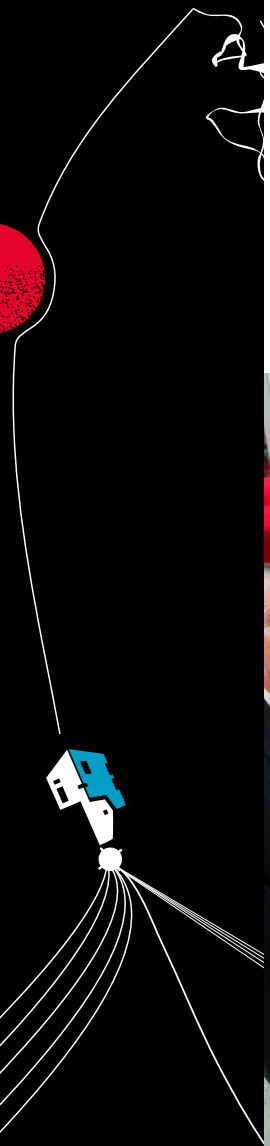# SENIOR UNIVERSITY TEACHING QUALIFICATION
UNIVERSITY OF TWENTE
PROJECTS OF 2017-2018

UNIVERSITY OF TWENTE.

4TU. CENTRE FOR
ENGINEERING EDUCATION

THIS BOOKLET CONTAINS THE PRODUCTS OF THE FIRST GROUP OF TEACHERS WHAT HAVE BEEN WORKING ON THEIR SENIOR UNIVERSITY TEACHING QUALIFICATION.

THE SENIOR UNIVERSITY TEACHING QUALIFICATION
The SUTQ is based on the SoTL approach; the Scholarship of Teaching and Learning. Participants (senior teachers) do research and/or design innovative education within their own teaching practice. For about one year participants worked 160 hours on their individual educational (SUTQ) question. Within the SUTQ participants determined their own personal learning path (based on the Student - Driven Learning principle). In order to gather all the necessary information to answer the education question, participants received facilitations, support and feedback from the Centre of Expertise and Learning and Teaching (CELT) and Centre of Engineering Education (CEE).

SUTQ IMPROVES EDUCATION
The University of Twente educates the professionals of tomorrow. To be able to provide a high standard of education, the UT emphasizes the importance of highly skilled teaching staff. We stimulate teaching excellence by implementing a wide range of activities. SUTQ is designed for experienced teachers who achieved their UTQ (or exemption) and have the ambition to improve the/their education. The UTQ and SUTQ are embedded strongly in our HR policy of life long learning. The UTQ and SUTQ programmes are coordinated by the Centre of Expertise in Learning and Teaching (CELT).

www.utwente.nl/sutq

A HYBRID TEST FOR MATHEMATICS

INTRODUCTION
Nowadays electronic testing packages offer excellent opportunities for students for practicing mathematics. However, traditionally mathematics exams still consist of merely open exercises.

SUTQ QUESTION
To what extent can traditional summative mathematics tests be transformed into digital tests, without harming validity and reliability?

SOLUTION
Compose a hybrid test containing both open (pen and paper) and closed (final answer) exercises.

EXAMPLES OF TRADITIONAL EXERCISES

1. [4 pt]
Compute the following integral by reversing the order of integration.

$$\int\limits_{0}^{1}\int\limits_{\sqrt{y}}^{1} \sqrt{x^3+1}\,dxdy$$

6. [6 pt]
The solution to this exercise must be clearly written down on a separate sheet (including calculations and argumentation)!

The function $f : \mathbb{R}^2 \to \mathbb{R}$ is given by: $f(x,y) = x^2y$.
Use the method of Lagrange Multipliers to find the maximum value and the minimum value of f subject to $x^2 + 2y^2 = 6$.

HARRY AARTS

Harry Aarts (1960) studied mathematics at the Radboud University in Nijmegen. After receiving his Master's degree, he did his PhD in game theory at the University of Twente. From 1994 onwards he has been a lecturer at the department of Applied Mathematics of this university, except for a four year period at the Hogeschool Larenstein in Arnhem. At the University of Twente he teaches Calculus, Linear Algebra, Discrete Mathematics , Analysis, Abstract Algebra and Graph Theory to students of several programs.

EXAMPLES OF EXERCISES IN CLOSED FORM

2. [3 pt]
Let $f(x,y) = f(x(u,v), y(u,v))$ and $x(u,v)$ and $y(u,v)$ be differentiable functions.
Use Tables 1 and 2 to determine $\frac{\partial f}{\partial v}(u,v)$ in $(u,v) = (1,2)$.

(x,y)	$(0,0)$	$(1,2)$	$(3,0)$
$f(x,y)$	1	6	−2
$f_x(x,y)$	−1	3	−5
$f_y(x,y)$	−2	8	9

Table 1

(u,v)	$(0,0)$	$(1,2)$	$(3,0)$
$x(u,v)$	−2	3	7
$y(u,v)$	6	0	3
$x_u(u,v)$	1	2	6
$x_v(u,v)$	0	4	1
$y_u(u,v)$	3	−4	2
$y_v(u,v)$	0	5	−3

Table 2

Choose from the alternatives below and fill in your answer on the answer sheet:

(a) 31 (b) −21 (c) 0 (d) 25
(e) 58 (f) −32 (g) 52 (h) 26

7. [1 pt]
Choose, from the eight figures below, the correct sketch of the region of integration of the following integral.

$$\int_{-1}^{2}\int_{-y}^{y^2+1} x\,dx\,dy$$
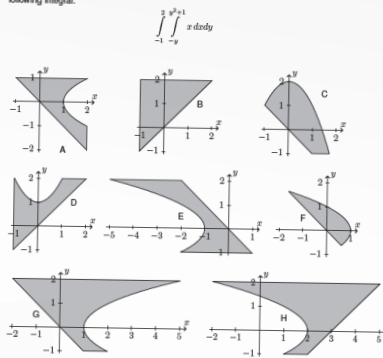
9. [3 pt]
Consider the following integral.

$$\int_{0}^{4}\int_{\frac{1}{2}x-1}^{1+\sqrt{x}} xy^2\,dy\,dx$$

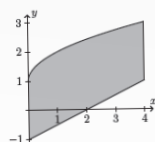The region of integration is depicted in Figure 1.

