Creative Technology

self-assessment Report

a critical reflection

Preface

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Introduction

Administrative data

Programme:	B Creative Technology
Isat:	50447
Orientation and level:	Academic Bachelor's degree
Specializations:	Smart Technology and New Media
Location:	Enschede, The Netherlands
Study mode:	full-time
Institution:	University of Twente
Institution status:	publicly funded (bekostigd)
Institutional Quality Assessment	NVAO accredited in 2014

Quantitative data

Intake

	2009	2010	2011	2012	2013	2014
non-Dutch	3	14	35	30	25	
hbo		1	1	1		
hbo-p			4	1	2	
unknown			8			
other		1	1		1	
vwo	10	25	43	38	49	
Total	13	41	92	70	77	
Female%	23,1%	24,4%	25,0%	27,1%	39,0%	

Dropout rates

Percentages (cumulative) of students who dropped out (after 1, 2 or 3 years). Between brackets are the absolute numbers. The corresponding numbers for just the intake with a Dutch VWO diploma are included in italics.

	2009	2010	2011	2012	2013	2014
Population *Dutch VWO intake*	(13) (*10*)	(41) (*25*)	(92) (*43*)	(70) (*38*)	(77) (*49*)	
% dropout after 1 yr *among Dutch VWO intake*	38,5 (5) *40,0* (*4*)	22,0 (9) *8,0* (*2*)	18,5 (17) *11,6* (*5*)	12,9 (9) *13,2* (*5*)		
% dropout after 2 yrs *among Dutch VWO intake*	53,8 (7) *50,0* (5)	26,8 (11) *12,0* (3)	22,8(21) *16,3* (7)			
% dropout after 3 yrs *among Dutch VWO intake*	53,8 (7) *50,0* (*5*)	31,7 (13) *16,0* (*4*)				

Dropouts' destinations

Percentage of total intake continuing their careers in various ways after their first year (in another BSc programme at our university, in a BSc programme at another university, in a Bachelor's programme at HBO, or otherwise). Between brackets are the absolute numbers. The corresponding numbers for just the intake with a Dutch VWO diploma are included in italics.

	2009	2010	2011	2012	2013	2014
% dropouts after year 1 *among Dutch VWO intake*	38,5 (5) *40,0* (*4*)	22,0 (9) *8,0* (*2*)	18,5 (17) *11,6* (*5*)	12,9 (9) *13,2* (*5*)		
% switch to BSc at UT *among Dutch VWO intake*	7,7 (1) *10,0* (*1*)		2,2 (2) *2,3* (*1*)	8,6 (6) *10,5* (*4*)		
% switch to BSc not at UT *among Dutch VWO intake*			2,2(2) *2,3*(*1*)			
% switch to HBO *among Dutch VWO intake*	23,1 (3) *30,0 (3*)	4,9 (2) *8,0* (*2*)	3,3 (3) *4,7* (*2*)	1,4 (1) *2,6* (*1*)		
% otherwise (not HO) *among Dutch VWO intake*	7,7 (1)	17,1 (7)	10,9 (10) *2,3* (*1*)	2,9 (2)		

Study success rates

Percentages of students re-enrolled for their second year successfully completing the Creative Technology programme, taking the degree after 3, 4 or more years. Between brackets are the absolute numbers. The corresponding numbers for just the intake with a Dutch VWO diploma are included in italics.

	2009	2010	2011	2012	2013	2014
Population enrolled for yr 2 *Dutch VWO re-enrolments*	(8) (*6*)	(32) (*23*)	(75) (*38*)	(61) (*33*)		
% degree after 3rd year *Dutch VWO re-enrolments*	12,5 (1)	12,5 (4) *4,3* (*1*)				
% degree after 4th year *Dutch VWO re-enrolments*	25,0 (2) *16,7* (*1*)					
% degree after 5th year						

Dutch VWO re-enrolments						

!!!TO BE PROVIDED

Teacher student ratio

Average amount of face-to-face instruction (for each stage of study)

Organization

Creative Technology is a Bachelor's degree programme of the faculty of Electrical Engineering, Mathematics, and Computer Science (Elektrotechniek, Wiskunde en Informatica, EWI)) of the University of Twente.

Annex 1 shows the organization charts of the university and of the EWI faculty, annex 2 describes the organization of the Creative Technology programme.

The backdrop for this self assessment

This self-assessment is a critical reflection on our efforts for Creative Technology over the period April 2010 – June 2014.

Early 2007 the dean of the EWI faculty announced his intentions to start a new programme on applied technology. Two preparatory committees made his initiative evolve to a Creative Technology programme proposal.

In 2009 we asked for the initial accreditation of Creative Technology, and started with a pilot class in Creative Technology at the same time. We recruited student volunteers who enrolled in either Computer Science, or Communication Studies, or Electrical Engineering or Industrial Design. With permission of their Examination Boards, this pilot group started participating in Creative Technology teaching activities in September 2009.

The NVAO granted Initial accreditation to Creative Technology in March 2010. The pilot group students were re-enrolled as Creative Technology students in April 2010.

In the reports we wrote about Creative Technology before the initial accreditation, we spoke about the endless possibilities of modern information and communication technology, and our conviction that the full awareness of these possibilities required a new "renaissance". Our mission for Creative Technology would be to educate the new "renaissance men" (and women, by the way). They would start pointing out how to really profit from the endless possibilities of technology in the creative industries.

We then took the view that our graduates would not be the developers of new technology, but rather the ones who came up with original ideas for the use of existing technology. We still do. We also still adhere to the view that interaction between and with users will be key in most applications designed by our graduates.

In our efforts over the last few years we concentrated on just a few things, the things we identified as the key qualities of the "renaissance men and women" we aim at.

A first key quality in our opinion is the proper design attitude, which means: to consider issues open mindedly, to practice problem-finding, to search for alternative approaches, to exercise divergent thinking skills, to explore the seemingly impossible, but also to dare to kill your darlings.

Second comes the familiarity with technical possibilities: to be a programmer, to be able to build a working prototype, to know about the working of technology, to be able to experiment with technological possibilities, to be able to use mathematics for quantitative modeling, and to be able to set up simulations.

And finally we identify “matchmaking” as a key quality, meaning: to be inspired by issues of human life, but also to be inspired by technological possibilities, to understand “value”, both societal and economical value, and to create value, bringing human issues and the technology together.

In our initial reports there was ample attention for arts in the education of new renaissance men and women. In contrast, this self-assessment pays little attention to arts. Arts are still an issue, but not as prominent as they have been during the preparations for Creative Technology.

Another recurring theme of the early reports about Creative Technology, besides the renaissance men and women, was the learning style: Creative Technology is a programme of exploration, and learning by doing. The initial programme was built around five Creative Applications, with a study load totalling to about one quarter of the first two years. The idea was not to teach about technology first, and then start thinking about the use, but almost the other way round. First start exploring possible use of technology (Creative Applications were about this exploration). The explorative doing will immediately inspire the learning, and the teaching can be minimal.

In our efforts over the last few years the elaboration of this perspective on the ideal learning environment has been important. It is a style we still believe in for our programme. In a sense, the adoption of a new teaching and learning paradigm by the university (the Twente Educational Model, which we shall introduce below, see also annex 8) is an extra motivation for our beliefs. But the learning style is not the only issue which needs our attention. The alignment of course content with intended learning outcomes is and has been important, and coherence and feasibility have been as well.

A third theme of our early reports on Creative Technology (also a prominent theme during the initial accreditation) , was diversity of intake. We were in search of students of different nationalities and cultural backgrounds, but we also wanted no requirements for applicants regarding the level of mathematics and physics in pre-university education. We have strong arguments in favour of this diversity, but attracting the right kind of diversity (i.e. a diverse group in many respects, but all equally capable of passing the Creative Technology degree) is a challenge, and so is teaching for such a diverse audience.

We still are in search of a diverse group of students. A lot of our efforts over the last few years addressed the issue of “attracting the right kind of diversity”. We have been intensifying and fine-tuning our intake procedure every year. In line with our belief in the students’ right and duty to shape their own learning, we have sought ways to make students responsible for solving at least part of the diversity issue in teaching. (E.g by voluntary participation in “build-up classes”). But smoothing differences between individual students in order to facilitate teaching remains an issue to work on.

