TRIBUTE TO
EXCELLENT
TEACHERS

COLOPHON

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FOREWORD

Investing in the quality of education means investing in the future

Peter Apers
dean

Creating and sharing knowledge is part of a university's core business. Knowledge transfer to businesses receives a lot of attention, but the biggest form of knowledge transfer is to the rest of society and it takes place through our graduates. Of course, providing education and coaching to our students are key factors. At the same time, we need to acknowledge that education doesn't get the attention it deserves during the selection and assessment of academic staff.

The University of Twente has visited the University of Lund a number of times. Education received a lot more focus over there, e.g. in the form of peer reviewing each other's teaching (similarly to how it occurs in research). Excellent professors are openly rewarded for their efforts (Excellent Teaching Practitioner). This led to a clear cultural shift in Lund, in which education and research are more balanced during assessments.

At the faculty of EEMCS, we took inspiration from Lund and started initiatives to bring appreciation for education more in line with appreciation for research. Naturally, the first step is to determine exactly what excellent education is. The next step is to voice greater appreciation for excellence in education during the annual performance appraisals. Within our own faculty we have innovative education. Education that goes above and beyond traditional lectures and tutorials. Lecturers regularly discuss their initiatives with each other. This booklet contains an overview of some of these extremely interesting innovations. The final goal is to broaden the assessment profiles of our roles, which will allow for profiling according to education (taking into consideration that profiling according to research is virtually standard practice). The research component will always be maintained, of course. We are currently working on this process with the rector and our fellow deans.

With the steps outlined above, the Faculty of Electrical Engineering, Mathematics and Computer Science is clearly signalling the cultural shift to increase appreciation for knowledge transfer to society at large by our graduates. During the alumni meeting of the University of Twente in China, it became abundantly clear how proud our graduates are of the University of Twente. Thanks to our excellent education, our ambassador network all over the world is experiencing considerable growth, further strengthening our international brand. Investing in appreciation for providing education means investing in the future.

Text: **Sandra Pool**

'Once that switch is flipped, the teacher will start to enjoy it'

THE FACULTY OF EEMCS IS WORKING ON IMPROVING THE QUALITY OF EDUCATION

Ten lectures followed by an exam? A ridiculous notion in the Excellent Teaching Practitioner (ETP) programme. The faculty of EEMCS employs the programme and aims to improve the quality of education. 'It starts with the teacher.'

'We have good education,' says Hans Romkema, coordinator of teacher development at the faculty of EEMCS. 'We want better education. We can achieve that goal by striving for greater appreciation and acknowledgement for teachers who contribute to innovations in education. The idea is that excellent teachers have a huge influence on the quality of education, and they get other people on board as well.'

The University of Lund (Sweden) was the source of inspiration for this approach. 'It's a research-focused approach for shaping education. That is why it works at a university. It starts with the teachers we ask to use their research attitude in solving design problems in education, as well as reflecting on that process. Once they flip that switch, the teachers start enjoying it, because they are researchers through and through.'

Pilot

EEMCS is currently working on an implementation within its own faculty. Twenty teachers are involved in the process. They will present their educational innovation during a seminar. Educational adviser consultant Karen Slotman says: 'We ask them to consider ahead of time what they want to achieve with their new educational method, and to reflect on whether expectations were met and which aspects played a part in the success or failure of a project afterwards. By making choices based on literature, for example.'

Sharing those experiences is vital according to Slotman. 'As well as the ensuing discussion. How do students learn, and what is the best way for them to learn? One teacher chose to implement a small part of his own course material in a challenge, for example. The end goal is for education as a whole to be permeated by someone's educational vision. One of the people involved recently published his research approach at a confe-

rence. An excellent example of sharing experiences outside of the UT.'

Excellent

Assessing whether a teacher is excellent is based on substantiated reflection. 'We're not going to sit in a lecture hall and look at how a teacher does things. What matters is how the course is designed and how the teacher reflects on that. Additionally, we want to see how the teacher has developed over the course of time.'

Improving the quality of education is necessary, according to Romkema, in order to better balance research and education. 'Education is under a great deal of pressure. Especially when compared to research. And research is always prioritized, in a variety of ways. Moreover, education isn't always appreciated in the same way by everyone in the academic community.'

Slotman adds: 'Teachers feel cheated if they work hard at improving education. With ETP, we want to make sure that a teacher is appreciated more.' A reward system ties into this idea. 'But we haven't gotten to that point yet. What will happen, however, is the creation of a network that you become a member of. And the title of ETP teacher should, in time, become a status symbol.' Additionally, EEMCS wants to know whether this model can be applied across the entire UT.

