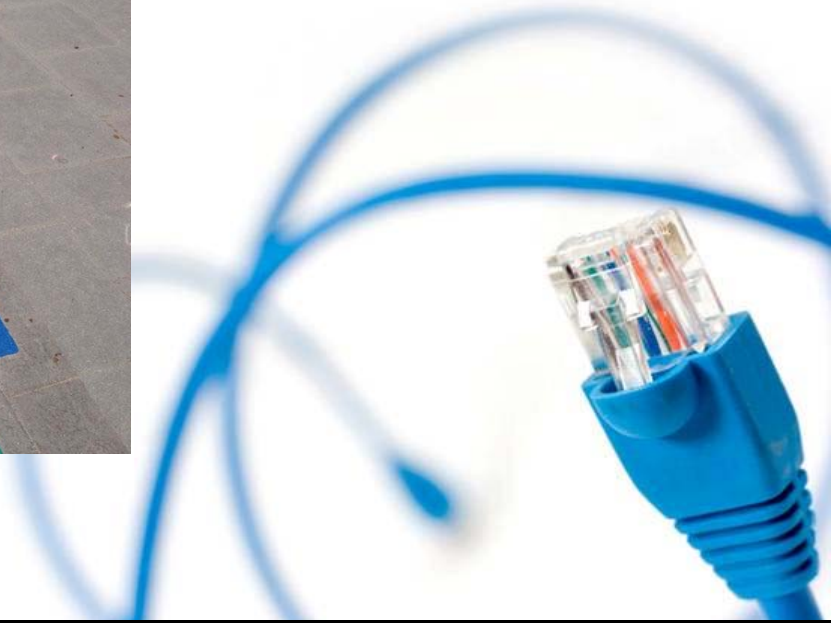
Teaching adagio (source unknown)

- We teach today students
  - With yesterday knowledge
    - For a future we don't know

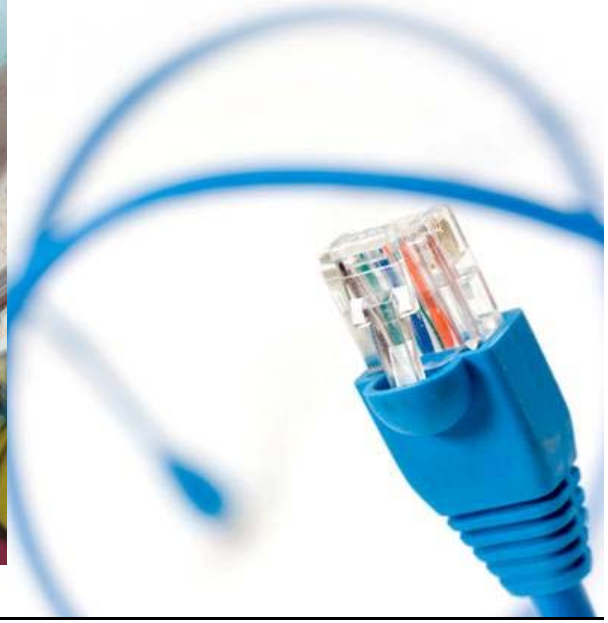
How to transform a Network without communication and interaction to a social network of actors connected by dyadic ties and cooperate via social media ?

Social learning includes cooperation and modelling, How to implement in MOOCs?

Learning material could enable individual learning



For a good harmony orchestration, cooperation fine tuning is needed,
How to implement in MOOCs?



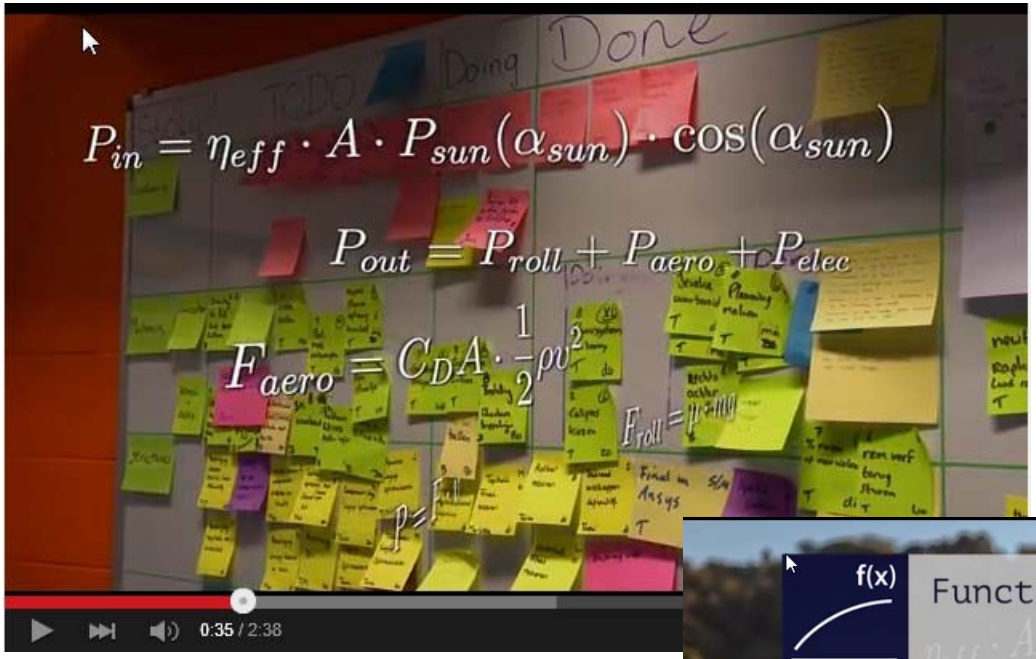
Recent developments around MOOCs at TUDelft

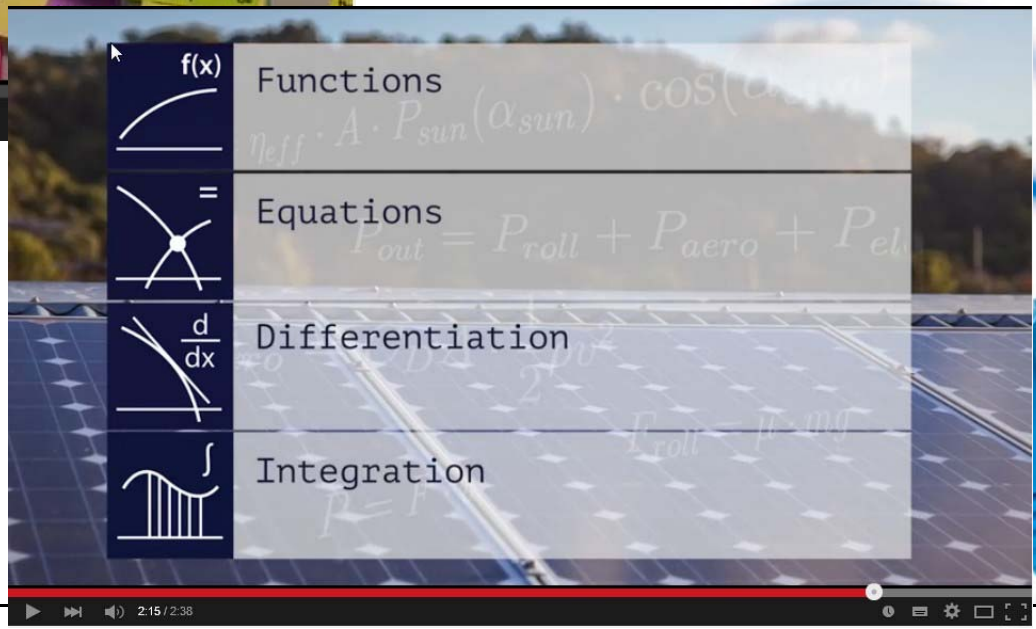
How to increase student participation?
How to involve societal relevant applications?
How to use social media?