A final theme of the early reports was the personal (and individual) development of students. The viewpoint we took can be summarized as follows. Students have the right and the duty to find their own strong points, and to earn a diploma on the basis of a personal and individual Creative Technology profile. The profile covers the general learning outcomes, but it shows something extra. In the preparatory committees we have even been considering the idea that students might earn the diploma while they still showed weaknesses relating to some of the learning outcomes,which would be compensated by the excellence they had shown in other areas. But we agreed that the learning outcomes should be covered in every personal profile.

In our efforts over the last years we have been elaborating on this issue, especially by shaping the role of a tutor. Our tutors are persons who supervise their tutees' self-management when it comes to issues like: find your own strength, repair your weaker points, find your place in the student community, build your portfolio, show your portfolio, learn, and don't wait to get taught. In fact, the tutor also plays an important role in the previous issue, smoothing background differences between students.

When we wrote our early reports, we had working groups preparing for the definition of the programme, and for the set-up of the learning environment. There were no students, and there was no active teaching staff.

This self-assessment reflects upon the road we travelled from a blue-print to a vivid reality. Students and teaching staff have been very important on our route.

Students have been important in addressing coherence and feasibility issues their remarks on possible improvements have often led to changes. We are happy that older students generally acknowledge that students of later generations study in a better programme than they did. On the other hand, in one of our recent graduation projects a student investigated "the spirit of Creative Technology," for the purpose of communication about CreaTe with prospective students. In the context of that investigation we hear students observe that over the years our programme has lost some of its unconventional and pioneering spirit, and that this is a bit of a pity (despite all the improvements).

When it comes to teaching staff, we have been a small group, at the same time paving and travelling the road to our current vivid reality. We have seen that teaching and research qualifications are important for adequate staff (we knew that already, of course). But the way in which staff relates to the overall intended learning outcomes of the programme is also very important, and so is the extent to which staff (or at least some staff members) are role models. The creation of a community of teachers has been and is as much an issue as the creation of the community of learners among the students.

A last remark is in order, setting the stage for the actual reflection which follows.

While we were preparing for our first larger group of graduates, we dealt with the consequences of a decision at university level. The University of Twente adopted a new paradigm for teaching and learning:

the Twente Educational Model (Twents onderwijsmodel, TOM)[1]. This required an adaptation of our curriculum for the 2014-2015 generation. We feel that most of our ideas behind teaching and learning in Creative Technology fit well in the new paradigm. So the adaptation for the 2013-2014 generation concentrated on the transfer the existing approach into the new setting. In this self assessment we will look at both curricula, pre-TOM paradigm (September 2010 - August 2013) and TOM paradigm (from September 2013 onwards).

The structure of the self assessment

This self-assessment is organized in accordance with the guidelines, it has three core chapters relating to the accreditation standards. The sections in these chapters correspond to $$$.

So

- we produce the critical reflections on our aims and intended learning outcomes (first core chapter, Standard 1), and then
- take these aims and the intended learning outcomes to the everyday teaching practice (second core chapter, Standard 2), and finally
- consider our system of assessing students' progress towards the intended intended learning outcomes, and reflect on the level our graduates actually reach (third core chapter Standard 3).

But in the next chapter, the Creative Technology BSc programme, we first cover the three main issues (i.e. the standards: aims, teaching and intake, assessment and level reached) in general terms. So we start with an overview.

Then the three core chapters come along, to be followed by two more. The first of the final two sums up some remaining issues which need attention in our reflection. And the last one draws conclusions by putting the strong and weak points that we present in the three core chapters into perspective.

The Creative Technology Teaching and Examination Regulations (Onderwijs- en Examenregeling, OER) contain the formal provisions underlying (almost) everything we shall reflect upon in the core chapters on Standards 1-3. They are included in annex 0. The same annex 0 also contains the regulations, procedures and forms elaborating the provisions of the OER.

[1]The five key of the TOM paradigm are: Modular education (units of 15EC), Project-based work, Personal responsibility, Students learn together, Quick and correct fit. cf annex 8.

1

The Creative Technology BSc programme

/ Short summaries in reply to the following questions:*

- *What is the programme aiming for?*
- *How is the programme realizing this aim?*
- *Is the programme achieving its objectives?*

**/*

What Creative Technology aims for

We aim to educate students with the skills, the knowledge and the attitude to contribute to improvement in issues of human life, acting as "matchmakers" between these issues and existing technology. We see the interaction with and between users as a core issue for these "matchmakers".

We feel that an academic degree should witness someone's potential to push boundaries. A graduate at Bachelor's level is perhaps not fully qualified to really do so. But we want to educate Creative Technology graduates with at least the potential to push boundaries when it comes to novel use of (often existing) technology in an original and fruitful approach to a challenge of everyday life.

We know that the chances of a Creative Technology student drastically changing the world are rather small, and so are our graduates themselves. The actual improvements that they will achieve in their later career will probably be small ones. Moreover, they know that close cooperation with other interested and qualified partners will be necessary in order to achieve even small improvements and changes.

To educate graduates who can achieve improvements, we have to ensure they acquire relevant and up-to-date knowledge. For Creative Technology this knowledge is primarily in the areas of Computer Science and Electrical Engineering (soft- and hardware, 30-40%), in Human Factors (15%), and in Media (including sound, movies, animation, visualization, and story worlds, 20-30%).

But to us it is equally important, if not more, that graduates have learned to manage their creative process. We mean the process which is triggered by a question, an observation, a spontaneous thought, and which leads to a fully evaluated concept, or even better, a prototype for that concept. This is where about 25% of the learning effort should go to.

Such a process firstly requires idea generation and divergent thinking, our graduates must develop their capabilities to explore different views and possibilities (including reconsideration of and possibly new ideas about the impulse which triggered the creative process in the first place) , But our graduates must also have learned to take design decisions based on their evaluation of ideas and approaches (and the willingness to kill a darling in favour of better alternatives). The graduates' capabilities to critically evaluate ideas and approaches should cover both "internal" and "external" criteria: the internal

criteria relate to (technical and economical) feasibility), and the "external" ones relate to use, user experience, impact, and added value.

Finally we aim for graduates who dare to take risks (well-calculated), and who want to reach out: they do not wait for opportunities but actively seek them, they do not only work well in a team, but they can find or create their team.

In chapter *$i* we concentrate on the translation of our aims into learning outcomes, and we shall assess these intended learning outcomes against external standards.

What Creative Technology does to reach its goals

Offering the right courses in a coherent way

The aims we have for our graduates require that we offer them courses relating to the learning outcomes they must acquire, and that we organize these courses in such a way that students can gradually and consistently grow towards these learning outcomes. In chapter *$i* we assess our course programme, relating objectives of individual courses to the learning outcomes of the entire programme, and by reflecting on how learning objectives of individual courses are organized in learning lines progressing in time.

Attracting the right students

Thinking about novel use of (often existing) technology in an original approach to a challenge of everyday life, we realize that:

- challenges of everyday life are often global challenges, they occur in different cultures and different countries,

while at the same time

- the success of an original approach depends on cultural awareness, the same thing which gives a positive experience in the one context, may scare people in another context,

and finally

- although technological possibilities may inspire an original approach, a valid approach can never be technology driven alone.

We want to actively confront our Creative Technology students with these observations. One way to do so is to work with classes showing diversity:

1. students come from different countries and different cultures (it is an international programme), and neither the Dutch nor the non-Dutch students form a true minority (i.e. less than 30% of the population)
2. students come with different interests and different orientation (no formal requirements regarding the entry level in mathematics nor any other requirement regarding the preparation for a study in technology), but neither neither the "Arts" nor the "Science" students form a true minority (i.e. less than 30% of the population)

3. among the students that come neither male nor female students form a true minority (less than 30% of the population)

In chapter *$*- we reflect on our success in attracting the diverse groups of students we aim at.

Shaping and maintaining the adequate learning environment

Creative Technology offers a learning environment which emphasizes the following

1. Students should learn by doing, exploring, tinkering.
2. Students should learn, and not wait to get taught.
3. Students should show themselves, and not hide.
4. Students should pay attention to their personal development, they should find their own strength, and not think they have already found it, they should repair their own weaker points, and not wait until someone else finds them.
5. Students should stick together, they learn best in a group.

In chapter *$i* we will assess the issues relating to our learning environment.

Does Creative Technology reach its goals?