Figure 1: Exercise 9: Region of integration

Change the order of integration of this integral.
Choose the right expression below: either (a) or (b).
Then determine the correct limits of integration and the integrand(s):
either a_1, a_2, a_3, a_4 and $f_1(x,y)$, or $b_1, b_2, b_3, b_4, c_1, c_2, c_3, c_4$ and $f_2(x,y)$, $f_3(x,y)$.

(a) $\int_{a_1}^{a_2}\int_{a_3}^{a_4} f_1(x,y)\,dx\,dy$

(b) $\int_{b_1}^{b_2}\int_{b_3}^{b_4} f_2(x,y)\,dx\,dy + \int_{c_1}^{c_2}\int_{c_3}^{c_4} f_3(x,y)\,dx\,dy$

RESULTS
Pass rate: 76.5 % (comparable to traditional tests)

Item	Max Score	P	C	α
1	2	0.62	0.259	0.654
2	3	0.26	0.115	0.679
3	2	0.39	0.218	0.657
4	2	0.60	0.195	0.660
5	3	0.78	0.316	0.644
6	6	0.62	0.457	0.614
7	1	0.82	0.257	0.659
8	2	0.87	0.278	0.652
9	3	0.68	0.392	0.630
10	6	0.65	0.542	0.604
11a	1	0.78	0.313	0.655
11b	2	0.63	0.293	0.647
12	3	0.49	0.455	0.625

Table 4: Item scores Math D1, June 16, 2017

LESSONS LEARNED
- No complex exercises in closed form.
- Provide students with sufficient representative practicing material.
- Not all educational targets are suitable to be tested with closed exercises.
- The test package itself might have unexpected technical restrictions as well.

FOLLOW UP
Extension hybrid tests to other mathematics courses.

MY EXPERIENCE WITH THE SUTQ

WHAT MY SUTQ PROJECT WAS ABOUT
My SUTQ project concerns a study to digital testing of Mathematics at an academic level. I designed a hybrid test (partially open, partially closed exercises) for one of the Calculus courses at the University of Twente.

WHAT I HAVE LEARNED
In this study I learned what pitfalls come across when designing closed exercises for a mathematics test and how to avoid them.

WHAT WAS THE BIGGEST CHALLENGE
The biggest challenge in this project was to convince my collegue-mathematicians that a valid and reliable test for a mathematics course, mainly consisting of closed exercises (only the final answer is graded), could be designed at all.

WHAT ARE YOU PROUD OF
I am proud of the final result: the hybrid test was subjected to almost 500 students of various programs and their scores were analyzed. Regarding validity and reliability, the conclusion is that this test is comparable to the traditional pen and paper tests of this course.
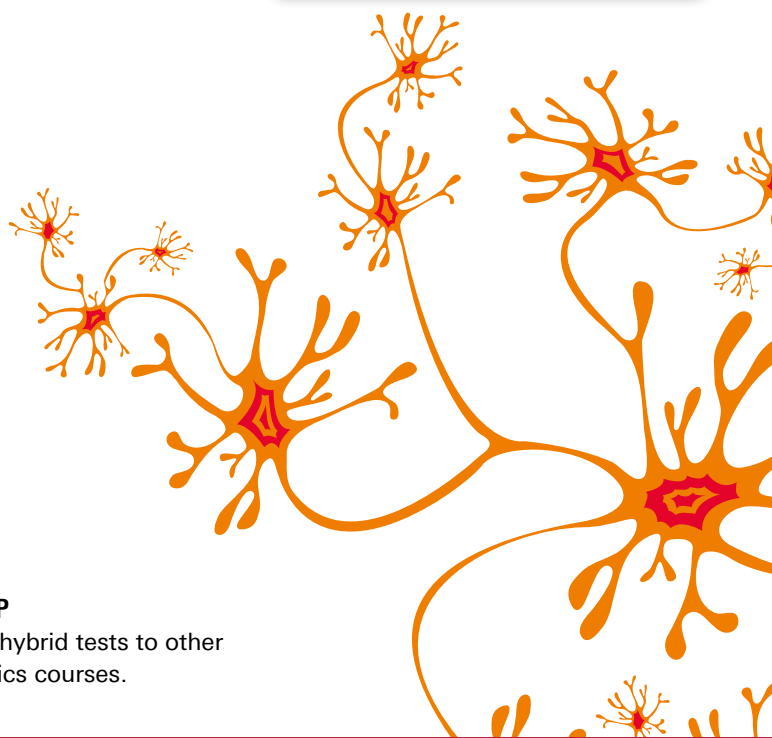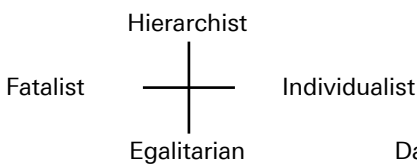
IS STUDENT CENTRED TEACHING ALWAYS FAIR?

EFFECT OF CULTURE ON THE OPINION TOWARDS STUDENT CENTRED LEARNING BY INTERNATIONAL STUDENTS

BACKGROUND
- Student centred teaching is becoming more popular as the initiative and ownership of the learning is placed with the student and not the teacher.
- This should stimulate the intrinsic motivation of students to participate in the learning.
- When students from a cultural background where own initiative is less valued are subjected to student centred learning this might have ad-verse effects to their learning.