Fresh-up course mathematics starting students (TUD)

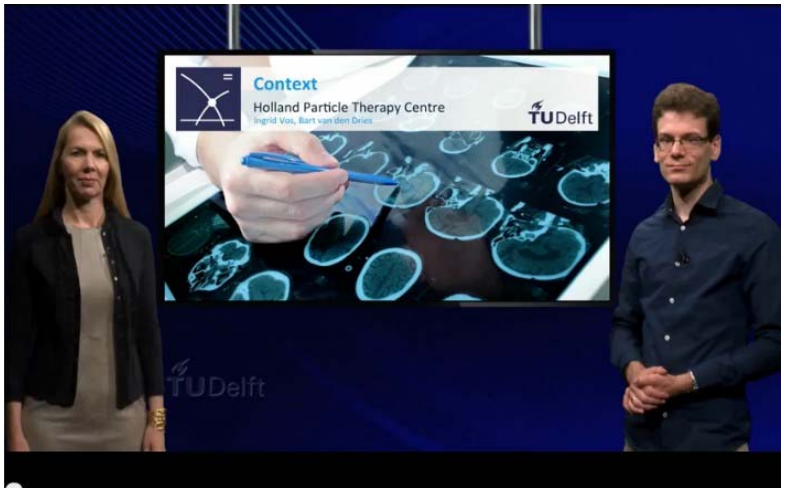
Focus on real life applications
Solar cars challenge race (TUD)

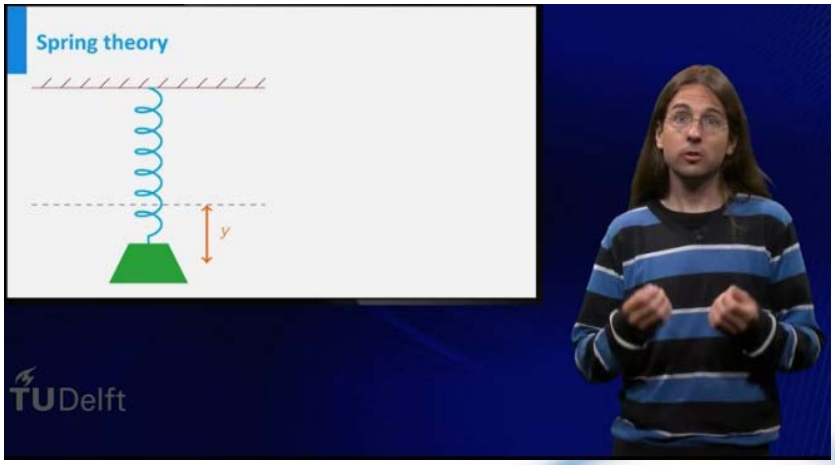
How to design a course? (TUD)

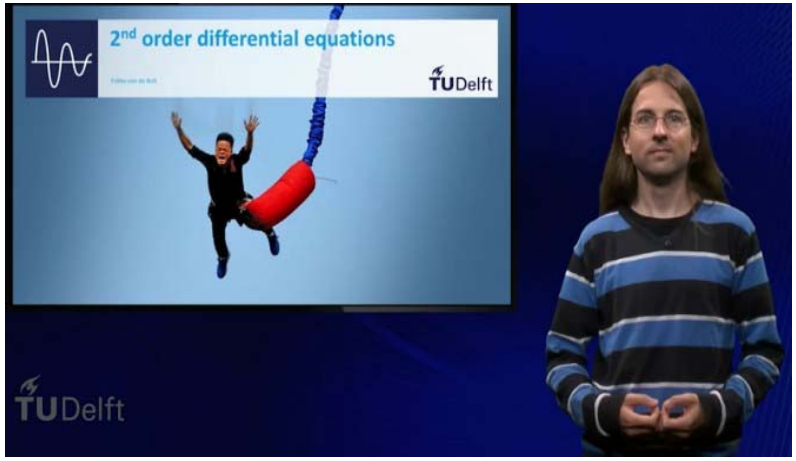


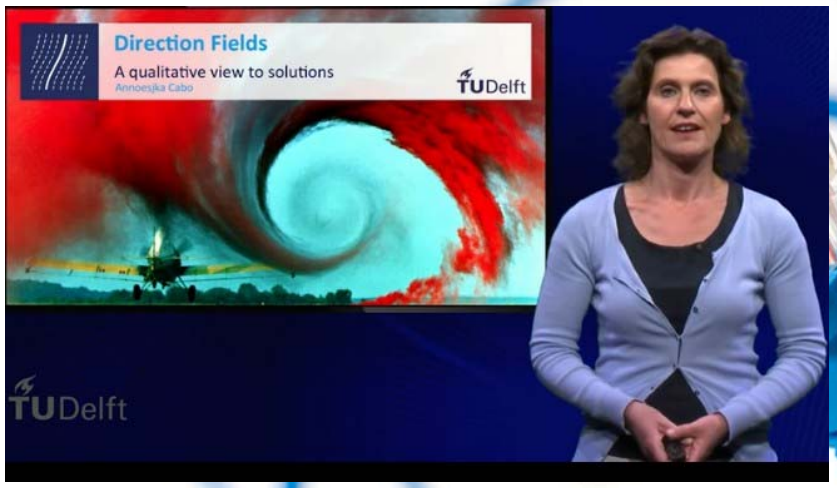


Mathematics from real life (TUD)

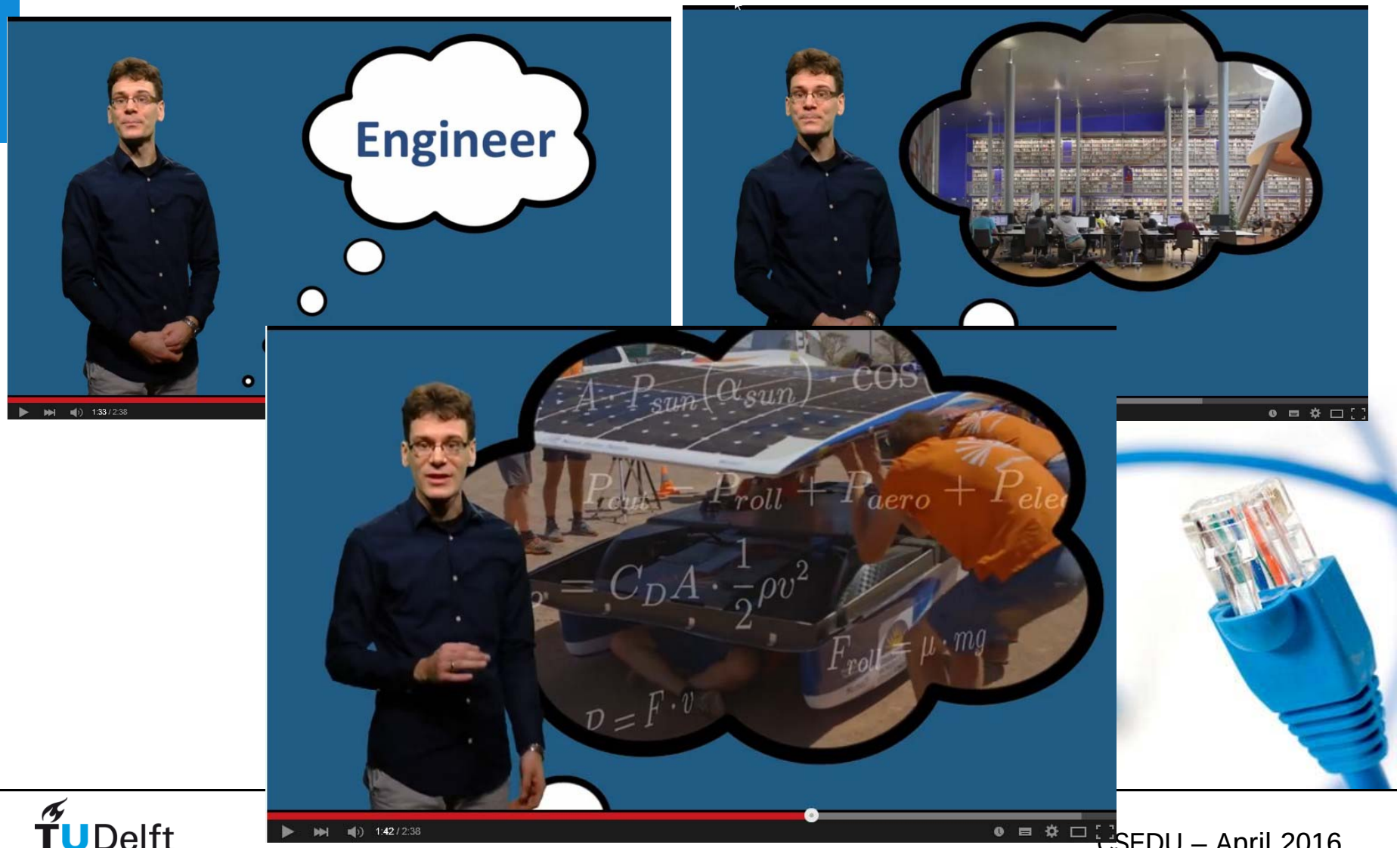








Introduction Pre-Un Calculus (TUD)