The graduates we are seeking

!!!TO BE PROVIDED

*/*Too early to tell.*/*

The student intake

!!!TO BE PROVIDED

*/*Diversity and chance of success must be guaranteed at the same time, the minority principle has to be maintained, (the university is extremely reluctant to take coercive measures). So far we did well, but it is hard to keep control.*/*

The learning environment

!!!TO BE EDITED

*/*What we want depends not just on us, but on students as well, there are maturity issues. Homogeneity issues among staff (in teaching style) as well.*/*

The control

!!!TO BE PROVIDED

/ few remarks about "getting there"; Student - learning environment - attainment targets - outside world*/*

Standard 1: Intended learning outcomes

Five years ago we started Creative Technology with a list of 10 final qualifications as our intended learning outcomes. Although these final qualifications have been subject of debate, the adjustments we made in the course of those five years have not seriously affected these original intentions.

Our adaptations in intended learning outcomes have been motivated essentially by

- the desire to provide a coherent structure for the learning outcomes we aim at;
- the desire to have clear and distinctive focal points among the intended learning outcomes.

Comment [1]: HvdB: so what?

The learning outcomes

The Creative Technology programme aims at graduates who are context-driven problem-solvers.

- They can trace back (or help a client trace back) a possibly ill-posed initial question to the underlying challenge;
- they can generate ideas and concepts;
- they can identify opportunities for the exploitation of new technologies; and
- they can develop ideas and concepts into key prototypes.

The new technologies they will exploit are technologies that have been developed recently, or which are being developed, but our graduates are not themselves the developers.

In the problems our graduates will solve, interaction with and between users will often be a key issue.

To this end, they have acquired skills and knowledge in five areas:

1. Self-management of the process of creation by a designer;
2. Understanding and use of technology;
3. Designing for interaction, expression, impact and experience;
4. Societal and economic value; and
5. Academic and professional skills.

The specific learning outcomes in these five areas are in annex 3.

The relationship between the five areas is depicted as a pyramid structure below.

At the top of the pyramid is the area of learning outcomes which is key to problem-solving competencies: the problem-finding, the opportunity spotting, the idea and concept generation and the prototype development.

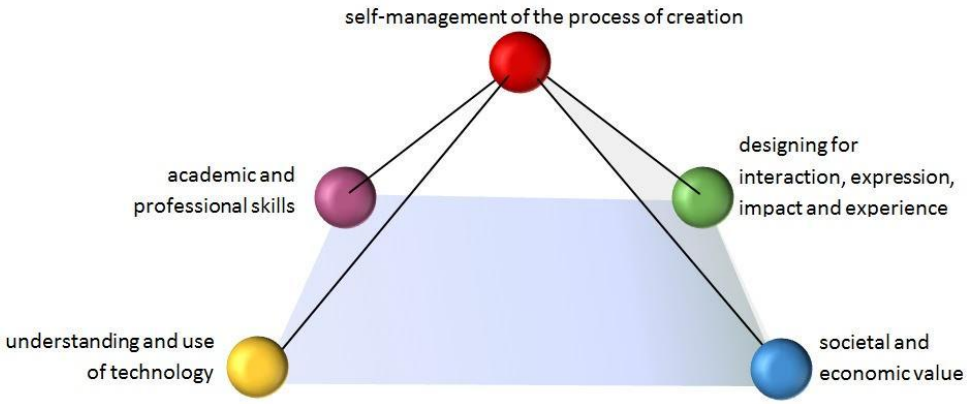
At the base are the four areas of knowledge and skills which are fundamental, firstly to the successful development of competencies at the top of the pyramid, secondly to the understanding the challenges and possibilities the context offers, and finally to deserve a degree at academic Bachelor's level in the first place.

The “Creative Technology focus triangle” is the triangle consisting of the left-bottom (yellow) area of “understanding and use of technology”, the top (red) area of “self-management of the process of creation”, and the right bottom (green) area of “design for interaction, expression, impact and experience”

Within this triangle we consider the following characteristics to be typical for Creative Technology:

- understanding and use of technology concentrates on soft- and hardware, technical insight is not restricted to “coding” but it also covers electronics like sensing and filtering;
- design for interaction, expression, impact and experience has a strong focus on gameplay and narration;
- self-management of the process of creation includes “autonomous design”, and “tinkering as a method”, it aims to bring more creative thinking than what is implied by engineering competencies, without aiming at artistic competencies, or concentrating on idea and concept generation only.

The edge between the top level (red) area of “self-management of the process of creation” and the bottom left (violet) area of “academic and professional skills” is the edge of 21st century skills. We



consider “self-direction” to be a key feature along this edge.

Personal profile

The Creative Technology curriculum offers our students a lot of freedom in their choice of courses (and the choice of their graduation project) in the final year of their studies. As a consequence every graduate

will reach the intended learning outcomes, but with a personal profile. Some students opt for courses in Electrical Engineering or Computer Science, others choose for courses in Industrial Design Engineering, there are students who devote half of their third year to game development courses, or to business courses, and we have students who turn to Psychology. We even see students who graduate with a personal profile which "extends" the above pyramid, e.g. students who opt for profile courses in Philosophy.

In each case these students reach learning outcomes which include the intended learning outcomes of Creative Technology, but with an extra (personal) emphasis in one or more areas.

The Examination Board oversees the choices of personal profiles by students. But it has given mandate to the students' tutors to act as "legal guardians" for this choice. (cf. the sections *Curriculum* and *Tutoring* in chapter *Standard2: Teaching learning Environment*).

Further development of intended learning outcomes, and alignment with the TOM curriculum

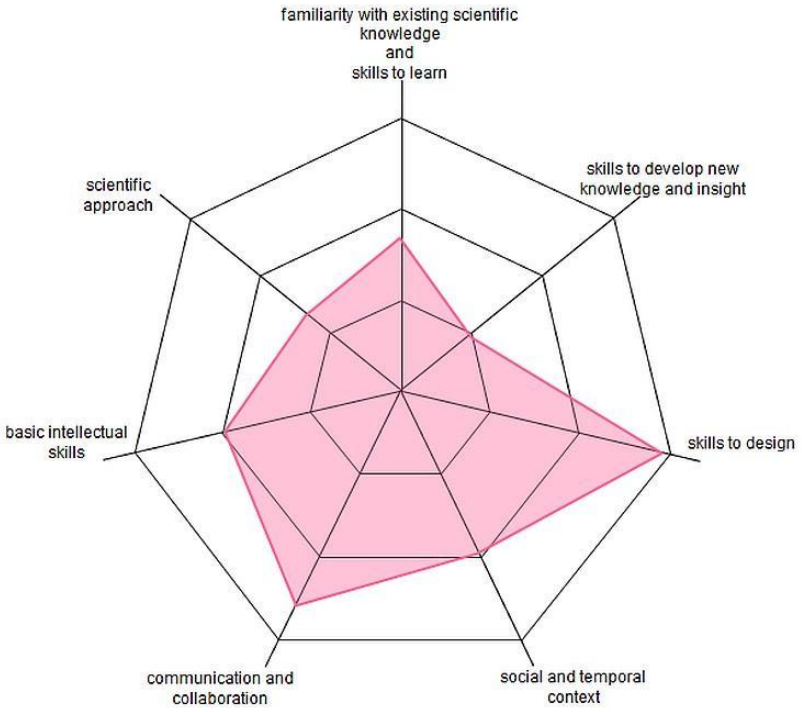
We must insure that intended learning outcomes remain adequate when measured against various external standards (cf the section *self assessment of learning outcomes* below). We must guarantee the alignment of learning outcomes with the curriculum, in its transition to the TOM paradigm. To those ends we have installed a "syllabus committee" consisting of three members of the core staff[2] and a staff member primarily related to the Industrial Design programme (but who was present in the committee which wrote the original proposal for the Creative Technology curriculum)

Self-assessment of the learning outcomes

Meijer's Criteria

[2] core staff is introduced and explained in the section *Personnel* under Standard 2.

First part of our critical reflection on these intended learning outcomes is to evaluate them by Meijers' criteria. Meijers' criteria are in annex 4. Our evaluation of the learning outcomes by these criteria is in



annex 5. We claim that creative technology graduates reach learning outcomes in the seven competency areas of Meijers at a level as depicted in the spider web.

The domain specific frame of reference

Second part of our self-assessment of the intended learning outcomes is to adopt a domain specific frame of reference, and to evaluate the learning outcomes relative to that framework.

The domain specific frame of reference we adopted combines viewpoints on the academic and professional context of Creative Technology from different sources.

The domain specific framework and the sources it is based on are in annex 6.