THEORETICAL MODEL

Hierarchist

Fatalist ——————+—————— Individualist

Egalitarian

Data collection on:
perception
opinion
readiness

DATA
~ 27 students
~ 14 nationalities
~ Questionnaires
~ Open question on student centred teaching
~ Focus group discussion with students

QUESTIONNAIRE
Perceptions of students (likert scale rating) towards activated learning, with respect to:
- Initiative (who should take initiative?)
- Benchmark (who should decide what to learn?)
- Learning goals (how does activating teaching affect your performance?)
- Impact (how does activating teaching affect your performance?)
- Interaction (how should you interact with students and staff?)
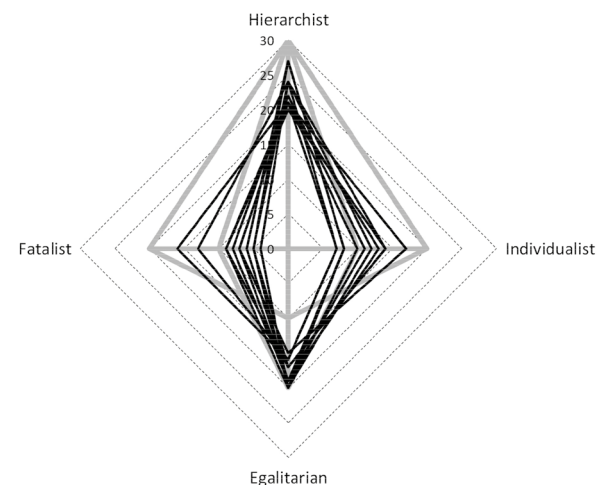
HYPOTHESIS
Students that are classified as hierarchists would have a less favorable opinion to SCL that students that are classified otherwise.
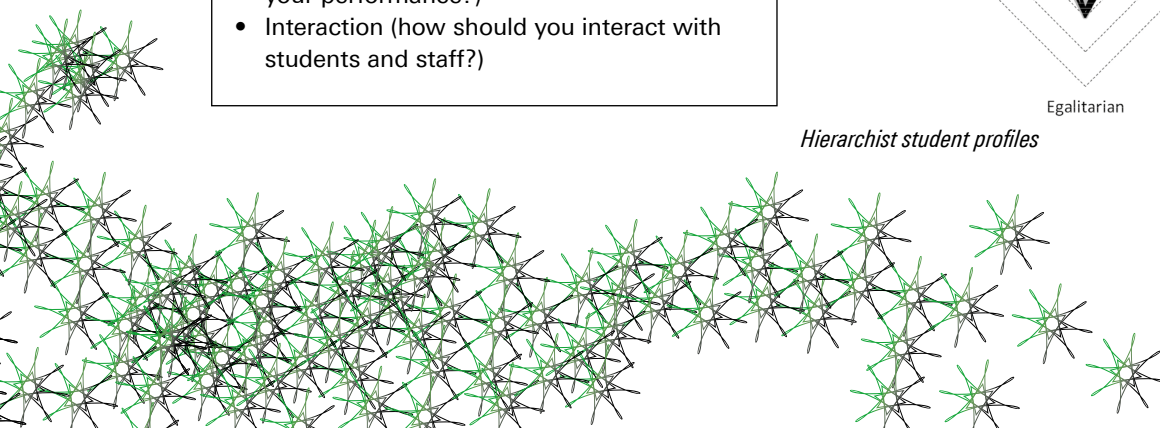
RESULTS
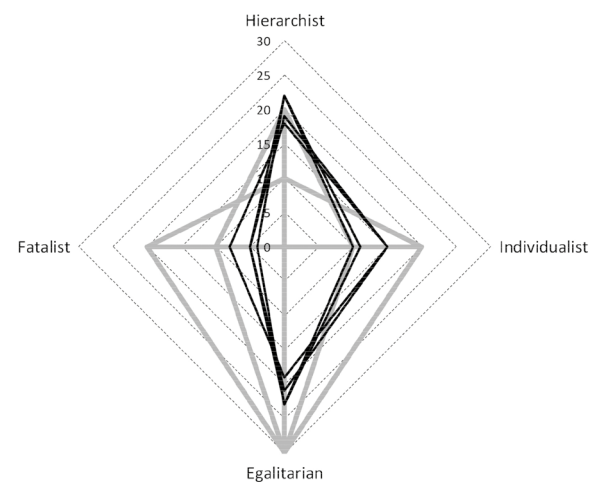
Egalitarian student profiles

Hierarchist student profiles

THOMAS GROEN

Thomas Groen is Assistant Professor at the department of Natural resources of the Faculty of Geo-Information Science and Earth Observation (ITC) at the University of Twente. He is active in teaching for Natural Resources Msc specialisation of the Faculty's Master programme, and also active in the distance based iGEON course which is offered in cooperation with Lund University. He specialized in tropical ecology at Wageningen university, and has a specific interest in ecosystem modelling, spatial modelling and remote sensing.

CONCLUSIONS
- Most students in sample seem hierarchists
- Overall sample size too small for real quantitative analyses, mainly qualitative results.
- Overall positive opinions regarding SCL suggesting to falsify the hypothesis
- Students seem ready for SCL as well
- Little change in opinion over time
- Open questions and discussion revealed suggestions regarding better organizing SCL including:
  - more formative feedback
  - more formal meetings with teachers during SCL projects
  - better formulation of assignments
  - better balance between group and individual assignments
  - more control in group formation by teachers

MY EXPERIENCE WITH THE SUTQ

WHAT MY SUTQ PROJECT WAS ABOUT
My research was about identifying the opinion of students from different cultural backgrounds towards a student centred learning approach. The hypothesis was that students with a more hierarchical background would have a less favourable opinion towards student centred learning than student from more individualistic background.

WHAT I HAVE LEARNED
The study showed that most students that participated in the survey could be classified as having an hierarchical background. Nevertheless, their readiness and acceptance of student centred learning was quite high, seemingly falsifying the initial hypothesis. The group size, however, was small, so a follow up study is currently prepared to more rigorously test this finding.

WHAT WAS THE BIGGEST CHALLENGE
This was the first time I conducted qualitative research in the form of open-ended questions in a questionnaire, as well as focus group interviews. This was unexplored territory for me and taught me a lot about surveying with these kinds of methods.

WHAT ARE YOU PROUD OF
I believe that the very honest and useful feedback that I acquired through the various questionnaires that the students filled in have helped me to become a better teacher, because they forced me to critically reflect on my own way of implementing student centered learning. I'm proud that I took on this challenge, and that there will probably be a follow up.