The ETP programme is open to all EEMCS teachers, regardless of where they are in their research. It is not linked to the UFO profile, the Universal Teaching Qualification (UTQ) and the Senior University Teaching Qualification (SUTQ). More information: **https://www.utwente.nl/en/eemcs/educational-quality/teacher_development/**

Passport

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Passport

Name: Hans Romkema (65)

Position: Coordinator of Quality Assurance at EEMCS

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Text: **Sandra Pool**

WEARING PARTY HATS IN CLASS

Having *serious fun* in Electrical Engineering

The green, yellow, red and blue-coloured keyboard immediately catches your eye when you enter Anne-Johan Annema's office. There's a story behind it. As is the case for most of the stuff in his office – and he will gladly tell you all of them.

Passport

Name: Anne-Johan Annema (50)

Position: Associate Professor of Electrical Engineering

Has been working at the UT since:

Started in 1985 with the study programme of Electrical Engineering at the UT and obtained his doctorate in 1994. After working a job at Philips Research he returned to the UT in 2000.

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The Electrical Engineering lecturer received the keyboard from his PhD students. 'I always use the Comic Sans font in my classes. As well as many different colours.' And not without reason. 'It's a very readable font, but you need to focus just a little bit harder. It takes just that little extra concentration, which makes the material easier to remember. And the colour codes refer to the chapters. They tell you exactly where we are in the course material. The students succeeded in sourcing a matching keyboard as a birthday present. I like using it, though it's not very comfortable to type on.'

'Clever tricks'

Annema's teaching features other 'clever tricks' to trigger his students. 'You need to find the right balance between being sufficiently clear and sufficiently unclear. If I'm simply narrating everything clearly during a lecture, students will think 'hah, this is easy' and I'll lose their attention. If I'm making a very complicated argument, they will also trail off. You need to tell a story that students find incredibly fascinating, which then encourages them to read the course material and the literature.'

By using a variety of teaching methods, the teacher improved his classes. For instance, he uses project groups consisting of three people. 'It's an uncomfortable number, but the result is that everyone is actively involved. No one can hide.' And wearing party hats in class? It could happen with Annema. 'It's the 1 vs. 100 quiz. Everyone wearing the party hat is still in the race, and is trying to outplay the candidate in front of the class. And there are prizes to be won. An entire EC, or half a point for the final grade. I call it having serious fun. They work on tough assignments during the quiz, and there's a fun factor.'

Fun in the classroom

The traffic light is another example of fun in the classroom. 'It has a timer, and I challenge project groups to hold their project presentation in three minutes. It forces them to think about what they want to say. So what exactly are the highlights? The audience keeps paying attention because the clock is ticking, and the traffic light jumps to red without remorse. Hilarity often ensues when people just barely don't make it in time.'

It is only logical that Annema is partaking in the ETP programme. 'If you're teaching, you need to do it right,' he believes. The certificates on his wall prove his point. They symbolize a variety of educational awards and nominations. 'I'm really happy I've received those. Electrical Engineering is not an easy discipline. It's a lot of hard work. With awards like these, the students give a clear signal that they appreciate the course.'

Text: **Esther Windt**

COMPLETE COURSE MATERIAL IN TEAM BASED LEARNING

'I can repair _knowledge gaps_'

Team Based Learning (TBL) actively involves students in the learning process. At least, that is what Mark Bentum, programme director of Electrical Engineering and professor of Radio Technology, has found. 'The test results are significantly higher than with traditional lectures and tutorials.'

Education needs to change, much like the world around us is rapidly changing. That's what Bentum firmly believes. And according to him, education at the faculty of EEMCS has already gone through some significant development in the last few years. 'Teachers simply lecturing their students with little to no interaction is a thing of the past.'

Preparing for lectures

During a course on Educational Leadership, Bentum visited three universities in England. 'It was fantastic. I would highly recommend that everyone travel abroad in order to look at a different educational approach. You learn so much from it.'

At the University of Bradford, he became acquainted with Team Based Learning. With this particular teaching method, students prepare for the material to be discussed in class. The teacher makes the materials available online, including videos, slide shows and texts, allowing the students to get started at home. During the following class, each student completes a multiple-choice test. 'As a teacher, the preparation takes up a great deal of time. But education and my area of expertise are my passions, so it's also a lot of fun.' After the individual tests, the same questions

are answered in small groups. The ensuing discussions are part of the learning process. The teacher only provides their input afterwards. 'The 'knowledge gaps' that become apparent from the test are things that I can repair. And the students can comment on a question, or indicate why they believe an answer to be incorrect.'