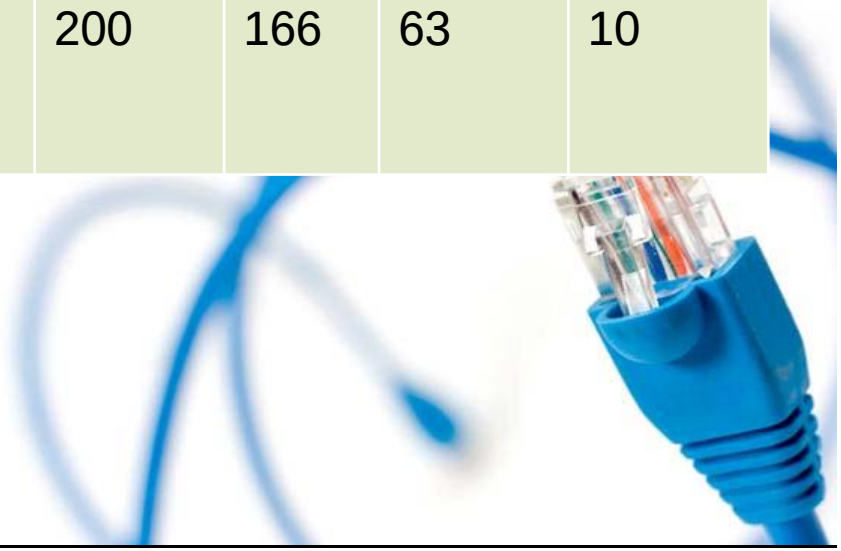


Pre-University calculus
MOOC offered worldwide via edX (TUD

Number of participants	Number attempted one exercise	Number attampted all exercise	Number passed final exam	
27.186	4.150	273		Worlwide
794	420	40	46	TUDelft

Distribution of students who enrolled and didn't enrol in the MOOC (TUD)

	5	6	7	8	9	10
# students that didn't enrol	101	764	1017	703	332	52
# students that enrolled	32	173	200	166	63	10



1. *Grades at secondary school are good predictors of a successful academic study*
2. *Is there is need of psychological assessment?*
3. *What could be the contribution of BIG Five personality test?*

BigFive personality test

Average score , 5-pointscale, 20 items

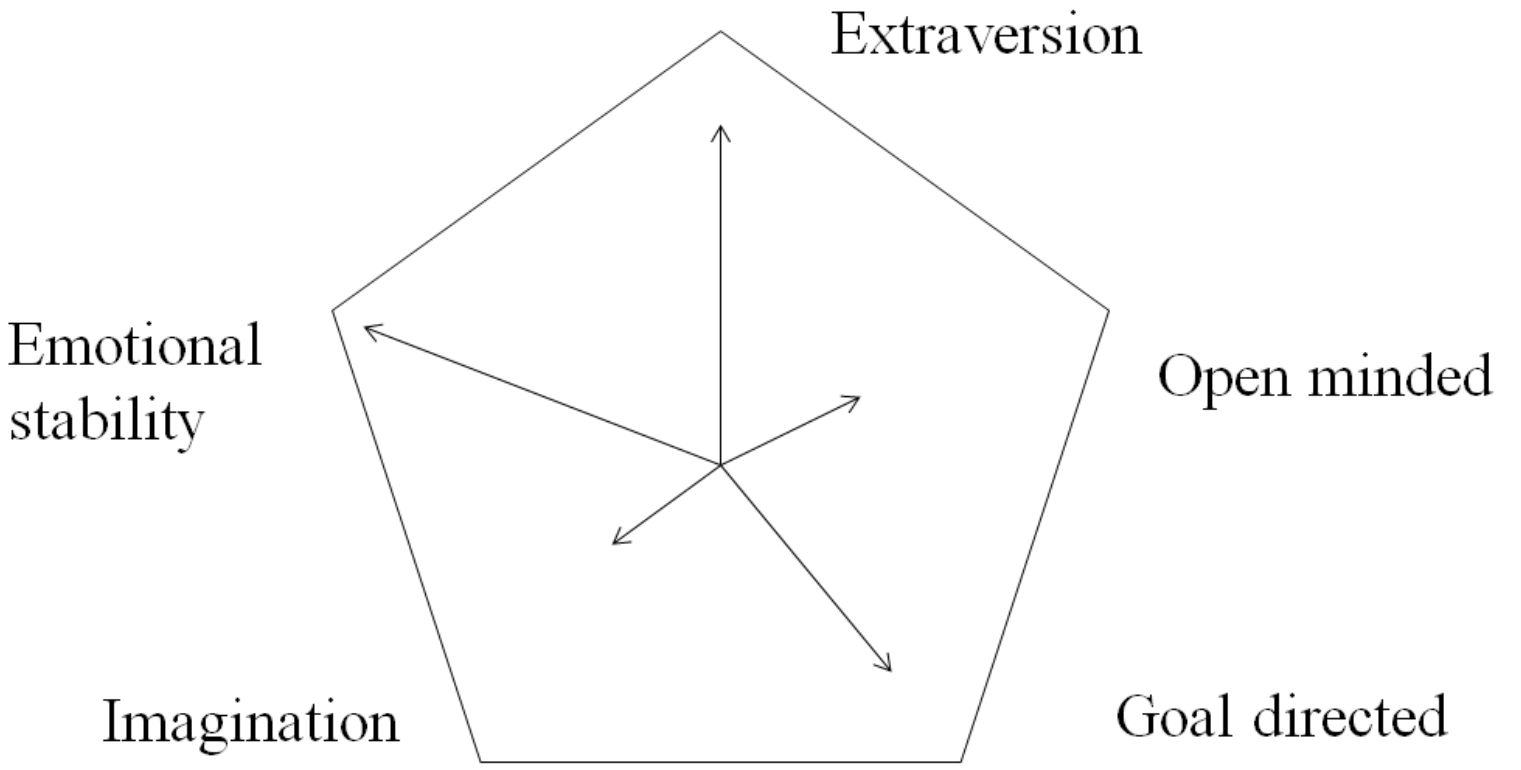
Number·of·respondents¤	10189¤	179¤
Extroversion¤	3.05¤	3.05¤
Agreeableness¤	3.84¤	3.69¤
Conscientiousness¤	3.38¤	3.06¤
Neuroticism¤	2.98¤	3.39¤
Openness¤	4.05¤	3.71¤

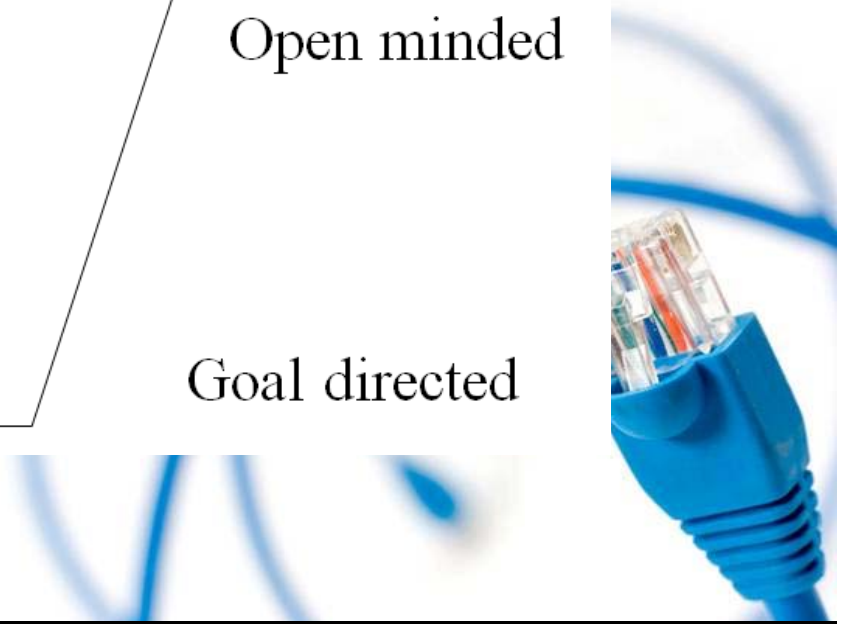
BigFive personality test

Average score , 5-pointscale, 20 items

	Item/response	--	-	-/+	+	++
1	On parties I talk to many people					
7	I work according to timeschedules					
10	I have problems to imagine things					
16	I complain about things					
19	I don't mind being the centre of interaction					