TOWARDS PRACTICAL AND EFFECTIVE VIDEO INTERVISION ROUTINES

CONTEXT

In teacher training, intervision is an important component. The goal of intervision is to achieve professional development by discussing concrete cases from teaching practice. Traditionally, one of the students brings in a case orally, that is discussed by means of a certain intervision method. This rarely produces a complete picture. Use of video offers a less subjective perception. The goal of this study is taking a first step towards practical and effective video intervision routines for preservice teachers.

MODEL OF PROFESSIONAL GROWTH

This study was setup by linking video club and video feedback coaching research to the interconnected model of professional growth of Clarke and Hollingsworth (see Figure 1).

RESEARCH QUESTIONS

This study sought to get insight in the course of current, traditional intervision sessions and new video intervision sessions as well as the experiences of the participants with the latter. It focused on:
- Input of the case owner
- Group process
- Output for the case owner
- Output for the peers
- Outcomes for the case owner

PARTICIPANTS

Traditional intervision
- 6 economics students, 1 teacher trainer
- 8 physics students, 1 teacher trainer

Video intervision
- 6 computer science students, 1 teacher trainer
- 8 chemistry students, 3 teacher trainers

METHOD

Analysis of video recordings of 5 traditional and 3 video intervision sessions.
- Description of the sessions
- Timing of the sessions on: input case, asking clarifying questions, discussion without case owner, discussion with case owner, and conclusion case owner
- Teacher trainer questionnaire
- Student questionnaire

JAN VAN DER MEIJ

Jan van der Meij is Program Director of UT Teacher Education, ELAN, Department of Teacher Professional Development. He has a vocational secondary education teacher qualification in electronics and a master's degree plus PhD in educational technology. In the UT teacher training program, Jan teaches the general pedagogical courses. Jan's research interest lies in teacher and learner use of ICT in the classroom. Currently he is investigating video coaching of pre-service and starting teachers.
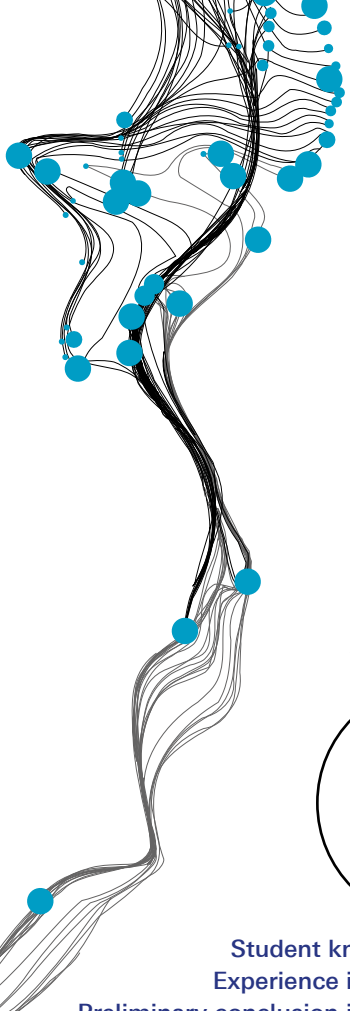
Student brings in case

Intervision group   *External Domain*

External Source
of Information
or Stimulus

Personal Domain

Knowledge
Beliefs
And Attitude
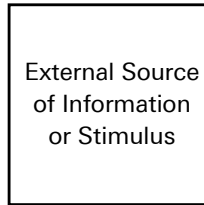
Domain of Practice

Classroom Experience
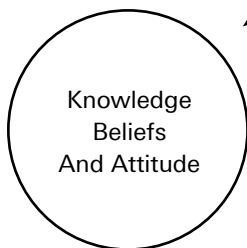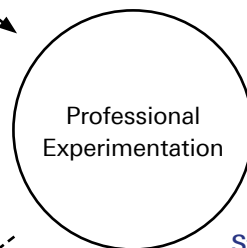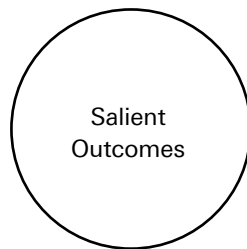
Professional
Experimentation

Domain of Consequence

**Student tries
strategy**

Student knows strategy
Experience influences PD
Preliminary conclusion influences PD
Intervision influences PD
New conclusion influences PD

Salient
Outcomes

- - - ► Enactment
────► Reflection

Student draws preliminary conclusion
Student draws new conclusion

Figure 1. Possible professional development (PD) through intervision according to the interconnected model of professional growth.

RESULTS
The teacher trainers used several intervision methods in the traditional and video intervision sessions.

Video supported	students	teacher trainers
Input case owner	✓	✓
Group process	✓✗	✓
Output case owner	✓✗	✓?
Output peers	✓✗	✓?
Outcomes case owner	✓✗	✓?

MY EXPERIENCE WITH THE SUTQ

WHAT MY SUTQ PROJECT WAS ABOUT
My SUTQ research focused on the use of video during peer group review (intervision) of our pre-service teachers. The study sought to get insight in the course of current, traditional intervision sessions and new video intervision sessions as well as the experiences of the participants with the latter.

WHAT I HAVE LEARNED
I have learned that it is very important to invest time to

discuss the pros, cons, and implications of an educational innovation with the stakeholders.

WHAT WAS THE BIGGEST CHALLENGE
For my SUTQ project, the biggest challenge was to involve my colleagues in such a way that they were excited to participate.

WHAT I AM PROUD OF
I am proud of the way I introduced and implemented the use of the video recording and sharing platform IRIS Connect in our teacher training program and our partner schools.

MARK VAN DER MEIJDE

Prof Dr Mark van der Meijde is a geophysicist who works for the faculty ITC and is strongly involved in the MSc programmes 'Applied Earth Sciences' and 'Spatial Engineering', but also teaches in the bachelor HTHT module 'Smart Ways To make Smart Cities Smarter'. He is active in curriculum development and is teaching himself topics on 'earthquakes and engineering' and 'exploration and environmental geophysics'.