Our evaluation of the intended learning outcomes relative to that framework is in annex 7

[$] Present a picture here which makes conclusions immediately visible

Level and orientation

The programme is at Bachelor's level

!!!TO BE PROVIDED

*/*Explain why this a Bachelor's degree programme (and not at Master's, nor at VWO level)*/*

The programme has an academic orientation

!!!TO BE EDITED

*/*Explain why the degree is academic, and not professional.*/*

Creative Technology learning ou concentrate on design and on understanding and managing the process of creation. These targets are met at an academic level.

- Creative Technology graduates are familiar with research methodology (human factors course, research methodology course, graduation work.)
- Creative Technology graduates can find and assess relevant scientific literature. (ambient screens project, electives, graduation work)
- Creative Technology graduates can write texts which meet academic standards, especially to justify their design approach and design decisions in front of experts. (all projects and creative applications)
- Creative Technology graduates are familiar with the integration of scientific study in their design process. In the context of their Bachelor's degree programme, their scientific study remains restricted to literature search (in scientific literature), assessment of the contribution of existing research to the design issue at hand, and setting up simple surveys and experiments.
- Creative Technology graduates are familiar with design related fields of study such as the study of the relationship between humans and artefacts, and the study of the technology needed to construct artefacts. (human factors, electives, new media track/smart technology track)

Moreover Creative Technology graduates have the academic qualifications that allow access to at least one further programme at academic master's level .

The graduates of Creative Technology have unrestricted access to the Human Media Interaction (HMI) Master's programme of the University of Twente. Five (out of ten) Creative Technology graduates are now HMI students. Depending on the courses chosen as personal profile (first half of the third year) graduates have access to the Master's programme Industrial Design Engineering (one out of ten), Computer Science (one out of ten). It may be expected that graduates of September 2014 will continue in HMI, Industrial Design Engineering, Philosophy of Science Technology and Society, Embedded Systems, Systems and Control, Business Information Technology and probably other directions as well.

Strong points and challenges

!!!TO BE EDITED

Strong

- Inspiration by material combined with inspiration by challenge
- Explorative and demand driven design
- Physical engineering with software engineering
- Explicit attention to a range of means of expression
- Personal development and personal profile
- Broad range of options to continue their studies.

Challenge

- the range of learning outcomes
- do justice to areas 3 and 4

Standard 2: Teaching learning environment

Over the first five years of Creative Technology's existence, we have been discussing, evaluating, and adapting the intended learning outcomes. The previous chapter showed the impact of our efforts.

Our discussions about learning outcomes have always been paired with discussions about the teaching and learning environment. It is fair to say that these combined discussions about learning outcomes on the one hand and the teaching and learning environment on the other, had more impact on the teaching and learning environment than they had on learning outcomes.

Comment [2]: HvdB: So what?

The discussion about the teaching and learning environment was not restricted to just the level of our Creative Technology programme, it has been and is a discussion at university level too. For the university it led to the introduction of a new teaching and learning paradigm, the Twente Educational Model, which goes under the name TOM (Twents Onderwijsmodel).

The ideas underpinning TOM and its implementation are in annex 8.

Our "local" discussions concentrate mainly on

- curriculum contents and their arrangement in time (issues of coherence, feasibility, and alignment with intended learning outcomes);
- the creation of a community of learners;
- aspects of intake
    - managing the expectations of applicants for admission, in order to promote the chances of study success
    - dealing with the tension between the necessity to attract a diverse intake, and the challenges of a diverse audience in the classroom;
- issues regarding adequate staff
    - sufficient in number
    - qualified for teaching at university bachelor's level
    - committed to the overall intended learning outcomes of the programme, and including role models, when it comes to these learning outcomes.
- the challenge of individual personal development of students (which is partly related to the diversity issue), and the role of our "tutors" as the supervisors of the students' self-management.

The impact of our efforts related to the teaching and learning environment is presented in this chapter. When necessary we reflect on the pre-TOM and the TOM situation.

Curriculum

*/*Explain what courses are offered, by drawing the floor plan (in time). Include information about compulsory and optional items.*

In an annex: floorplan + contents and learning outcomes at course level/*

Pre-TOM

The floorplan of the pre-TOM curriculum is in annex 9. The learning objectives of the pre-TOM courses are in annex 11.

Year 1

Year 1 is our foundational year. Every unit is mandatory for all students.

Course content of the first year is foundational because it touches upon each of the five areas in which we want to educate our students

1. Self-management of the process of creation by a designer;
2. Understanding and use of technology;
3. Designing for interaction, expression, impact and experience;
4. Societal and economic value; and
5. Academic and professional skills.

The emphasis is not the same for each of the areas, however. The process of creation and the understanding of technology draw a lot of attention, while economical value is hardly an issue.

The foundational character of year 1 is not just in the course content. We find community building important. We actively encourage students to start thinking about about their personal development. And finally we find it important that students discover their own stronger and weaker points, and start dealing with those.

At first glance it seems contradictory to have a foundational year which is identical for every student, while at the same time (see below) we aim at diversity in our intake. The unit “First Year Portfolio” plays a special role here. It is a unit where reflection on studying, showing personal progress, working on weaker and challenging stronger points find their place. The “working on weaker points” of First Year Portfolio also includes taking extra mathematics and physics classes by students who have little background in these subjects. The assessment and grading of the First Year Portfolio unit is the responsibility of tutors. We return to the role of tutors in the section *Monitoring, counselling and tutoring* below.

Year 2

Year 2 is not the same for every student. Everyone chooses a specialization, either Smart Technology or New Media. So one quarter of the second year will be devoted to either a deeper insight into electrical engineering (Smart Technology) or a deeper insight in media technology, storytelling and game development (New Media). In the pre-TOM paradigm, the specialization was split into four parts, one each quarter. The study load of the specialization is 15 EC.

The remaining 45 EC of year 2, ask students to make two more choices, both relating to mathematics. They will choose a variant of the systems and signals course which suits them (and their specialization) best, and they make a choice between a game theory and a stochastics oriented math course.

Deepening is an overall characteristic of the second year. Regarding the first area, self-managing the process of creation, this means that justification, and the interplay between investigation and creation are emphasized. And in the area of societal and economical value, there is ample attention for economical value in year 2.

The unit "Second Year Portfolio" is (as in the first year) a unit where showing personal progress, and working on weaker and challenging stronger points find their place. Included in the "working on weaker and challenging stronger points" in the second year is the preparation for the choice of a personal profile (in year 3). Assessment and grading of "Second Year Portfolio" is the responsibility of tutors. (Cf. the section *Monitoring, counselling and tutoring* below.)

Year 3

It will be hard to find two students for whom year 3 is exactly the same. The first half of the year has unspecified units of study with a study load totalling 30 EC to establish a personal profile. Students establish their personal profile by choosing a minor programme (which can be deepening, but which is mostly broadening), or a bridging programme towards a Master's programme (mostly deepening), or an international exchange programme (which could serve as a bridging programme as well).

The student's choice of a personal profile needs the approval of the student's tutor. The tutor grants approval on behalf of the Examination Board.

The second half of the final year is for the 15EC graduation project, plus units of study which count as electives.

There is one element identical for all third year students: among their electives there must be a course devoted to ethics and professional standards. Other electives are chosen from a fixed list. The courses in that have as common characteristic that they consider design issues from a user viewpoint, and include theory regarding human behaviour and use of technology in a specific context.

The student's choice of electives also needs the approval of the student's tutor. The tutor grants approval on behalf of the Examination Board.

In graduation projects there is a "third party" involved which has an independent interest in the outcome of the project, and acts as a client/co-supervisor for the student doing the graduation work.

TOM

The (simple) floorplan of the TOM curriculum is in annex 10. It consists entirely of 15 EC units which are typical for the TOM paradigm. These units are called modules. Every year of study has four modules. The learning objectives of the TOM modules are in annex 12.

Year 1

The transition to the TOM paradigm did not change the nature of the first year. It is a foundational year, every module is mandatory for all students. The modules of the first year touch upon each of the five

areas of intended learning outcomes, as the first year courses did in the pre-TOM paradigm. Community building is still an important aspect of the first year, and so are personal development, and attention to individual stronger and weaker points.

There have been some (minor) shifts in attention though, which we implemented in the transition to TOM. Firstly we reconsidered the buildup of the "understanding and use of technology" component. We added an elementary introduction to engineering, and we established more continuity in developing programming skills. Moreover, we moved statistics from the second to the first year, to align it with the human factors component in the first year.

To compensate for the additions, we reduced an (animated) image creation component. It had two parts. Firstly it was about tools for image creation; they are still taught and explored. The other part was about working with an external client; that part has been abandoned. Working for clients is becoming a standard part of the Living and Working module, in the third quarter.