BigFive profile





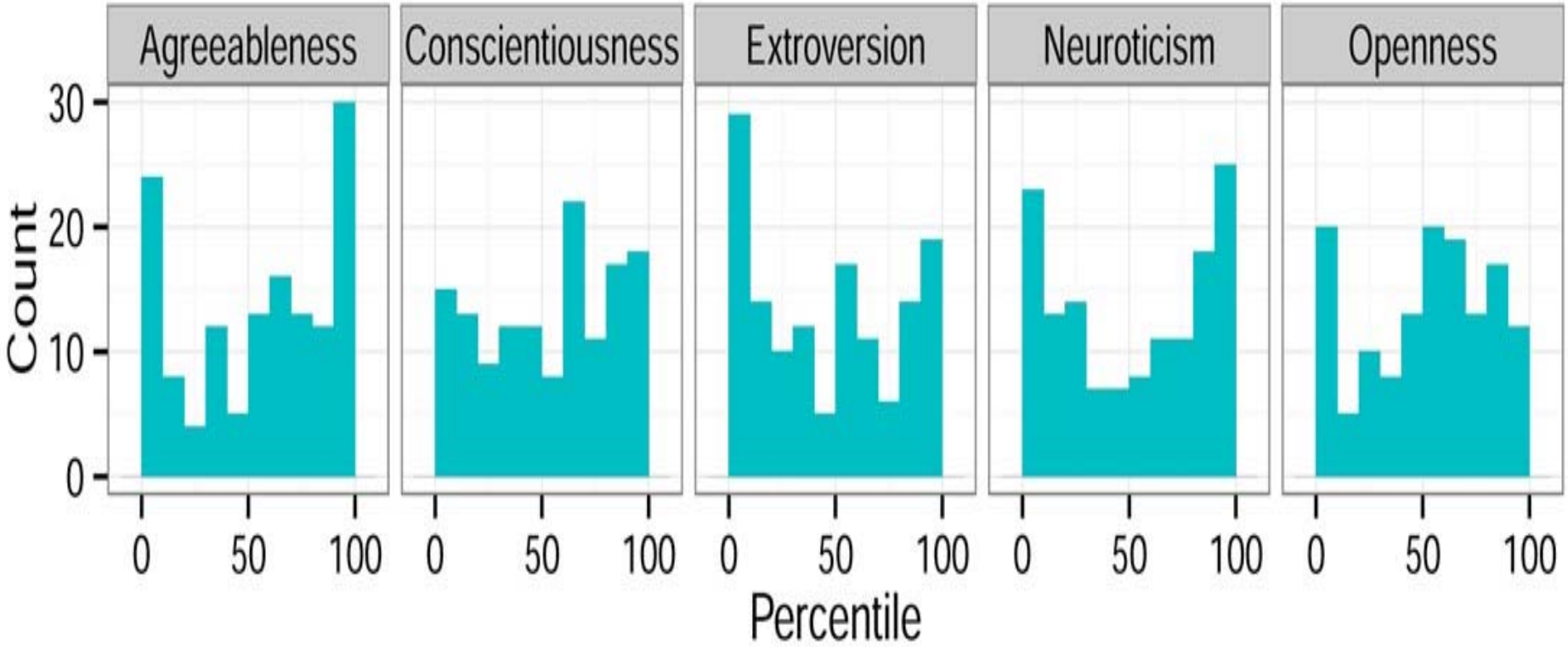
BigFive personality Test (Wikepedia)

Openness	Interest in searching new things and inexperienced stimuli, unconventional
Conscientiousness	Self-discipline, prudence, following rules, strong will, active planning, organizing and completing tasks
Extroversion	Socializing, cheerfulness, searching new options and experiences
Agreeableness	Obedience, cooperation, friendliness, helping others
Neuroticism	Emotional lability, shyness, sadness, embarrassment

Felder-Silverman learning style model (1993)

Dimension	Preference
Sensing – Intuitive	Facts and experiments vs. principles and theories
Visual – Verbal	Learning via pictures and diagrams vs. via verbal explanation
Active – Reflective	Active experimentation vs. passive observation
Sequential – Global	Linear reasoning process vs. intuitive leaps when problem solving

Distribution item responses (D.Chuda)



Psychological Assessment at TUDelft 1953-1957

- All first years students (2.500) were requested to take part in the psychological assessment procedure
- The following tests were used:
- NAT'70 Mathematical ability test-Figure series
- NPV Personality Questionnaire
- NVA Non verbal Abstraction
- VAT '69 Verbal Analogies
- APT Calculus with characters
- DT Test using diagrams

Conclusion: Outcomes Psychological test has no added value to scores mathematics, physics, Dutch at secondary school

Study-progress/delay/dropouts in percentage crossed with average score mathematics/physics grades at school, cohort 1953

Studyprogress¶ ≥·150%¤	0%¤	4%¤	11%¤	15%¤	7%¤
Studyprogress¶ ≤·150%¤	0%¤	8%¤	13%¤	4%¤	0%¤
Delayed·students· with·Incomplete·first· year¤	2%¤	2%¤	1%¤	1%¤	0%¤
Dropouts·during· second·year¤	2%¤	6%¤	2%¤	0%¤	0%¤
Dropouts·during·first· year¤	2%¤	9%¤	9%¤	1%¤	0%¤
Average·math/· physics·grades·at· school·exam¤	5-6¤	6-7¤	7-8¤	8-9¤	9-10¤

Study-progress/delay/dropouts crossed with number of passed exams

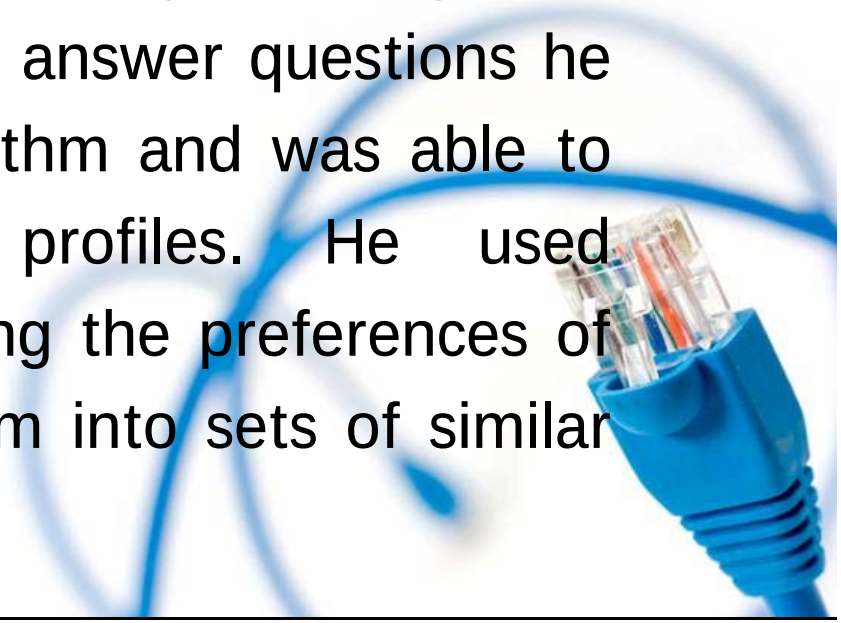
Studyprogress¶ ≥·150%¤	0%¤	1%¤	7%¤	14%¤	16 %¤
Studyprogress¶ ≤·150%¤	3%¤	8%¤	8%¤	4%¤	3%¤
Delayed·students· with·Incomplete· first·year¤	2%¤	1%¤	1%¤	0%¤	0%¤
Dropouts·during· second·year¤	2%¤	6%¤	1%¤	1%¤	0%¤
Dropouts· during· first·year¤	6%¤	9%¤	5%¤	0%¤	0%¤
Numbers·of·exams· passed·successfully· in·first·period¤	0¤	1¤	2¤	3¤	4¤

How to find matching study partners in global online learning?

The matching algorithm from dating sites can provide a solution

McKinlay University of California 2014

- McKinlay researched online data-sites and discovered that one of these dating sites sorted people into profiles using the answers to thousands of questions posed by other users on the site. By creating fake profiles and writing programs to answer questions he discovered the underlying algorithm and was able to create successful matching profiles. He used collaborative filtering by collecting the preferences of many people, and grouping them into sets of similar users.

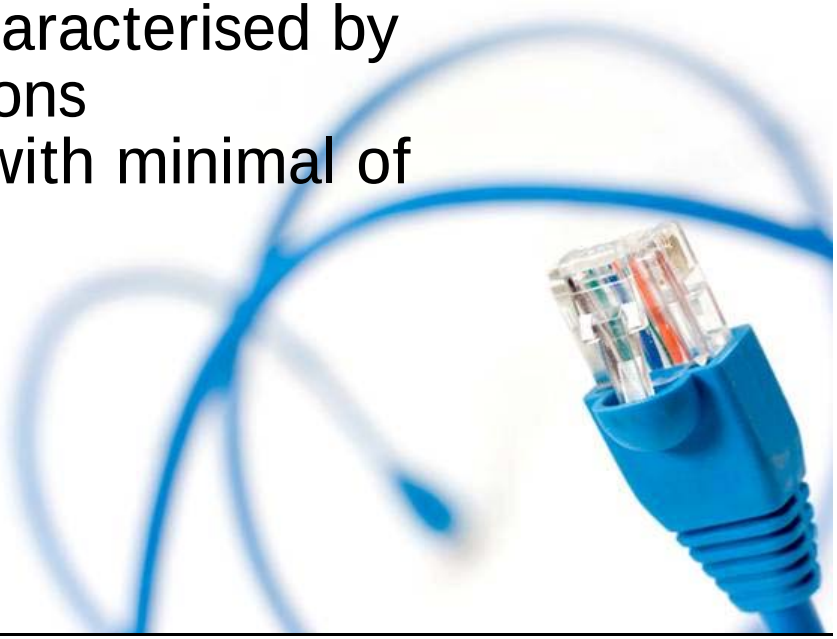


Groups of study-friends in social networks

- Partners who chat for a longtime are stable, better fitting partners
- Groups with balanced abilities are stable groups
- Formation of groups of excellent students results in groups of less excellent students
  (underscoring students)