After Bentum applied TBL during a series of lectures by way of experiment, he compared the test results to those of the preceding years. 'I can hardly call it a scientific study, but I am utterly convinced that this particular form of education will increase the rate of success by 25%. On average, the students are scoring a full point higher than the year before. My colleague Erik Faber also conducted a few tests with TBL, and we are sure to continue working with it.'

ETP project

The teacher is partaking in the Excellent Teaching Practitioner (ETP) project, because he believes that the appreciation for education needs to be prioritized. 'And I mean a variety of related aspects; from acquisition and selection of teachers, to promoting education and additional rewards for excellent teaching.'
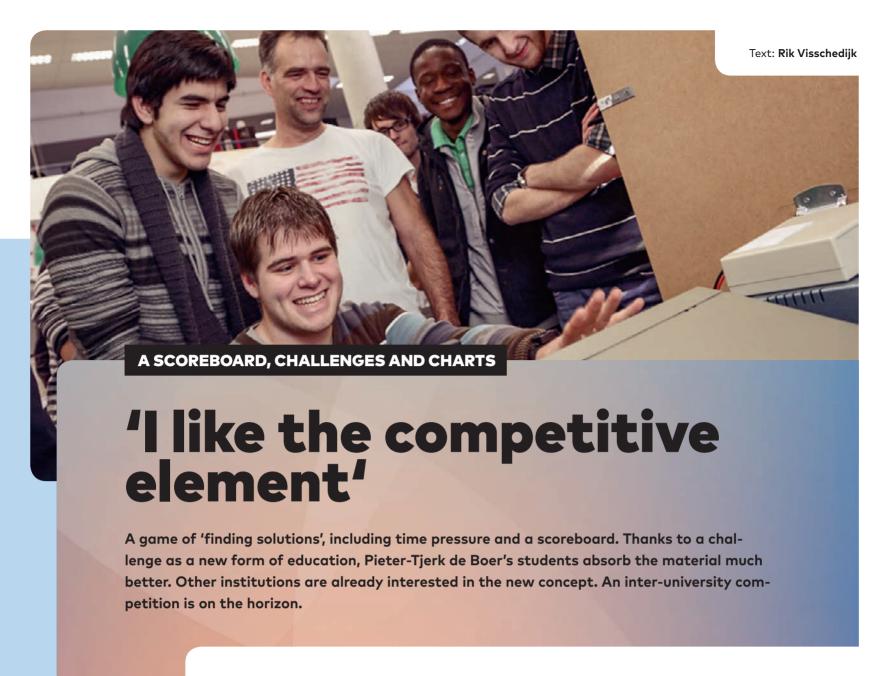

Passport

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A SCOREBOARD, CHALLENGES AND CHARTS

'I like the competitive element'

A game of 'finding solutions', including time pressure and a scoreboard. Thanks to a challenge as a new form of education, Pieter-Tjerk de Boer's students absorb the material much better. Other institutions are already interested in the new concept. An inter-university competition is on the horizon.

Passport

Name: Pieter-Tjerk de Boer (45)

Position: Assistant Professor at the Design and Analysis of Communication Systems group

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He won the Academy Education Prize twice. In 2014, and once again this year. But Pieter-Tjerk de Boer didn't enjoy teaching right away. 'As a trainee research assistant it's part of the job,' he says. 'But I'm really enjoying it now.'
In De Boer's office, a certain antique device stands out immediately. 'It's a Minitel,' he says. 'A French videotext service that uses the telephone line. It's a predecessor of the Internet. I found it at a French flea market one day and I use it during lectures now. It's something I do regularly. By showing students something from the past, you can better explain why things are the way they are today.'
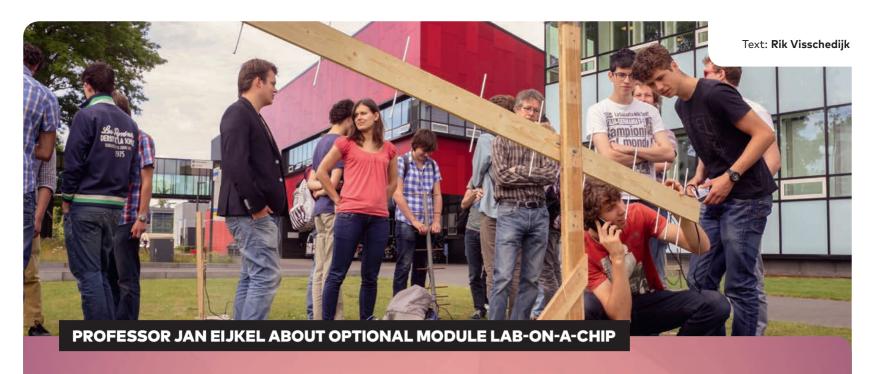
Challenges