MY EXPERIENCE WITH THE SUTQ

WHAT MY SUTQ PROJECT WAS ABOUT
The University of Twente has started a new initial 2-year MSc program. The program will be based on a project-based learning approach. It will be formed around 3 projects (one quartile each) and each project has an increased level of wickedness. Wicked problems deal with issues that cannot be resolved merely by gathering additional data, defining issues more clearly, or breaking them down into small problems. A wicked problem has innumerable causes, is tough to describe, and doesn't have a right answer.
The prime educational question for this SUTQ project is to define how wicked problems, problems with innumerable causes that are tough to describe and don't have a right answer, can be used in project based education, with a particular focus on how to:
- define objectives that intrinsically can't be defined
- give structure to an unstructured project
- assess the quality when there is no true answer or preferred approach
- provide guidelines to staff that need to supervise such a wicked problem based module.

WHAT I HAVE LEARNED
Gaining knowledge and experience on a whole MSc course based on project-based education (PBE) was a prime goal. The further complication of the inclusion of wicked problems in PBE is a strongly complicating factor that required a deep understanding of wicked problems, their main role and importance in PBE, and how to make it efficient for learning and teaching. Deepening my understanding on these points helped me to define solutions that can make wicked problems suitable for learning in PBE. My main focus was on providing a challenging learning environment with objective learning/testing/assessment procedures that provide clarity for students and supervising staff on what is required on group and individual student level. It required a different view on content related assessment since the outcome of each project is inherently undefined and

therefore no strict assessment criteria are available on the correctness of execution of the content component of projects. This required to dive deep into PBE and wicked problems, in relation to rules for assessment, to derive the optimal solution for assessing the learning in wicked PBE assessments. In relation to the assessment of student performance, and guaranteeing the knowledge gain (the learning) throughout the course, the role of the teacher is very important. The teacher should be working in such a teaching environment that supervision could be provided, but meanwhile not reducing the wickedness of the problem. This is a precarious balance that I have learned to address. Overall, the main personal learning experience was on how we can develop a whole new MSc program while in the meantime adopting new educational approaches based on wicked problems in PBE. The focus was, therefore, strongly oriented towards the definition of wicked problems in PBE and the corresponding assessment and teaching approach.

WHAT WAS THE BIGGEST CHALLENGE
The biggest challenge was to find the right meaning of all the abbreviations in the educational field. The P in the abbreviation PBE can mean, for example, process or project. But also there are often different definitions for the same term or the same definitions for different terms. If you then try to find all the detailed differences and commonalities it was often a challenge to get this coherently done (and I'm even wondering if I got it all right in the end…).
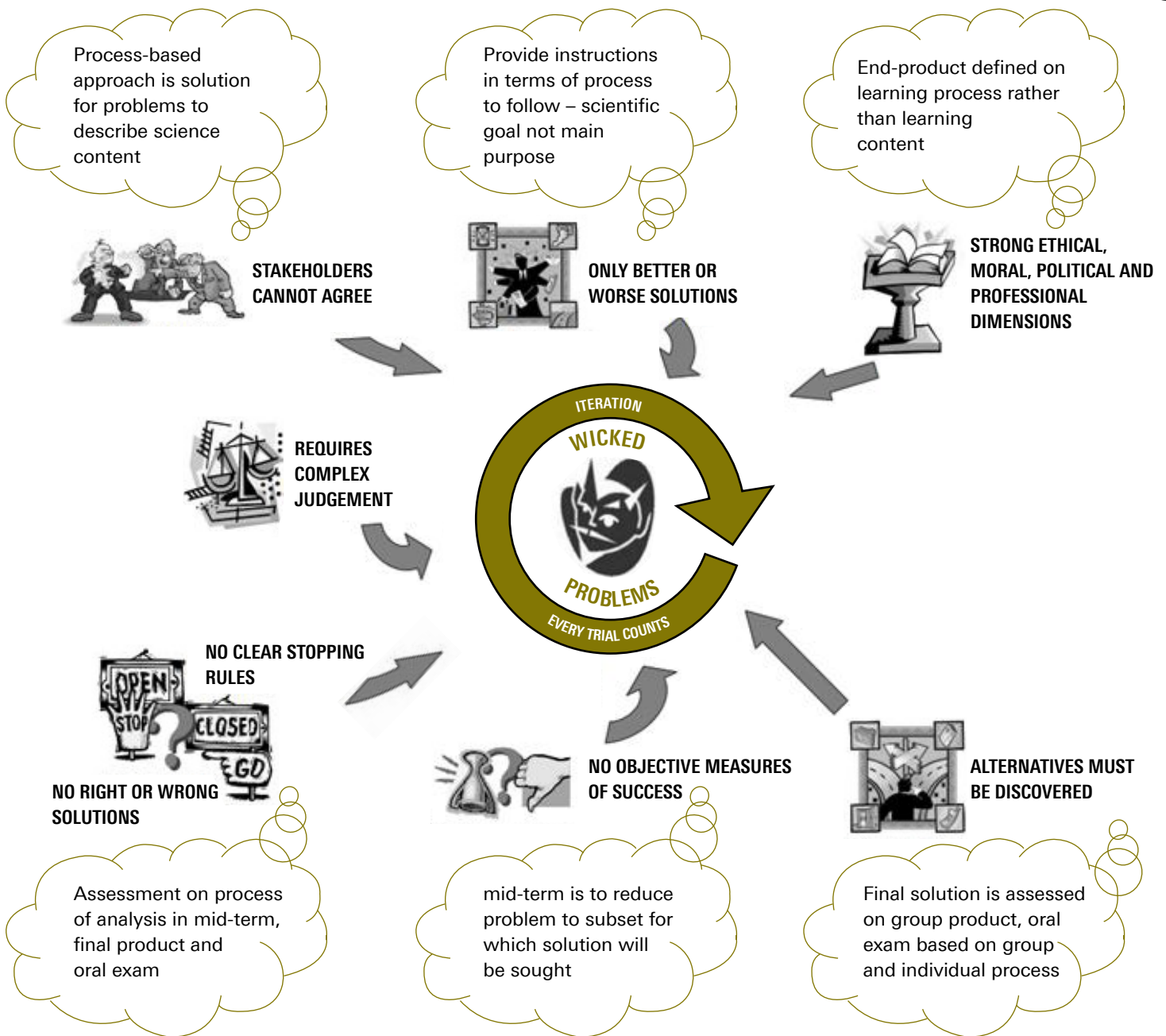
WHAT ARE YOU PROUD OF
The SUTQ project was meant as a development for a single course. During the development it already became clear that the framework for the very complex project I was studying was also a very suitable framework for the earlier projects. It was in the end implemented in the whole MSc which was a very nice added value to the original SUTQ plan.
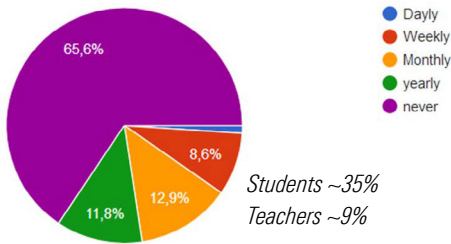
TAMING THE WICKED EDUCATION