Analysis social interaction

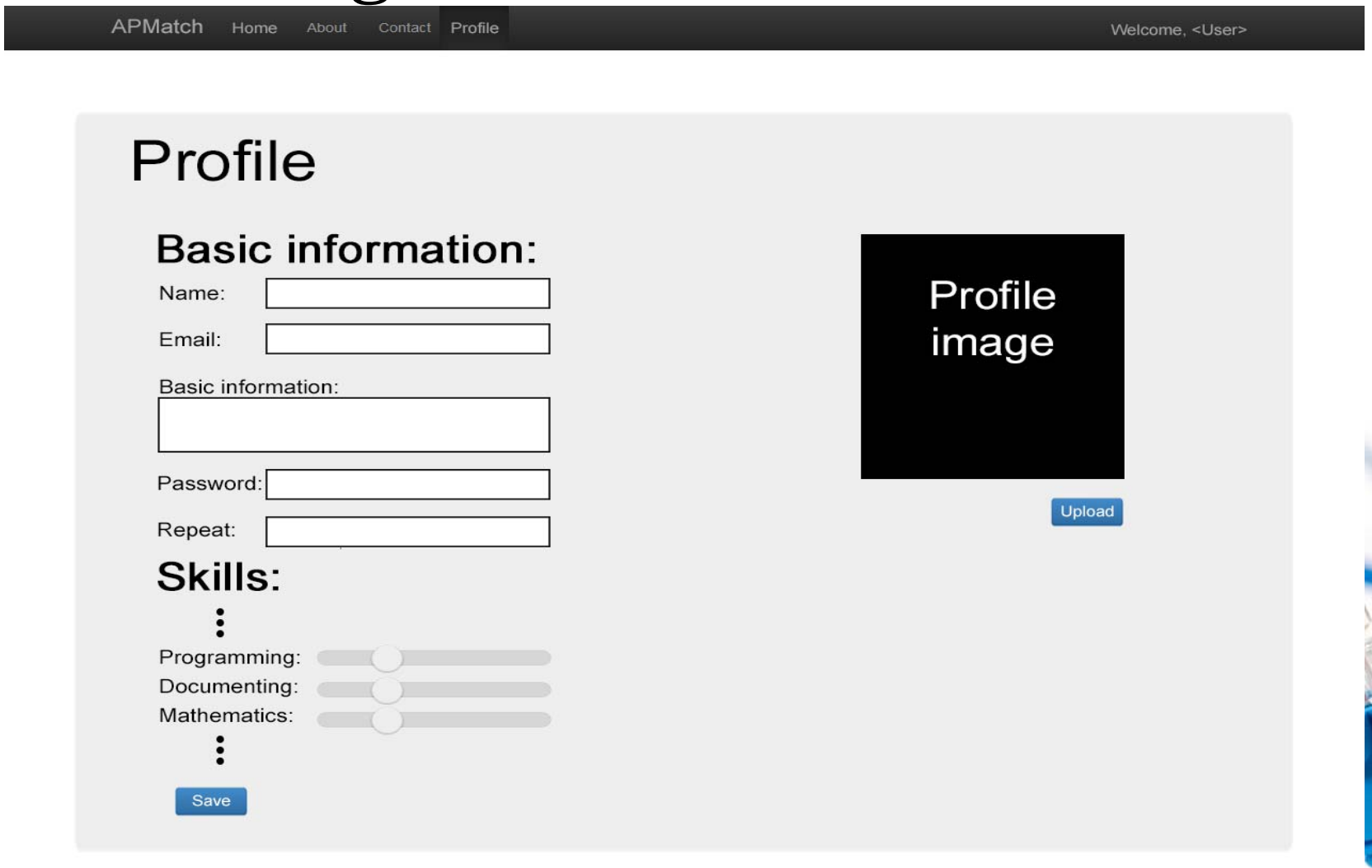
- Students, interaction and frequency of interaction can be displayed on a map
- Groups can be detected as clusters, groupleader barycentre
- Stable groups, partners are characterised by continuous stream of interactions
- Problem of outliers, students with minimal of interactions



Features used in our matching algorithm

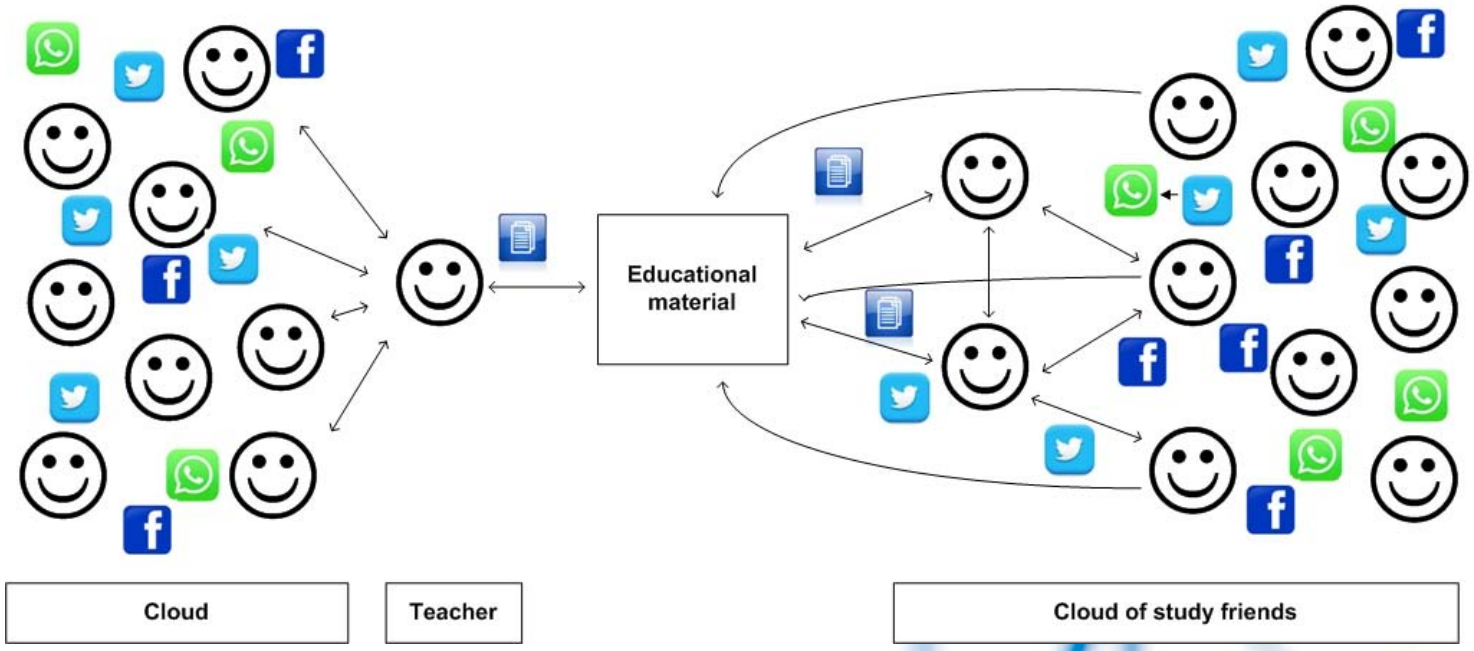
- Students provide scores of basic abilities as mathematics, programming, report writing, groupworks on a 5-point scale
  (possibility to upload academic record)
- Personal characteristics measured by Big Five personality test
- Data on personal websites, CV (if provided in a standard form)
- Problem of fake data