Finally, we have implemented (or rather, are still implementing) differentiation within modules. The extra mathematics and physics classes we offered for the purpose of "working on weaker points" are gradually replaced by "personal development classes" within modules, where all students work on a similar subject, but at their own level. If the subject is one of your weaker points, then the "personal development class" is an extra to help you overcome your disadvantages. Is it a subject which you consider to be among your stronger points, then the "personal development classes" will challenge you to prove your strength.

Year 2

The changes of the second year, when compared to pre-TOM, promise to have more visible effects than the changes in the first year[3].

One thing remains the same though: students choose different specializations in their second year, with a study load of 15EC. The second year will start with two modules in parallel, a Smart Technology and a New Media module.

Where the first quarter of the pre-TOM second year had no project or creative application, these modules have an individual assignment which aims at the development of elementary research competencies: formulating research questions, conducting a literature search, presenting findings of such a search with adequate citations and references. This assignment precedes the research methodology classes in the second module of year 2.

Otherwise, the two modules at the start of year 2 roughly cover the contents of the systems and signal courses plus the New Media and Smart Technology courses of the years before, albeit condensed and at some points more shallow.

[3] This self assessment was written before we finished teaching the first module of the second year, let alone the other modules of the second year.

The remaining three modules of the second year are mandatory for all students. As in the pre-TOM period, the modules of the second year are more deepening than the foundational modules of the first year. Moreover, the module structure of the second year shows more concentration on topics, especially in modules 6 (the second module of year 2) and 7 (the third module of the year). Their topics are Intelligent Interaction for module 6, and Innovation and Entrepreneurship for module 7 Both modules show an expansion when compared with pre-TOM, in their attention for Artificial Intelligence (module 6) and Technology Management (module 7).

To compensate for the expansions, the individual Creative Exploration of Art, Science and Technology project, as well as the additional mathematics course are discontinued.

Year 3

Year 3 has two unspecified modules with a study load totalling 30 EC to establish a personal profile, plus one mandatory module which incorporates elective subjects (with a study load of 15 EC) plus a graduation project of 15 EC.

The student's choice of personal profile modules will need the approval of the student's tutor. The tutor grants approval on behalf of the Examination Board.

The characteristics of personal profile and graduation in the TOM curriculum will be the same as the characteristics for the pre-TOM curriculum. But the actual contents for the third year are still under development.

Comment [3]: HvdB So what?

Portfolio and tutoring

The TOM paradigm requires a "workaround" for units like First and Second Year Portfolio. Reflection on studying, showing personal progress, and working on weaker and challenging stronger points now find their place in each of the modules. The student's tutor is involved in assessment and grading for each module. (Cf. the section *Monitoring, counselling and tutoring* below.)

Relationship with learning outcomes

!!!ANNEXES TO BE PROVIDED. ACTION TO BE TAKEN BY TEACHING STAFF REGARDING OSIRIS CONTENTS

*/*Explain that the learning outcomes are addressed in an adequate way in the curriculum*/*

The learning objectives of the courses address the learning outcomes of the programme in an adequate manner. Our self-assessment of the way in which the course objectives contributes to students' growth towards the learning outcomes of the programme is in annexes 12 (pre-TOM) and 13 (TOM).

Coherence

We consider coherence aspect from two perspectives:

- The systematic buildup towards intended learning outcomes
- The internal consistency of larger units of study and study phases

The systematic buildup towards intended learning outcomes

Our organization of the curriculum supports our students in reaching an intended learning outcome over a longer period of time, by following various courses pertaining to that learning outcome. Our curriculum is coherent in this sense.

The chart of courses classified by learning outcomes area which is included in annex 12 shows the buildup in time for each area of learning outcomes (pre-TOM). Since the TOM modules are to a large extent amalgamations of the courses in the same quarter in the pre-TOM period, this buildup hasn't changed with the introduction of the TOM paradigm.

Although we are content with the coherent buildup towards intended learning outcomes in the five areas we distinguish. Still, at the level of learning outcomes within an area, we face some challenges of continuity and ordering.

Most notable is the challenge regarding knowledge of and skills in programming. In the pre-TOM period programming (part of the "understanding and use of technology" area) was taught in the first and second quarters of the first year, to return as a subject only in quarter 5, at the beginning of the second year. This was a breach in continuity in the buildup towards the intended learning outcomes for programming with noticeable negative effects. Confronted with the continuity problem, we have used the transition to the TOM paradigm to move programming forward for one part, from quarter 5 to quarter 4, and backward for another part, from quarter 5 to quarter 6. We expect buildup of programming qualifications will benefit considerably.

Also in the area of "understanding and use of technology", we have been confronted with some steep transitions from one course to another (in the area of mathematics, physics, electronics and system dynamics). By changing the order of some subjects, and by introducing an introductory engineering class, we improved coherence. (Note that these steep transitions were also partly a feasibility problem, we have lowered our ambitions[4] to improve feasibility).

Finally, inspection of the chart of courses classified by learning outcomes shows that attention for the areas outside the "Creative Technology focus triangle", i.e. the attention for the areas "societal and economic value" and "academic and professional skills" is centered in the third year. This is not entirely satisfactory. We are currently working on a more gradual and systematic buildup in the "academic and professional skills" area. We introduced an additional assignment to develop research skills in module 5. We are introducing academic and professional skills items systematically in each module. We are considering the possibilities of the portfolio module in Osiris to help steer and keep track of the development of these skills for each individual student.

[4] Lowering is a good thing here. To put it bluntly, our original ambitions aimed at Creative Technology students who could mingle in with Electrical Engineering students in their second year. Or at least a sizable group who could almostdo so. An appealing thought, but not entirely realistic.

The internal consistency of larger units of study and of study phases

With the introduction of the TOM paradigm, another reading of coherence has become important. The consistent arrangement (and assessment) of subjects in a single module is an issue deserving attention.

To a certain extent we are already familiar with this issue, since pre-TOM Creative Technology had two larger (15 EC) units.

The internal consistency in the large pre-TOM units Smart Technology and New Media is partly a matter of content, but mostly a matter of the teaching staff operating as a team. We have a strong Smart Technology team. The New Media team has to stabilize.

Comment [4]: HvdB: So what?

In the TOM situation the teaching staff operating as a team is still a crucial factor. But we are now also facing a trade-off between internal consistency in modules (coherence in the second sense) and the gradual buildup to intended learning outcomes (coherence in the first sense). For reasons of internal consistency it makes perfect sense to have modules with learning objectives within a single area of the intended learning outcomes. But especially in the first, foundational, year it is also sensible to have modules which touch upon all areas, in the spirit of the foundational character.

We have chosen to have modules which have a wide spread of learning objectives, in various areas of intended learning outcomes. I.e. we have made a choice in support of the gradual buildup towards intended learning outcomes. We have made internal coherence a matter of the responsible team of teaching staff. The role of the module coordinator in shaping his/her team, and guarding internal consistency, is a matter of further development.

Comment [5]: HvdB: so what?

Feasibility

We reflect upon four issues in the context of feasibilty

1. No insurmountable hurdles
2. Sufficiently high standards
3. Planning issues
4. Feasibility of personal development

No insurmountable hurdles

Throughout the preparation for and the development of Creative Technology we have been working with a basic idea regarding feasibility in mind:

> students who are committed to their studies, and who participate actively and well-advised, will take the diploma without meeting insurmountable obstacles

On the whole, we are convinced that we have realized this intention. Our close monitoring of students' progress shows no evidence to suggest the contrary.

Despite this intention, and our belief that we have realized it, we do see students for whom the maths and physics contents of the curriculum are an insurmountable obstacle. In our analysis this is a matter of intake. We are very careful managing the expectations of prospective students regarding the "understanding and use of technology" area of creative technology, but not always successfully. (This does not mean by the way that students with a weaker background in Science systematically have problems with maths and physics. For most of them our intentions as expressed in the basic idea become true.)

The fact that we now feel we have realized our intentions (for feasibility and coherence) has a history. After our pilot year 2009-2010 we concluded that we had a steep hurdle at the start of the first year, so we rearranged subjects. And the end of the first official Creative Technology year 2010-2011 we conclude that we still had a steep hurdle, but now at the end of the first year. We adapted nominal study loads to better align with the actual ones, and we rearranged subjects again. After these first two years adaptations have been smaller, But, as we pointed out already under coherence, we steep transitions between courses in the maths and physics area keep asking our attention, so we rearranged contents even further.