WICKED PROBLEMS HAVE ONE ESSENTIAL PROBLEM: THEY ARE BASICALLY NOT SUITABLE FOR EDUCATION…

Process-based approach is solution for problems to describe science content

Provide instructions in terms of process to follow – scientific goal not main purpose

End-product defined on learning process rather than learning content

STAKEHOLDERS CANNOT AGREE

ONLY BETTER OR WORSE SOLUTIONS

STRONG ETHICAL, MORAL, POLITICAL AND PROFESSIONAL DIMENSIONS

REQUIRES COMPLEX JUDGEMENT

ITERATION
WICKED
PROBLEMS
EVERY TRIAL COUNTS

NO CLEAR STOPPING RULES

NO RIGHT OR WRONG SOLUTIONS

NO OBJECTIVE MEASURES OF SUCCESS

ALTERNATIVES MUST BE DISCOVERED

Assessment on process of analysis in mid-term, final product and oral exam

mid-term is to reduce problem to subset for which solution will be sought

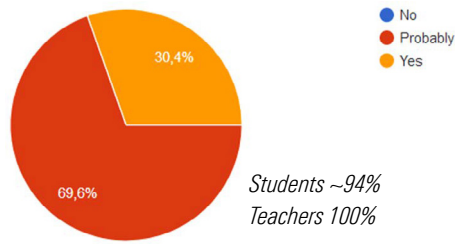Final solution is assessed on group product, oral exam based on group and individual process

ISSUES: NO FIXED CONTENT, NO CLEAR END GOALS, NO RIGHT SOLUTION À NO FIXED GUIDELINES, NO FIXED ASSESSMENT RULES
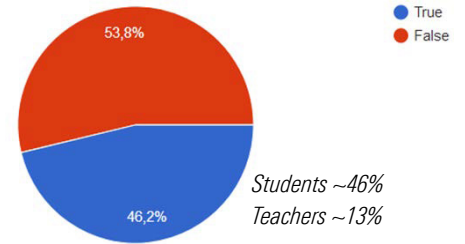
source figure: http://socialdoers.com/neet-an-increasing-wicked-social-problem/

WHY STUDENTS PLAGIARISE?

Frequency of copy-paste without referencing

- Dayly
- Weekly
- Monthly
- yearly
- never

65,6%
8,6%
12,9%
11,8%

Students ~35%
Teachers ~9%

Do you think classmates copy-paste without referencing

- No
- Probably
- Yes

30,4%
69,6%

Students ~94%
Teachers 100%

I copy 1 or 2 sentences Just to get inspired

- True
- False

53,8%
46,2%

Students ~46%
Teachers ~13%

DISCOURAGING FACTORS

ENCOURAGING FACTORS

Personal

Self esteem
Moral reasoning
Fairness to others
Desire to learn
Guilt and/or fear

Negative attitudes
Lack of Awareness
Lack of competences
Second language skills
Knowledge viewed
as irrelevant

~ 46% would not feel guilty when plagiarising

~ 76% : "there are only so many ways you can write things"

Negative ———————————————————— **Positive**

Professors knowledge
Chance of getting caught
Effort
Danger
Specific Assignments
Knowledge needed in future

Pressure (grade,time,task)
Lenient penalties
Temptation
Teachers "loose attitude"
Broad task or assignment

~ 23%: benefit might outweigh risk of getting caught
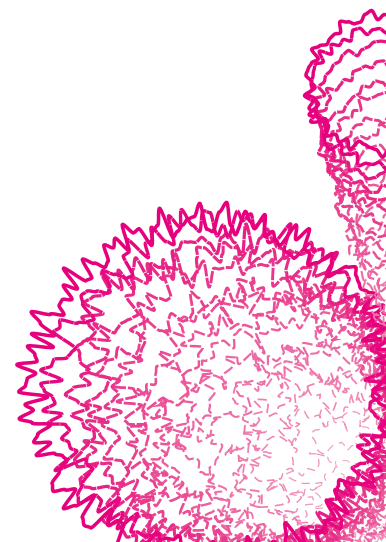
~ 40%: short deadlines give right to plagiarise

Situational

Do all teachers follow the same rules
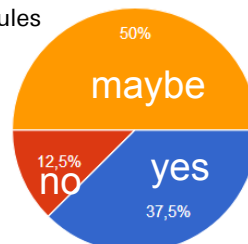
50% maybe
37,5% yes
12,5% no

CORA SALM

Cora Salm obtained a master degree in Applied Physics and a Ph.D degree in Electrical Engineering in the field of semiconductor device physics and fabrication. Her present research field is the reliability physics of semiconductor devices and systems. She holds a 1st degree high school physics teaching qualification and completed the DUIT course (predecessor of the University Teaching Qualification) with a redesign of the master course Reliability Engineering.

Presently she is the Bachelor Coordinator of Electrical Engineering (EE). She teaches in the bachelor programs EE, Creative Technology, Industrial Design and the master program EE. She is also a tutor in the bachelors Applied Physics and Advanced Technology.

MY EXPERIENCE WITH THE SUTQ

WHAT MY SUTQ PROJECT WAS ABOUT

My research focussed on plagiarism and tried to identify the reasons students commit plagiarism with the aim of improving our teaching on this topic. This should lead to graduates that have the knowledge, the skills and the motivation to write proper scientific documents.