Matching form students

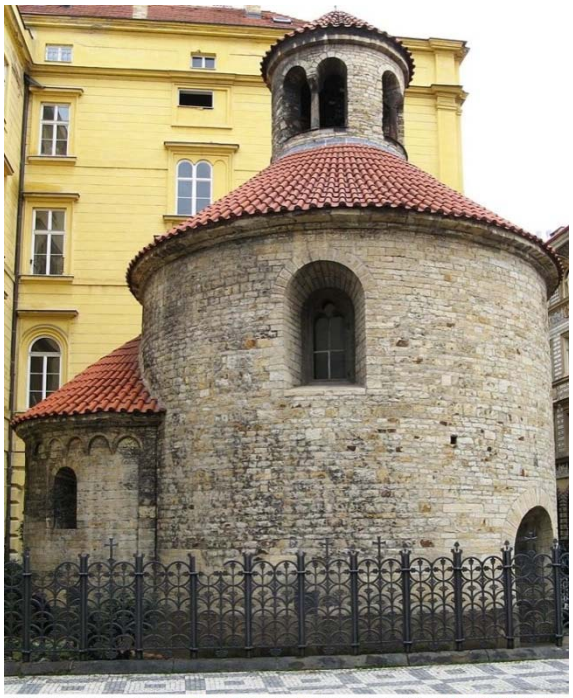


How to use social media in open online learning?
Some examples

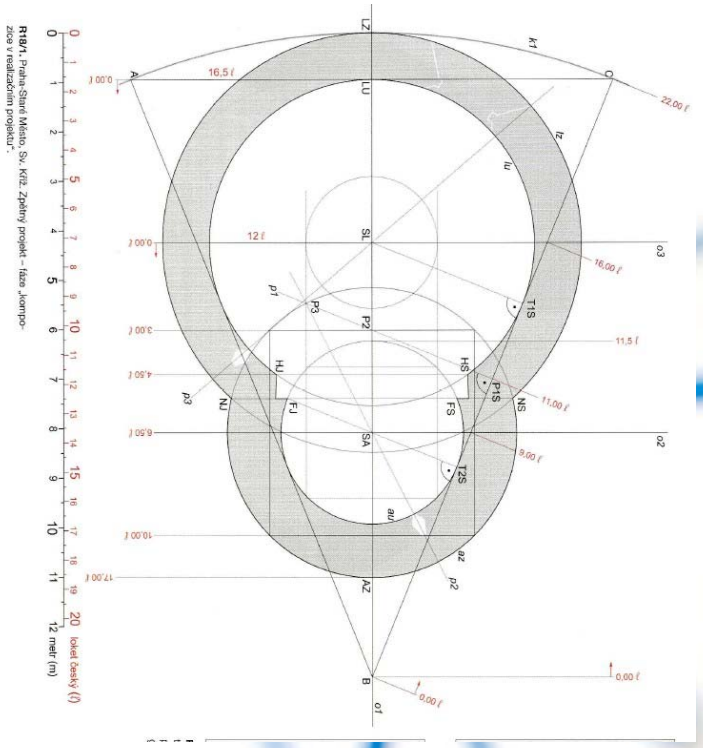
FETCH 2.0 didactical model using social media



Rotunda Holy Cross at Prague and its geometrical ground-floor Data collection via social media (Wikepedia)



van deze voorvertoning: 603 × 599 pixels. Andere resoluties: 242 × 240 pixels



Hanan Al-Kutubi , best graduate 2016

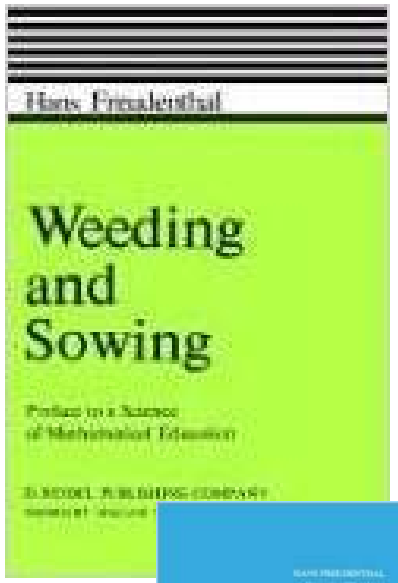
"With a good network you can perform experiments you couldn't do normally.
(TUD)

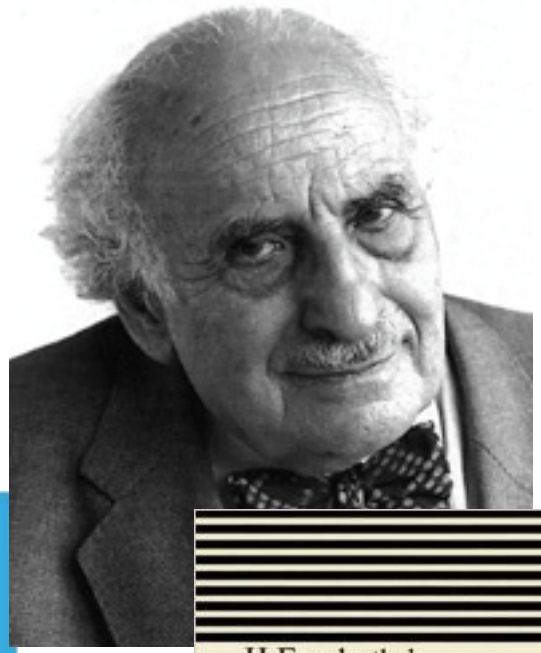
Escape from prison of Alcatraz at San Francisco Bay (TUD)

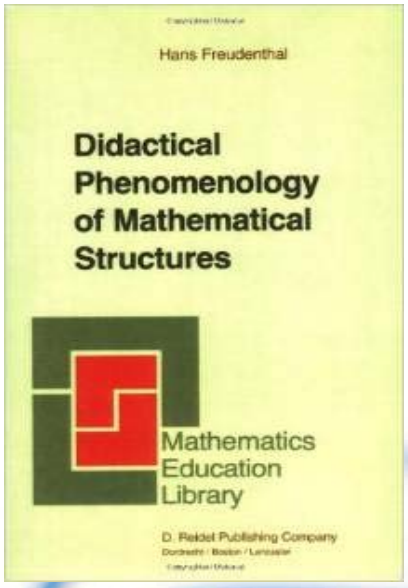
A piece of pie to celebrate pie day (TUD)

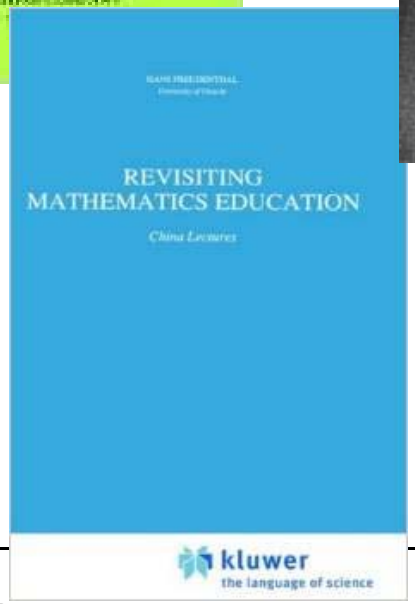
Didactical Background

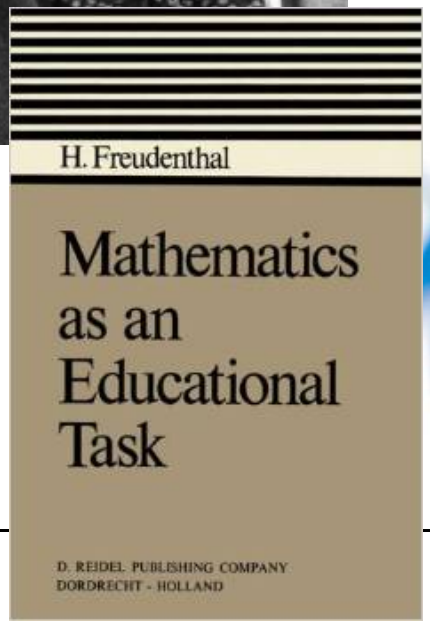
Teaching is more than knowledge transfer
Mathematics as an educational task