Sufficiently high standards

One might argue that building a curriculum with the basic idea as formulated above in mind, bears the danger of lowering standards, and granting degrees to people who do not actually deserve them. We have only a few graduates at the moment, but in their graduation work, and the response of the external parties involved in this work, we find no hints that our standards are low.

We strongly believe however that our first basic idea must be combined with a second one

> many Creative Technology students will have a talent in Creative Technology which is not fully challenged by the contents of the Creative Technology programme; students should find an additional challenge for their talents, and meet it, before they take the diploma.

We find that many students in the course of their studies come to appreciate this point, and make deliberate choices in their "personal profile" to challenge their strong point.

Comment [6]: HvdB: So what

Planning issues

We have been confronted with a feasibility issue of an unexpected nature, an unforeseen side-effect of our teaching and learning approach. The approach favours group work, and there have been quarters in which students had to work in three different teams simultaneously. This made it virtually impossible for students to organize team meetings, since each team member was confronted with different constraints (due to arrangements in other teams they were in).

This planning issue hasn't been an insurmountable obstacle, but it definitely was an obstacle. We now arrange the composition of teams in such a way that students work in the same team during a module, even if there is more than one project or assignment to work on. (Or smaller teams for one assignment are joined into a larger team for another project.)

Feasibility of personal development

The first sentence of the section *Learning outcomes* (in the *Standard 1: Intended learning outcomes* chapter of this report) states that Creative Technology aims to educate context-driven problem solvers. It then elaborates this aim in more operational terms, by giving (in an annex) the intended learning outcomes which Creative Technology graduates must meet to qualify as context-driven problem solver.

Tutors observe, and it has become apparent in graduation work as well, that there are students who quietly work towards the intended learning outcomes, with average, or even above average success, but who show insufficient signs of becoming context-driven problem solvers.

In our analysis, this is primarily a matter of personal development. We see a small group of students who accumulate the desired skills and knowledge without much problems, but who seem to lack the maturity, the independence, the confidence, or the drive to act as the intended problem solver, employing all their skills and knowledge. It feels as if self-definition is still an insurmountable hurdle for these few.

Tutoring plays a role here, but this kind of personal development cannot be enforced. We decided to have an individual larger assignment at the beginning of the second year, hoping to diagnose at least those cases of students who are falling behind in personal development by leaning too much on fellow students.

Learning methods and contact hours

Exploration and instruction

The "learning cycle" we want our students to go through is:
to explore - to get feedback - to focus on learning objectives - to account for reaching these objectives.
This is the self-directing cycle. The choice of self-direction as a key feature for the development of our students along the "21st century skills edge" of the learning outcomes pyramid, motivates the choice for the self-directing learning cycle as the primary cycle among our learning methods.

Comment [7]: HvdB: So what?

In our teaching practice however, we also rely on a more standard "short" cycle:
to get instruction and explanation - to practice and exercise - to account for reaching the learning objectives.
This is the teacher directed cycle.

The overall learning experience for students shows a wide variety between the self-directing cycle and the teacher directed cycle.

Teaching methods used in both cycles are lecturing, tutorial classes, practical sessions, (homework) assignments, and project work. Tutoring (cf the section *monitoring, counselling and tutoring* below) also employs individual feedback sessions between tutor and student.

Regardless of the nature of the learning cycle, we provide ample opportunity for students to meet and work with teaching staff, as the overview of contact hours shows. We are reluctant to make presence

obligatory for students, and we try to minimize lecturing time in favour of time for practice, exercising and feedback.

Table of contact hours

!!!TO BE PROVIDED

	year 1	year 2	year 3
quarter 1			
quarter 2			
quarter 3			
quarter 4			

The variety of learning cycles we provide fit in the Creative Technology view on Education, with the following key points:

1. Students should learn by doing, exploring, tinkering.
2. Students should learn, and not wait to get taught.
3. Students should stick together, they learn best in a group.

Learning by doing

The Creative Technology programme shows a lot of learning by working on projects and assignments. Our educational view here is that we want to enhance the sense of achievement. Of course there is a sense of achievement in finally understanding a difficult issue. But the reward of “having the job done” is equally satisfying, and it works better as motivation. Doing the job will have the understanding of the difficult issue as a side effect. And it will provide additional meaning to the understanding: it fits in a context.

There are obvious dangers here. In the assessment chapter (Standard 3) we will return to the assessment of “insight and understanding”

And unfortunately we notice that some of our students develop a resistance against any approach to learning other than learning by doing. So we are becoming more and more careful not to glorify the doing.

Learn and don't wait to get taught

It is probably a feeling of hope that every programme of study shares: this year we will attract only students who are all equally curious, well-motivated, eager to learn, and mature enough to start learning, if only we point them in the right direction.

Unfortunately this hope is vain.

We do observe however that the learning by doing approach helps students to make the transition from waiting for instructions to autonomous learning.

This transition takes time however, during the first half year of their studies many students find it hard to deal with the lack of precise instructions. And it is interesting to notice that this transition seems to be related to the community building that we discuss in the next section. If there are sufficiently many role models who help shape the community of learners, the sense of "we learn, and don't wait to get taught" seems to be stronger.

The community of learners

During intake already we discuss with our prospective students the benefits of teamplay. It is interesting to notice that such discussions soon concentrate on difficulties like balancing the workload between team members, and every person in the team finding his or her role, and every person making the contribution that was agreed upon. Very few applicants seem to appreciate the idea that they, as individuals, may profit from working in a team.

We strongly believe that the individuals in our diverse community of students will profit a lot from teamwork, and from their studying in a community working towards the same intended learning outcomes.

We promote the development of a community of learners among our students in a number of ways. Most important is the availability of the SmartXp Theatre Hall (see below) for teaching and learning activities. Having such a "home base" enhances the community spirit. Having our students work in teams on assignments, and not always in the same teams, is also beneficial to creating the sense of a community. In some cases we organize teams in such a way that mutual profit is to be expected for the participating students.

Our success in community building seems to depend highly on the presence of role models in the community: students who inspire others. (Not necessarily by their leadership qualities). Since the presence of such role models varies over the years, the success of community building varies as well.

Moreover, the second year shows less group work and less activities planned in the SmartXp Theatre Hall, which threatens the survival of the community after the first foundational year.

And finally, for some individuals the community building has a risk: their fellow students consider them to be valuable community members, but in a sense they are "hiding", their personal development is not self-directed, it follows the community. So our conviction that students should stick together and learn

best in a group must have (and has) a counterweight: “show and don’t hide”. A large responsibility for that counterweight lies with the tutors.

Intake and throughput

Aims for intake

We want to see a yearly intake which meets the following three conditions.

1. A vast majority of the students who begin their studies, will turn out to be successful creative technology students.
2. The group of students who begin their studies is diverse when measured along various axes, i.e. there is a variety of secondary school backgrounds (especially relating to Arts and Sciences), there is a variety of nationalities, and both sexes are represented.
3. There are no minorities for any of the three diversity criteria. (A group of less than 30% of the population we consider to be a minority)

The first aim is obvious: neither we nor the students have anything to gain if the match between the student and the programme turns out to be insufficient.

The second aim stems from our conviction that the quality and effectiveness of matchmaking between human issues and technology will be best in a global community of men and women with different interests in Arts and Sciences. So we want to educate our students in such a community.

Finally the diversity in the community must be true diversity: the third aim expresses that no group in the community should feel itself in a subordinate or dependent position.

The rules of admission and the intake procedure

The rules of admission to Creative Technology provide for the admission of seven categories of students, according to their school leaving certificate(s). The categories are listed in annex 15.

Next to these diploma requirements, there are English proficiency requirements. We have included the language requirements in annex 15 too.

The rules of admission are “liberal.” For obvious reasons, looking at our aims for intake: liberal rules help to create a diverse intake. We are content with our admission policy. Of course, the success of this admission policy depends on our information to prospective students, and on the whole intake procedure.

In our information to prospective students we strongly emphasize that Creative Technology is a technology study, and that Creative Technology students have to reach an adequate level of understanding of technology (and not just an understanding of the use of technology). In annex 16 you will find the slide in our Open Days presentation by which we illustrate the central and major role of technology.