WHAT I HAVE LEARNED

There are a large amount of factors (positive and negative) determining the attitude towards committing plagiarism and fraud. This holds for both students and teachers. The most interesting factor is the willingness of students to cheat/plagiarize when they feel the course is not properly taught (e.g. unrealistic deadlines or unfair teachers). The most surprising conclusion to me was the percentage of teachers that admit to also bend the rules themselves and the differences in interpretation and application of the governing rules at the university both within (a) and between educational program(s).

WHAT WAS THE BIGGEST CHALLENGE

Being an engineer by training and heart I had never ventured in the field of behavioural sciences. Making and analysing surveys even when there are questionnaires from literature you can use as inspirations is not as simple as one thinks. Randomising the order of totally agree to totally disagree from one of the references turned out to be an outdated principle. Fortunately the target group students know me and also gave feedback on how to improve the survey.

WHAT ARE YOU PROUD OF

In combining knowledge obtained from literature with data obtained from two surveys I gained a better picture of the factors involved which helps me to prioritise actions to be taken. I am proud of the fact that discussions with fellow teachers have resulted in increased awareness and willingness to at least think about and hopefully implement changes in the programs.

SUMMARY

+ Masters score better than bachelors
+ Integration in project
+ Write essay on notorious case

- Detection: too little too late?
- Many things not reported
- Exam board sometimes too slow
- Teachers do not have same interpretation
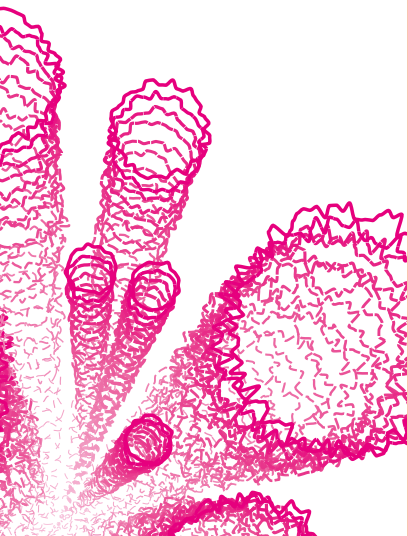
TO PLAY OR NOT TO PLAY: ON THE MOTIVATIONAL ASPECTS OF SERIOUS GAMES

INTRODUCTION

The use of games as educational tools has gained increased interest over the last decennia. Referred to as serious games their primary purpose is to educate and train the player which differentiate them from pure entertainment games. Games are often assumed to possess an inherent motivational power through which individuals become immersed and absorbed in a game and experience the game play as enjoyable. This engaging potential of games is brought forward to argue that games are also suitable in the educational context. However, previous research indicates that the motivational appeal of games as demonstrated for entertaining computer games does not play out in the educational context. The aim of this research is to investigate the role of different motivational forms in serious games and the influence of the game environment on students to get involved and stay involved in game playing.

APPROACH

Based on self-determination theory and a mixed-method research design the role of intrinsic motivation (IM), identified regulation (IR), external regulation (ER) and amotivation (AM) in seven serious games (Table 1) is determined and the influence of game attractiveness, game learning and game operativeness on these motivational forms is revealed. The data collection is conducted in two consecutive years of a postgraduate course in which the games are used. It combines observations, panel discussions, and questionnaire surveys for all games in both years.

Figure 1 Game 4 impression

Figure 2 Game 6 impression

MY EXPERIENCE WITH THE SUTQ

WHAT MY SUTQ PROJECT WAS ABOUT

I investigated the role of different motivational forms in serious gaming and the influence of the game environment on students' motivation to get involved and stay involved in game playing.

WHAT I HAVE LEARNED

The research put my initial overconfidence in the motivational power and, thus, learning effectiveness of serious games more into perspective. It revealed that different motivational forms (intrinsic and extrinsic) can co-exist when students play serious games and that the motivational effects of games will depend on the circumstances under which the games are applied. A main learning outcome is that design and use of games for education purposes should address multiple forms of motivation and should not only focus on the game content but on operational and learning issues as well

WHAT WAS THE BIGGEST CHALLENGE

The integration of research design and course structure was challenging. On the one hand, the research design required a certain number of games to be played and the replication of the game play in a consecutive year to ensure valid and reliable research results. On the other hand, the games had to fit in the overall course structure to allow for the intended learning of the students.

WHAT ARE YOU PROUD OF

It was an achievement for me that I was able to conduct research about my own education and could generate some interesting findings written up in a scientific publication. It was also nice to see that most students had fun while playing the games.

No	Name	Type	Subject	Learning goal
1	GasSolution	Computer-based Single player	Building a gas network to deliver gas in a safe, reliable and sustainable manner	Understanding the complexity and trade-offs of infrastructure management decisions
2	RiskSwitch	Computer-based Single player	Increasing the reliability of railway switches	Understanding the consequences of decisions on reliability, cost, maintainability and availability of infrastructure
3	RAMSes	Computer-supported Single/Multiple player	Developing a competitive bridge design for a DBFM tender	Understanding the consequences of design decisions on the costs and risks over the life-cycle of infrastructure assets
4	HighwayStakes	Computer-based Single player	Improving the intervention strategy for a highway link	Understanding the consequences of decisions for different stakeholders involved in infrastructure intervention projects
5	AMImplementation	Computer-supported Single/multiple players	Improving a road section by taking strategic, tactical and operational decisions	Understanding the relationship between decisions on strategic, tactical and operational level of an asset management organization
6	RoadRoles	Board game Multiple players	Preparing tenders for the maintenance of a road network	Understanding the relationship between procuring road maintenance and the condition of a road network
7	BridgeGame	Computer-based Single/multiple players	Monitoring and maintaining a bridge to reduce performance risks	Understanding the relationship between infrastructure objectives, infrastructure performance, and infrastructure interventions

Table 1 Overview of games investigated

CONCLUSION

- Different motivational forms can co-exist when students play serious games.
- The use of serious games, either computer-based or not, does not automatically lead to intrinsically motivated students in educational context.
- Game attractiveness is a driver for intrinsic motivation but not sufficient to explain the existence of other motivational forms.
- Game learning can particularly explain the emergence of different forms of extrinsic motivation.
- Game operativeness is a basic condition for serious games to unfold their challenge and engagement potential which in turn will frame the learning experience of students.
- Design and use of games for education purposes should address multiple forms of motivation and should not only focus on the game content but on operational and learning issues as well.