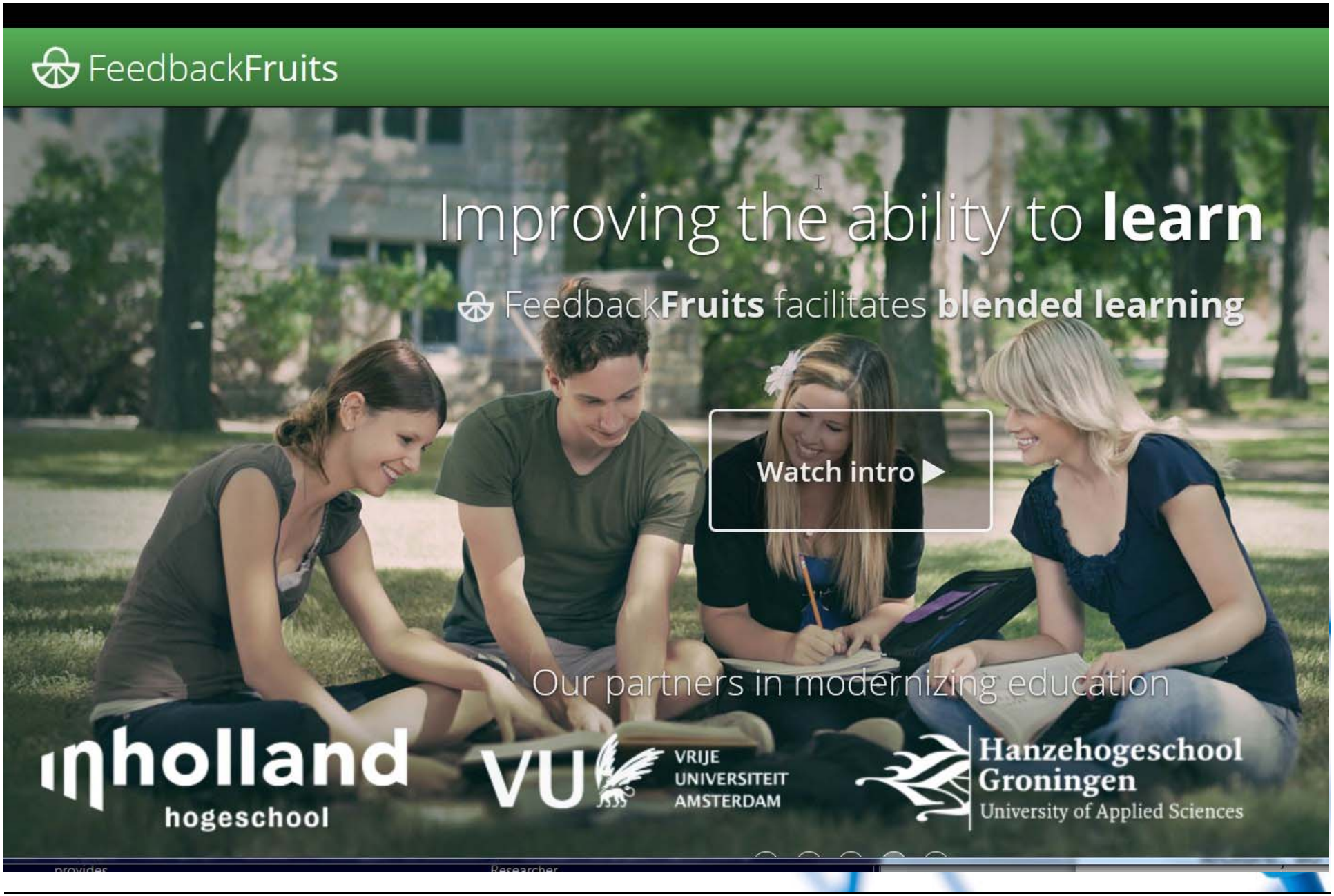








Freudenthal Institute for Science and Mathematics Education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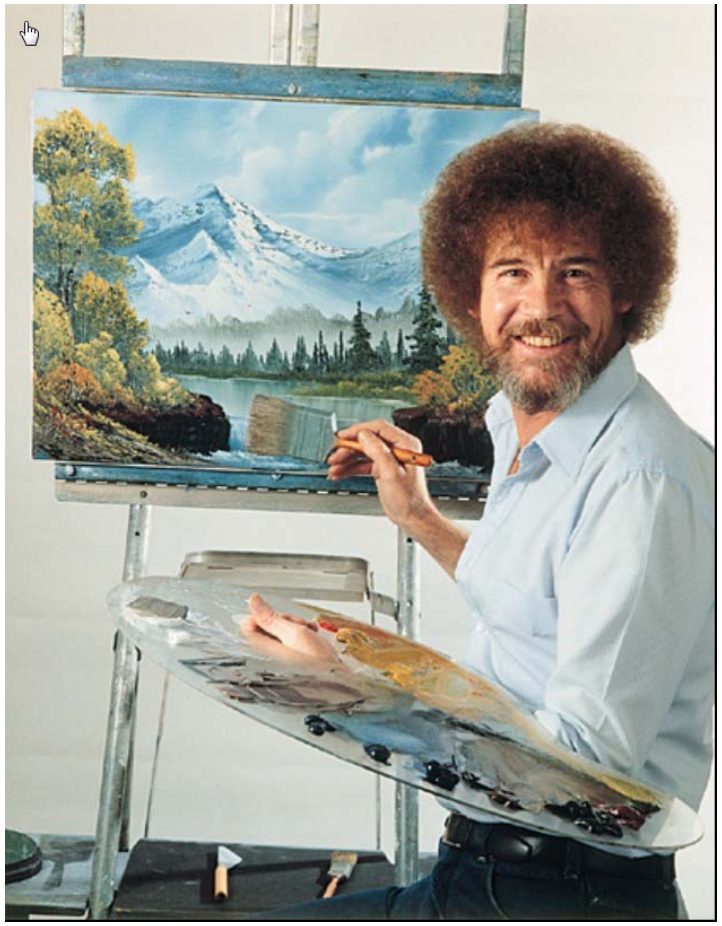
Successfull example of non-participatory learning Bob Ross (TUD)



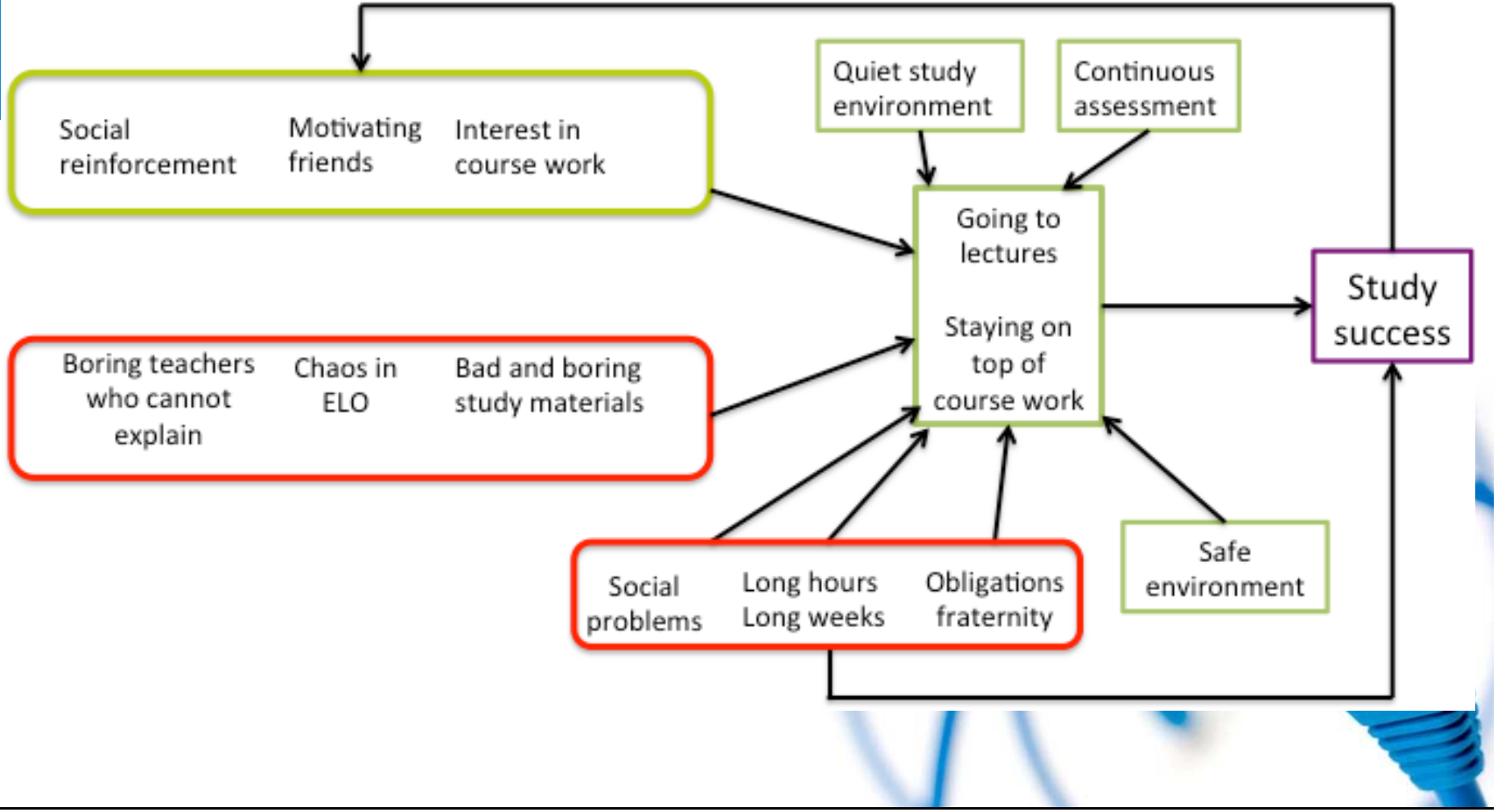
Attribution of success according to Killen (1994)