We use the same slide to explain that creativity also plays an important role in Creative Technology (as the name of the programme suggests), while art plays a really minor role in the programme. The message to our prospective students is that creativity in Creative Technology is not primarily the creativity of expression as in arts, but it is the creativity of finding ideas, approaches and solutions which are not the immediately obvious ones. We notice that it is harder to get this message across to our foreign students than to our Dutch. An explanation is probably that Dutch prospective students actually visit us, and get a more direct confrontation with the learning environment, and active students

The differences in interpretation of the notion of creativity become clear during intake interviews. From the start of the programme (even for the pilot group of 2009) we have organised activities to investigate the match between the Creative Technology programme and the talents and motivation of our prospective students. This year for the first time participation in these activities has been mandatory to become eligible for enrolment. So for the students who will start in September 2014 it is impossible to become enrolled without having been interviewed. And every interview has resulted in a formal advice about matching. For students who cannot come to Twente, we organize Skype interviews. But we strongly urge our applicants to come to Campus.

The matching activities result in an advice, students who ignore a negative advice will still be enrolled. In some cases, the effect of the negative advice turns out to be very positive. Some of the students who come with a negative advice turn out to have adapted their expectations, and to be very much aware of their weaker points, and to prepared to work on those.

In annex 17 we outline the intake procedure, and the information about that procedure to applicants for admission. The same annex 17 contains the intake checklist which is used the last two years. The prospective students for 2014-2015 receive a copy of this checklist, annotated with the interviewers observations, as an annex to their matching advice.

Also in annex 17 there is an overview of the nature of the intake activities over the years.

In retrospect it is clearly visible that our early intake procedures had an element of “propagating the good news” : we wanted to explain in how many ways and for how many different students Creative Technology could be exactly the right choice of study. The problems encountered by the pilot generation (and the high dropout rate in that generation) can be attributed to a large extent to our insufficient management of expectations during intake. (As was already observed during the initial accreditation.) The last three (maybe only two) years we have become interrogators, and expectation managers. We try not to explain Creative Technology, but let the applicants explain how they see it, and why they feel prepared to study it. And we give them feedback if we observe that they suffer from a misapprehension of what studying Creative Technology actually is.

*/*Statistics on effect*/*

Aims for throughput

Our goals for throughput are

1. At the end of the first semester of the first year there is clear distinction between students who underachieve and must reconsider their choice for Creative Technology, and the students who are doing well.
2. The students for whom it turns out that the match is insufficient (the underachievers of 1) quit studying Creative Technology before February 1st of their first year.
3. The students who are doing well reach a total of 45 credits or more at the end of the first year. This group contains at least 70% of the intake.
4. Students who graduate do so within a period of four years after their first enrolment. The number of exceptions to this rule remains below 10% of the graduates.
5. At least 90% of the students who pass their first year successfully (the students of 3) shall graduate.

Our primary goal as a university study is to educate our to students to reach the intended learning outcomes. But we also feel the responsibility not to waste talent. We want to know as soon as possible if Creative Technology is the study which matches the talents and ambition of the student, and if not, we want the students to reconsider their choice and to look at other options.

Despite our efforts at intake, we keep in mind that 30% of the students who are eventually enrolled will turn out to have an insufficient match. We have not yet found the decisive indicators to predict success on the basis of an intake interview. We doubt we will ever find them.

We want our students to maintain a study speed of at least 75% of the nominal speed. We do not believe the Creative Technology degree gets an extra value if it has been taken after more than 4 years. Sometimes we hear claims that personal development is an issue, and that extra-curricular activities must be encouraged despite their negative effect on study speed. We believe that the Creative Technology programme offers ample opportunity for personal development. We also believe that a four year period to complete a 3 year study programme offers enough options for extra-curricular activities.

Binding recommendation (bindend studieadvies, BSA), and transition to the second year

For Creative Technology students (as for all Bachelor's students of the University) the recommendation regarding the continuation of their studies at the end of their first year is binding. A negative recommendation amounts to a notice of exclusion.

A positive recommendation is guaranteed for students who complete 45 EC of their first year. This limit is set uniformly for all Bachelor's programmes of the university.

BSA was introduced in the academic year 2012-2013. In its earlier Teaching and Examination Regulations (since the academic year 2010-2011) Creative Technology had other provisions regarding the right to participate in units of study of the second year. These provisions made it mandatory to have completed 40 EC of the first year, before access to units of the second year was granted. The 5 EC difference in limit the old regulations (40 EC) and BSA (45 EC) is of minor importance. The real difference is that with BSA the consequences of not reaching the limit have become more radical. A negative

recommendation under the BSA regulations means that students cannot be re-enrolled. Before 2012-1013 students who failed to reach the first year limit could still hang in.

In any case, we believe that setting a limit for the first year's achievements, and to have consequences attached if that limit is not reached, is of positive influence when it comes to throughput aims.

Table xxx shows the relevant numbers for

	start	quit feb 1	quit before limit	pass limit	pass year	drop out with limit
2010-2011						
2011-2012						
2012-2013						

Transition to the third year and starting the graduation project

Since we believe that setting limits with consequences attached has a positive effect on throughput, we included similar provisions in the Creative Technology Teaching and Examination Regulations for the transition from the second to the third year and for the start of the graduation project, as we had for the transition from year 1 to year 2. The limits are 90 EC to pass to year 3, and 150 EC to start graduation work.

There are very few students who are close to the 90EC limit at the end of their second year, but stay just below. In most cases students either easily meet the limit, or they stay far behind. (This second group dates from the time that we did not have BSA)

The limit for starting the graduation work poses more problems. The graduation work coordinator has quite a few complicated cases to judge. Often they are referred to the Examination Board. And more than once it is decided that students cannot yet start finalizing his Bachelor's programme, even if they want to.

Monitoring, counselling, matching, and tutoring

To achieve our aims we must have an adequate course programme, and an adequate teaching and learning environment. We spoke about those before.

Achieving our aims is supported by setting limits, with consequence for students who do not reach these limits. We just explained that.

But even when explicit limits have been set, and with a course programme and a teaching and learning environment which are in order, our throughput aims will not be automatically reached. The students' behaviour eventually determines success.

We review the monitoring of student progress, the counselling of students, and the general supervision of students' learning.

Monitoring

Monitoring is primarily a task for our study adviser. Monitoring tools and monitoring activities fit in the university framework for monitoring and counselling.

Annex 18 gives an overview of monitoring and counselling activities.

It shows that, especially throughout the first year, teaching staff (in most cases module coordinators and tutors) are active, but informal "monitors", providing information additional to the progress information obtained via E-coach.

Counselling

As the *Organization of monitoring and counselling* annex (annex 18) shows, the study adviser starts counselling already in the pre-university phase. In particular the organization of intake activities (the matching process) rests with the study adviser.

There are roughly two groups of students who get special attention of the study adviser: students with disabilities, and students whose study progress or attitude shows a deviation from the "standard". But students who ask for counselling, even if they belong to neither of these groups, get attention as well (of course). And a deviation from from the standard is not always substandard, the study adviser also tries to spot candidates for the university honours programme, i.e. the ones who perform above standard.

Most counselling contacts are individual appointments. But there are a few written advices (for all students) as well. Firstly the matching advice, before enrolment. Next the pre-advices regarding BSA. And finally, at three quarters of the second year, an advice about study progress over the first half of the study (is the student still progressing as required, also after the positive BSA). Details are in annex 18.

The next section on tutoring discusses the role of our Creative Technology tutors, as supervisors of the students' self-directed learning. The relationship between tutor and tutee makes the tutor an obvious counsellor for the tutee. So there is a thin line between tutor and study adviser, But in principle the distinction is clear. The tutor has the competencies of a teacher, and acts as a supervisor and examiner on the basis of these competencies. The study adviser has the competencies of a counsellor, and acts as a counsellor on the basis of these competencies.

We are quite content with our monitoring and counselling of Creative Technology students.

Matching

Our matching interviews (previously intake interviews) are the start of monitoring and counselling activities.

Issues that are discussed during intake are not just the issues relating to curriculum content. We address the teaching and learning environment (tutoring and personal development, team work and a community of learners, learn, don't wait to get taught) as well.

From a counselling viewpoint, it feels like these matching interviews have an effect especially on applicants who are making an early, well-advised choice for the Creative Technology study.

Among the late applicants we sense that they are less inclined to take our advice seriously. It feels as if they want to avoid any second thoughts, happy as they are that they eventually managed to decide for a programme of studies.

Changes in the Act regarding the rules for application make it easier for us to deal with these late applicants.

Tutoring

At the start of their studies, every Creative Technology student gets a tutor assigned. Preferably the assigned tutor is the person who did the intake interview with the student, and who gave the matching advice. (Unfortunately we cannot always arrange tutoring this way.)