ANDREAS HARTMANN

Andreas Hartmann is Associate Professor of Infrastructure Management at the Faculty of Engineering Technology. He studied Civil Engineering and obtained a PhD in Construction Management. Andreas is teaching in the Master's programmes Civil Engineering and Management and Construction Management and Engineering. His research focuses on the interplay of the social, technical and environmental aspects in providing and managing modern infrastructure and aims at developing new methods and models for optimized decision making throughout the lifecycle of infrastructure systems.

CARINE DOGGEN

I am a clinical epidemiologist, and head of the department Health Technology and Services Research. We focus our research on the effects of technological innovations on clinical outcome, quality of life, quality, safety and costs of healthcare. I am teaching Clinical Research Methods to students Health Sciences, Technical Medicine and Biomedical Engineering. Teaching how to translate problems from clinical practice to a specific scientific research question and using an evidence-based research approach to answer this question is challenging.

MY EXPERIENCE WITH THE SUTQ

WHAT MY SUTQ PROJECT WAS ABOUT

The aim of my research was to assess the effects of flipped classroom in teaching clinical research methods to 2nd year students Technical Medicine on learning effectiveness.

WHAT I HAVE LEARNED

I have learned that a flipping the classroom approach does not notably increase learning effectiveness of all students Technical Medicine. It is not easily accepted and student do not like to change. For some students the traditional approach of lectures and tutorials might have led to better exam results. It would be a challenge to found out which students prosper by what type of (mixed) approach.

WHAT WAS THE BIGGEST CHALLENGE

The biggest challenge was to design new teaching materials which bridge pre-class work to in-class work in time before the start of the course, and to assess the effects of the flipping the classroom approach during the 10-week course.

WHAT ARE YOU PROUD OF

I am very proud of what we (my colleague who was involved in the overall process and myself) have achieved and that we did not let ourselves influence by the negative comments we sometimes received from students. What I am even more proud of is that the second time we taught this course using this new approach, students were really engaged with the materials and evaluated this part of the course as good to very good.

EFFECT OF THE FLIPPED CLASSROOM IN LEARNING CLINICAL RESEARCH METHODS

RATIONALE

- Student-driven learning is encouraged (customized, on-demand learning, self-paced)
- Online educational materials available
- Flipped classroom: basic knowledge moved to pre-class, application and syntheses in-class
- Integrating online materials in order to actively engage students and enhance learning is a challenge
- Effects on learning effectiveness in course clinical research methods yet unknown

OBJECTIVE

to assess the effects of flipped classroom
in teaching Clinical Research Methods
to 2nd year students Technical Medicine,
on learning effectiveness (engagement,
and grades)

METHODS

Cohort of 118 2nd yr TM students 2015-2016 10 week
Course Epidemiology Feb 2017 Two teachers

Learning effectiveness measured by:
- Teachers impression
- Examination results comparing grade
  a) students present vs absent
  b) previous cohorts
- Evaluation reports comparing cohort 2015-2016 vs previous cohorts on engagement, motivation and comments on type of teaching

RESULTS

Teachers impression of students:

'Are we really not getting any lectures from you?'

- were very surprised,
- did not want to believe this,
- were somewhat confused,
- realized doing pre-class work was necessary to make in-class meeting useful,
- who came to the in-class meetings were really motivated and engaged with the material.

Over time less students showed up (table 1) and more time was needed for in-class work.

EXAMINATION RESULTS

	T1 Research question	T2 Frequency measures	T3 association measures	T4 Study design	T5 experimental design	T7 observational design
Present, N(%)	79 (66.9)	95 (80.5)	78 (66.1)	68 (57.1)	53 (44.9)	47 (39.8)

Table 1. Presence of all 118 students during all 6 tutorials (T)

Cohort	Presence or absence students	Totaal aantal studenten	<5.5 (% failed)	>=5.5 (% passed)
2015-2016	>=5	44	43.2%	56.8%
	<5	74	71.6%	28.4%*
		118	61.0%	39.0%
2014-2015	-	102	48.0%	52.0%*
2013-2014	-	116	60.3%	39.7%

* chi-square p-value <0.01

Being present leads to higher % passing exam. No large differences over the years.

Table 2. Grades by presence/absence of the 118 students

Presence	N	Grade Mean (SD)	Min-Max
Not at all	8	5.0 (1.0)	3.5 – 6.8
1	11	4.7 (0.9)	3.7 – 6.4
2	16	4.9 (1.0)	3.2 – 6.8
3	22	5.0 (0.9)	3.2 – 7.3
4	17	5.3 (1.3)	3.2 – 7.8
5	21	5.7 (1.3)	3.5 – 7.8
6	23	5.7 (1.1)	3.5 – 7.8

* ANOVA P-value 0.06

Being more often present leads to higher grades.

Table 3. Grades by presence frequency of the 118 students

'I do not like this kind of teaching, I really prefer lectures'.

EVALUATION REPORTS

Previous years:
Students: appreciated variety lectures and tutorials, lectures were clear, tutorials were useful, took time, book not read as a standard, teachers enthusiastic, topic uninteresting.

Flipped classroom:
Students: own efforts and interest good, did not like no lectures were given, motivation and attendance low, tutorials (quiz) useful, book not nice, teachers did not give clear answers. Teachers: used to more active students, expected more self-reflection and an academical attitude.

DISCUSSION

Flipping the classroom approach does not notably increase learning effectiveness of all students Technical Medicine. It is not easily accepted and student do not like the change. For some students the traditional approach of lectures and tutorials might have led to better exam results. It would be a challenge to found out which students prosper by what type of (mixed) approach.

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