Items pertaining to success	Rank students	Rank lecturers	P level (if <.05)
Interest in the course	1	2	
Self-motivation	2	1	.00001*
Self-discipline	3	4	
Regular attendance at lectures	8	16	.04243
Effective study techniques	13	5	.00442*
Maturity	14	8	.03006*
Ability to reason logically	20	7	.00062*
Enthusiastic lecturers/tutors	26	12	.03940*

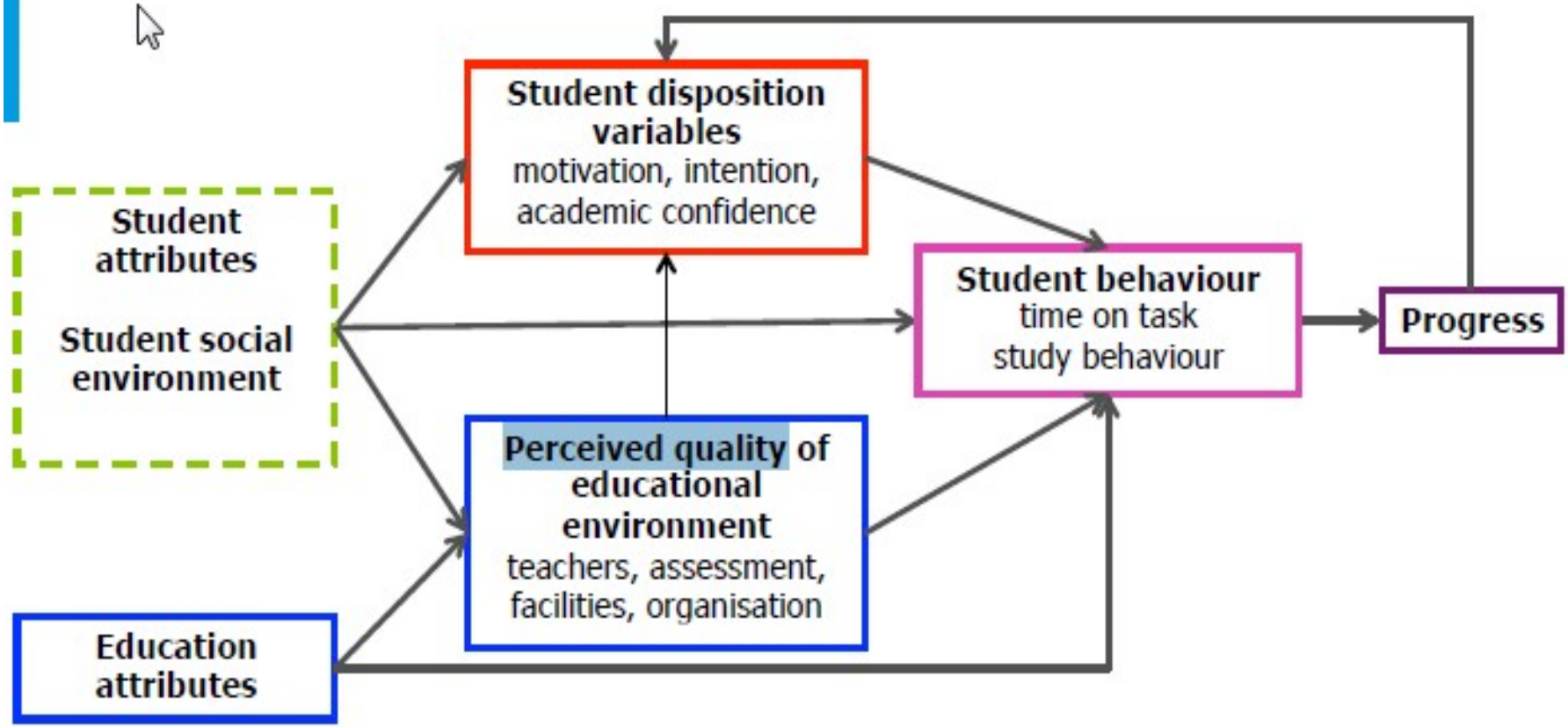
Items pertaining to failure	Rank students	Rank lecturers	p level (if <.05)
Insufficient effort	1	1	.01846*
Lack of self-motivation	2	2	
Too many demands on students' time	3	15	.00053
Lack of self-discipline	5	4	.03186*
Heavy course workload	7	35	.00001
Lecturers who are out of touch with students' needs	8	24	.00223
Boring presentations by lecturers	12	26	.00022
Failure to realize that uni ≠ high school	31	12	.00102*

Student models of student succes

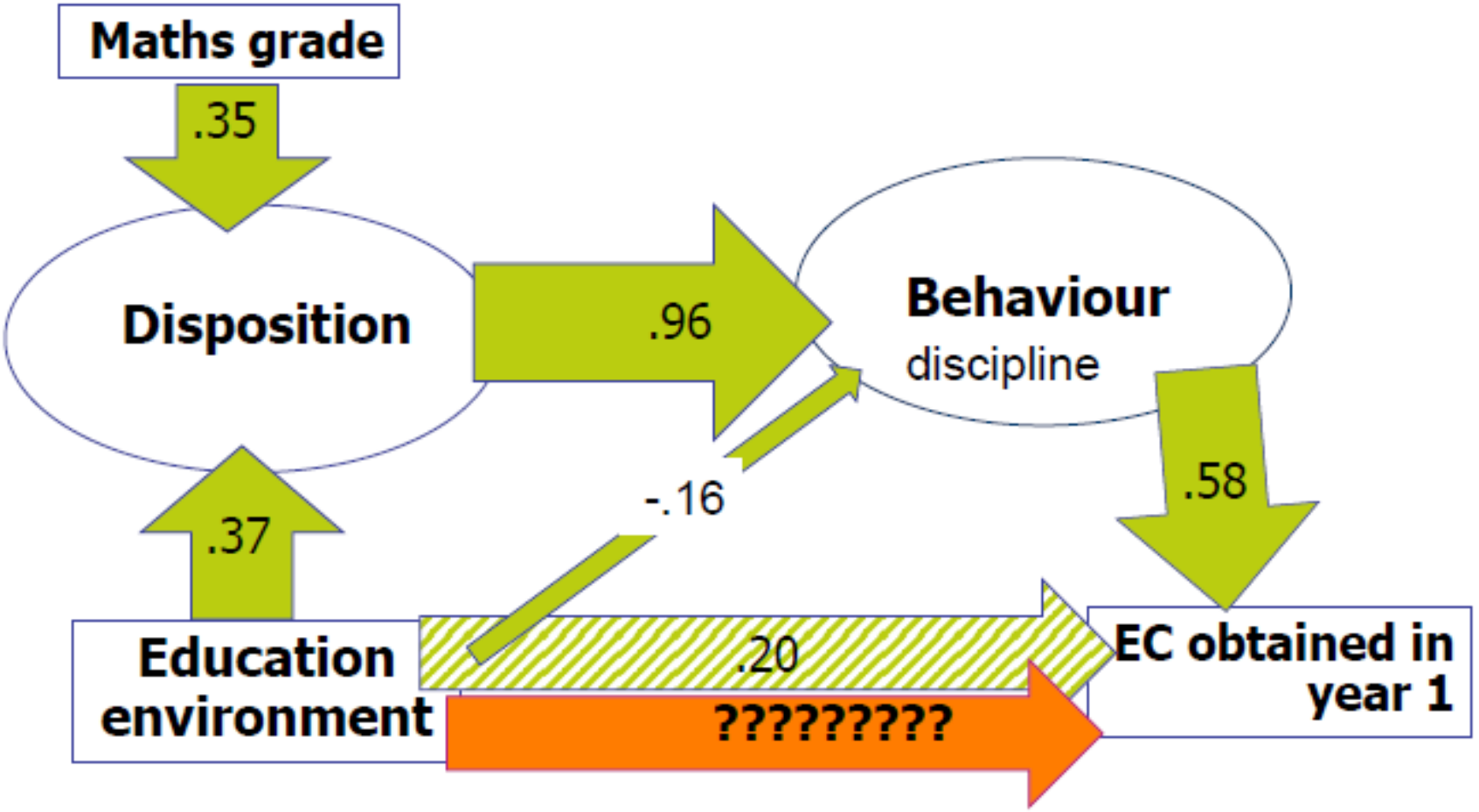
(M.vdBoogaard-TUD)



Preliminary model for DUT first year student success (M.vd Boogaard-TUD)



Generalised DUT model for first-year student success (M vd Boogaard-TUD)



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How to Support Learning at Anytime Anywhere
R E P O R T
on
WORK PACKAGE WP6
Questionaires on possible roles
Of social media
<Title>
Deliverable(s) WP6-3

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