De Boer is the module coordinator of Network Systems. Students learn how the Internet and computer networks work. 'With the introduction of the Twente Educational Model (TEM), we asked ourselves how we would shape the module,' he says. 'We wanted to create something new and break with tradition. These became the challenges: at the end of the week, students work on an assignment for an entire day. They need to come up with a working solution in the form of a bit of computer code, which is tested immediately.'

Score

The challenges are called that for a reason. 'In the front of the lecture hall there's a large scoreboard,' De Boer explains. 'It shows a chart for every student that shows how well the solution to the challenge works. The competitive element is fun, because students try to find a solution to the problem as fast as possible. But the most important part: students are learning actively and absorb the material much more effectively.'
With the introduction of module-based education, the challenges were created and developed in just a few months. 'They have been further developed since then. We're looking at whether they can be made available outside of the UT as well,' says De Boer. 'For MOOCS, for example, but also as a 'regular' part of the curriculum for other universities. We recently received a subsidy for that purpose. There were a number of institutions that were interested. If the challenges end up being used at other universities, we might even be able to organize a competition between various cities!'

Text: **Rik Visschedijk**

PROFESSOR JAN EIJKEL ABOUT OPTIONAL MODULE LAB-ON-A-CHIP

'The students are creating a full design circle'

Can you bring together students from different study programmes to work at solving a single problem? This is the challenge professor Jan Eijkel of the BIOS Lab-on-a-chip-Group and his team are facing. The solution: presenting problems no one is familiar with.

Jan Eijkel is the module coordinator of Lab-on-a-chip, an optional module at the end of a bachelor's programme. 'We were asked if we wanted to create such a module in our group for students of Electrical Engineering, Biomedical Engineering and Advanced Technology. We went to work with three young colleagues: Loes Segerink, Mathieu Odijk and Paul ter Braak, as well as two older ones: Wouter Olthuis and myself.'
'We also work together in our department, which means all of us complement the others,' Eijkel continues. 'That turned out to be a huge asset during the creation of this module. When you design a module, one of the things you start with is the question: how do we convey this information? Do we use lectures, or do we opt for problem-based learning? The younger colleagues preferred the latter, which is, of course, the most difficult route to take. After all, is it even possible to bring together students from different study programmes to work in groups to solve a problem?'

Uncharted territory
The answer to that, the professor learned, is: yes. 'We designed the module in such a way that the students create a full design circle,' says Eijkel. 'They are given the literature,

which they then have to think about and interpret. We deal with the differences in academic background by presenting problems that no one is familiar with. This means no student has an advantage over any other students. They then move on to the design process and actually creating the device - a lab-on-a-chip - and even use it for measurements. For example, a micro-brewery where they track the construction process optically and electrically.'
It's not just the students who benefit from this particular form of education. 'Because of this format, we are deeply involved with the module and the students,' says Eijkel. 'We discuss the students' progress every week, because we don't want to leave them hanging if they run into any problems. But it's a fun and education experience for trainee research assistants as well; they're helping the students in the lab, with 3D printing for example. This particular educational format is very beneficial for the students' development and the cohesiveness within BIOS.'
Eijkel himself also reaped the rewards of module-based education. 'The most important thing is providing our students with excellent education. But I realized that I was learning a lot myself by working together on a module.'

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Text: **Rense Kuipers**

'Stirring up students' drive'

'Today's student is different from students twenty years ago,' says Erik Faber. In these times of rapid change, as a programme coordinator and lecturer, he constantly asks himself: how do you teach today's student in the most optimal fashion?

Passport

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Tests and exams aren't all-encompassing according to Erik Faber. He believes it's all about the intrinsic motivation. 'I also tend to call it inspiration. It's the drive students feel when they want to know about something. As a teacher, part of your role is to fuel and encourage that drive. Everyone has a natural desire to learn things, just like when you were a child. Sometimes that desire is hidden a little deeper down.'

Magical

In practice, Faber implements two innovations. He copied the test review sessions from his fellow teacher Luuk Spreeuwers in Electrical Engineering. 'Students who fail a test are required to attend these sessions, although I encourage all students to do so.' During these sessions, the students discuss the material in groups. 'This allows them to learn not only from their own mistakes, but to learn from each other. After three courses as a teacher, I still see something magical happen. You see how the learning process unfolds right before your very eyes. All you need to do is give the students some direction if they need it.'

The second tool Faber uses is team based learning, or a so-called 'flipped classroom': a teacher records lectures and the students listen to it before they go to class. They start the class itself with an individual test comprising ten concept problems, global questions about the material. The students then work on the same problems in groups of four. 'Again, with the idea of learning from each other,' says Faber. 'There's a social component to these lessons; students need to support their answers and decide amongst themselves what the best answer is. They are ecstatic about this format - and not just because they can earn a bonus point for their exam.'

Bringing out the best

They're different tools, but they serve the same purpose: Faber wants to bring out the best of the students. In fact, he wants them to do so on their own. 'There isn't much you can do about the learning process as a teacher, but you can inspire students. Ultimately, you want to create a mindset among students that they take with them after they graduate. Knowledge isn't everything. It's your mindset that determines the kind of person you become in life.'

Text: **Michaela Nesvarova**

'Interaction is the best way to learn'

'Teaching is not the goal, learning is the goal,' says Luís Ferreira Pires, who has been teaching at the University of Twente for 29 years. 'Some teachers have the attitude 'I will just go there, give the lecture and if they don't learn, it's their fault', but a good teacher makes sure the learning process is effective. You have to look at the students' side of it.'

Do you have a special teaching method?
'I try to experiment a bit. In general, I try to deviate from the classical lectures. If you just talk for ninety minutes, it's difficult for students to focus and learn anything. It's not productive. So, I try not to give many traditional lectures anymore.'

'Students learn better when they interact with each other, so I try to foster that. For example, last year I started applying the 'flipped classroom' concept in one of my courses, which means that students are given material to study at home and when they come to class, we discuss the topic and points that were unclear to them. This way students give feedback to each other and a teacher functions only as a coach that clarifies things and supports the exchange of ideas among students. I believe that interaction is the best way to learn.'

Why did you decide to participate in the ETP project?
'I think it's important to give more attention to education, because that is the most important role we have as a university. Some people forget that because of the pressure to do research and publish. Teaching shouldn't be seen as something 'that just needs to be done'. It is also nice to see young people develop themselves.'

Have you always enjoyed teaching?
'Yes, but at first I followed more conservative teaching methods. Traditional lecturing doesn't work, though. I remember giving a classical lecture to first year students a few years ago. It was on a rather boring subject and I lost their attention. It triggered me to do things differently.'

'Now I focus on creating the right conditions for students to learn – I generally only give a short presentation and then give students exercises, motivating them to pay attention to what is being said. You have to think about what you're asking of your students and if it's even feasible. You have to look at their side of things, the difficulties they encounter, and adjust the lessons if necessary.'

Passport

Name: Luís Ferreira Pires (56)
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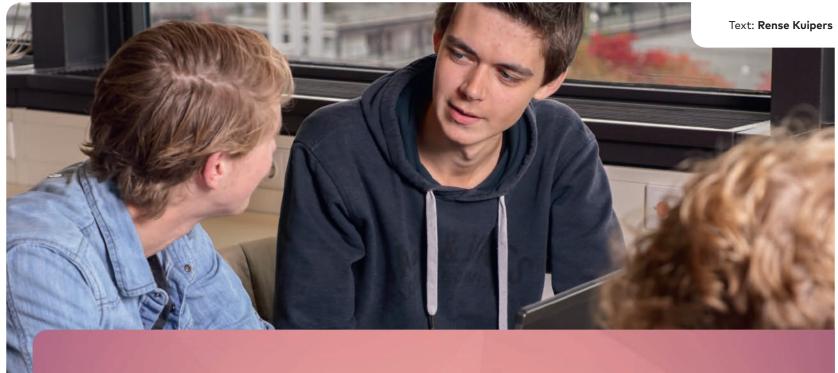   Programme Director of the
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Text: **Rense Kuipers**

'Students determine the content of the lectures'

What makes someone an excellent teacher? Mathematics professor Stephan van Gils doesn't need much time to provide a conclusive answer. 'Someone who can excite students, challenges them, and gets them working on their own.'

Passport

Name: Stephan van Gils (62)

Position: Professor of Nonlinear Analysis

Has been working at the UT for: 30 years

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Activating students is key, says Van Gils. 'After all, you only learn by doing.' According to him, the role he plays is not as important. 'The role of a teacher is to make selections. Course material is abundantly available in digital format. It's our job to help students find their way through that maze.'

Pencasts

Van Gils makes his own digital contribution as well. His office space looks more like a radio DJ's studio than that of a maths teacher. In addition to an iMac screen and an iPad Pro, there's a directional microphone on a mic stand that he uses liberally. Van Gils creates pencasts. They're interactive documents that combine his written notes with audio recordings. 'It's a very labour-intensive process,' he admits. 'But the TELT team (Technology Enhanced Learning & Teaching, ed.) is providing excellent support. They take care of the pencasts' post-production. They certainly aren't lacking in quality. This gives students as user friendly teacher as possible.'
Another benefit is the fact that students follow lectures using those pencasts ahead of time - after which they discuss the material during the tutorials. 'The ball is entirely in the students' court. They determine the content of a lecture,' says van Gils, who calls the process a variation of the 'flip the classroom' principle.

Politically correct

The maths professor hopes that these types of innovation will contribute to greater teacher appreciation. 'This appreciation is incredibly important. Especially for us, the mathematics teachers - because we live off education supplied to other study programmes.'
Although Van Gils has observed increased teacher appreciation, he is still bothered by the fact that 'politically correct behaviour' is still very ubiquitous. 'Originally, it was all about research. And, really, this is still the case today. We need to realize that education, too, needs to be outstanding. How else would you train the best researchers?' He keeps hammering that point: in the end, the students need to make it happen. 'This is what quality education is all about. It's not about the person who's offering it.'

Text: **Michaela Nesvarova**

Tinkering:
the hands-on approach

'Traditional teaching means learning theory that already exists. It doesn't involve raising new questions and forming new theories – self-thinking isn't on the program. But if you need to make things, like students of Creative Technology do, this classic way of teaching doesn't work. You need to find a way that enhances creativity. Which is why we use tinkering,' Angelika Mader explains a teaching method that she developed together with her colleague Edwin Dertien.

'Tinkering is a playful trial and error approach to learning and design. It consists of a rapid series of tiny scientific experiments that allow for new things to emerge,' continues Edwin Dertien. He and Angelika Mader have been using tinkering during their course Programming and Physical Computing, which is a part of the Creative Technology curriculum that both of the researchers helped to set up since its very start.

Make mistakes!

How exactly do their classes look like? 'Students are provided with tools and materials. We begin with small tool sets, but experienced tinkerers use the whole world as a tool box,' says Mader. 'We give students open assignments and define ingredients they have to use. Meaning they can make anything they like, as long as they use certain material, for example.'

Then the students simply dive in. Making mistakes isn't a problem, in fact it's rather encouraged by the teachers. 'The best way to learn is through failure,' thinks Edwin Dertien. 'We are also still experimenting as teachers – basically tinkering with the students,' he laughs. 'Tinkering leads to so much enthusiasm and a variety of solutions. I remember one of our assignments. We asked students to make a drawing application using only one light sensor. They complained at first, but then came up with a huge number of great solutions!'

'Children know how to tinker'

Besides freedom in carrying out assignments, tinkering also requires plenty of feedback and the right environment. 'The classroom needs to be stimulating,' clarifies Dertien. 'We also need to be able to easily approach the students, so we can give them feedback. That isn't always possible in classical lecture halls, where there are physical boundaries between you and the students.'

As the teachers point out, they didn't invent tinkering, they only started using it on academic grounds. 'Sad thing is that small children know how to tinker. They learn about the world hands-on, through trial and error, but they are taught to forget this approach at school,' says Mader. 'We have to bring it back out of our students, force them to allow themselves to fail.'

Passport

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The teachers' thoughts

'Teaching is about finding the balance between being clear and unclear'
Anne-Johan Annema

'On average, students score a full point higher with Team Based Learning'
Mark Bentum

'Challenging students to actively engage in the material'
Pieter-Tjerk de Boer

'You learn a lot from working together in a module'
Jan Eijkel

Knowledge isn't everything. It's your mindset that determines the kind of person you become in life.'
Erik Faber

'A teacher functions only as a coach'
Luís Ferreira Pires

'Quality education is about students, not about the person who offers it.'
Stephan van Gils

'Tinkerers use the whole world as a tool box'
Angelika Mader

'The best way to learn is through failure'
Edwin Dertien

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