These tutors are supervisors, students are accountable to their tutors in matters like the exposure of their progress and achievements (their showcase portfolio), their role in teams, and their in the community of Creative Technology students in general, and their self-direction in learning (not waiting to get taught, addressing weaker points, challenging stronger points). The tutors are appointed by the Examination Board to be examiners, which means that they also assess and grade the performance of the tutees they supervise.

Supervision by the tutor and being accountable to the tutor entails regular meetings between tutor and tutees, sometimes for a one-to-one discussion, sometimes for group discussions. These meetings are often mentoring and feedback sessions. Tutors don't give instruction, but they can give assignments to their tutees.

(It is an anomaly to call a person who doesn't give instruction a tutor; giving instruction is a characteristic feature for tutors. For two reasons we don't want to use the term "mentor", however. Firstly, our tutors are examiners, they assess their tutees, which is not what mentor are supposed to do. Neither are tutors, by the way. But more importantly, our tutors are in a sense "legal guardians" for their tutees, since the Examination Board gave them the powers to approve choices of personal profile and electives of their tutees. And, in another sense of the word, a tutor is a legal guardian.)

At the start of our Creative Technology efforts we identified guidance and supervision of students as self-directing learners as the key role of the tutor. The importance we attach to self-direction derives from three observations: we attract students with different starting points (cf the section on intake above), we encourage students to take the degree with a personal profile (cf the chapter on standard 1, intended learning outcomes), but we offer classes and projects to the group of students collectively. So the landscape of teaching activities is the same for all students, but they have to travel their own roads.

To support both tutors and tutees we developed a $$$$tutoring guide for self-directed learning , *The Road to the Final Qualifications* (annex 19).

In the third year, tutees proceed without their tutor. At the end of the second year the tutor's guidance in self-directed learning ends, when the tutor fulfills his task as legal guardian and signs the approval forms for the tutee's personal profile and choice of electives.

We consider our system of tutoring as a potentially strong characteristic feature of the Creative Technology programme. Unfortunately we are still struggling to get the system in good working order, and we lean on expert help to achieve result. We developed our *Road to Final Qualifications* syllabus under the guidance of educational consultants with experience in the field of self-directed learning. We contracted a professional educational consultant to guide the team of tutors in their tutoring role. (In both cases the educational consultants have strong ties with Art schools.)

Issues which are prominent in our discussions about the tutoring system are:

- it takes about a year before students are susceptible to the whole idea behind tutoring, at the start of their studies the tutoring concept seems not to fit their mindset;
- tutors choose their own style of tutoring, which is not a bad thing in itself, but the differences between tutors are too big;
- if anyone, it is the tutor who oversees the academic and professional growth of the tutee over a longer period of time. So it is the tutor who can assess the portfolio. But both parties, tutors and tutees, seem to underestimate the portfolio's importance;
- students tend to consider anyone with a role in guidance and mentoring as a person to lodge complaints with. A lot of discussions tutors have are not about travelling a road through a beautiful landscape (i.e. our courses and projects), but about changing the landscape, to promote easier travelling.

Data regarding speed of study and study success

!!!TO BE PROVIDED

Personnel

The list of teaching staff active in 2013-2014 is in annex 20.

There is a small group of staff who are dedicated to teaching in Creative Technology, i.e. they don't contribute (or they contribute only minimally) to teaching in other programmes . There are eight people in this group (in alphabetical order):

1. Robin Aly
2. Edwin Dertien
3. Yuri Engelhardt
4. Erik Faber
5. Gerrit van der Hoeven
6. Angelika Mader
7. Dennis Reidsma

8. Job Zwiers

Two persons in this core teaching staff act as tutors as well. There is one vacancy for an extra staff member to join the core Creative Technology staff.

The "nominal" contributions of core teaching staff to teaching Creative Technology total 2.5 fte.

In addition to the core staff, there are around 40 more members of faculty (not just EWI) staff active in teaching and tutoring Creative Technology. Their average nominal contribution is around 0.1 fte per person. (E.g. a tuto's nominal contribution is 0.07fte)

Having many teachers from different fields contributing to Creative Technology is in line with the nature of Creative Technology. The primary commitment of the 40 non-core Creative Technology teachers lies with Bachelor's programmes like Electrical Engineering, Computer Science, Industrial Design, Business Administration, Philosophy, and Psychology.

And then we hire a limited amount of extra staff which we hire outside the university faculties, with a nominal contribution of about 0.5 fte to Creative Technology teaching and tutoring.

The adequacy of staff is an issue which requires, and gets, a lot of attention, at the level of the Creative Technology programme, at the level of the EWI faculty, and at Executive Board level.

If we look at the 8 members of core staff, firstly they all have a doctoral degree, two of them have the teaching skills certificate, four of them are working towards that certificate, and two have more than 20 years teaching experience. This is adequate from the perspective a Bachelor's programme at academic level.

The number of staff with a doctoral degree in the "second circle" is between 60 and 70%. We find that adequate as well, looking at the nature of their contributions. There is a large group of around 60% in this second circle who doesn't have and is not working towards the university teaching certificate. Fortunately, two thirds of this group have extensive teaching experience.

Major problem with the adequacy of staff at this moment is not their qualifications for teaching.

First we face the issue of the reliable deployment of a sufficient quantity of staff. The pressure to keep the programme going is big, the number of staff available for teaching duties is small. There is no obvious backup for teachers in case of illness or other obligations standing in the way of their teaching. At the beginning of each quarter there must be a head count to make sure that every class has a teacher. It has worked out fine, we have teachers, and they are doing well. But reliability and control could be a lot better here. (The deployment of staff is a matter of department chairs, the Director of Education has a responsibility here, but he has very limited powers.)

And then we have an issue with "dedication", "role models" and the community of teachers. It is a minor issue compared with the issue of sufficient staff, but it is an issue.

We expect our students to develop, in a community of learners, towards a level where they are context-driven problem solvers, who rely on skills and knowledge in five areas of learning outcomes. The diversity in staff[5] mirrors the diversity in intake, and the diversity in intended learning outcomes. This is only natural. But still, the teaching staff must force themselves to be a community of teachers which understands the students' entire road towards the intended learning outcomes, and not just a fragment of it. The creation of that community dedicated to educating context-driven problem solvers, with a few role models among them, is a slow process. We are taking very basic measures to help this process (like providing a joint coffee room, and having joint study days). But unfortunately, the pressure of working in a small staff seems to stand in the way of the process of building a community of learners.

Programme specific facilities

The Creative Technology programme shares facilities with other Bachelor's and Master's programmes of the university. Lecture and tutorial rooms, library and internet connection facilities are shared by all. Some workplace facilities and rooms for sketching practice are shared specifically with Industrial Design. The electronics lab is shared with Electrical Engineering.

The only facility to which we lay claim specifically for Creative Technology, is the SmartXp Theatre Hall, and some of the adjacent rooms.

The Theatre Hall is used for work in project groups, for workshops, or presentations, and occasionally also for lectures and tutorial sessions.

It was developed originally to serve as a living lab for research purposes. But sinced the use for research remains very limited, we use it for teaching and learning. In practice, it is a (huge) living room for our students, or at least their home base.

The university facilities for teaching are good (rooms, library, internet connectivity). The workplace facilities and the facilities for sketching practice which we share with Industrial Design serve their purpose equally well, and so does the electronics lab we share with Electrical Engineering. The SmartXp theatre is a valuable asset in addition to these facilities.

/ include SmartXp picture*/*

Strong points and challenges

!!!TO BE EDITED

Diversity of intake is both a strong point and a challenge

Tutoring, reflection and personal development are both a strong point and a challenge

[5] The core staff consists of persons who share a background in Computer SCience and/or Electrical Engineering. This core is perhaps not diverse enough. In any case, we included a member of the Industrial Design teaching staff in our syllabus committee, cf Standard 1, Intended learning outcomes

Personnel is a strong point.

Lack of personnel is an tremendous challenge.

Student portfolio is not a strong point yet

Standard 3a: Assessment

!!!TO BE PROVIDED

Since 2010 the university maintains a framework for assessment policy (UT toetskader). It defines the necessary measures and provisions to promote and maintain quality of tests and exams. Every BSc programme of the university fits in this framework, Creative Technology is no exception.

In September 2013, with the introduction of the new TOM paradigm, the university renewed its framework. The current framework for assessment policy is in annex 21. (Unfortunately in Dutch only.)

The Creative Technology view on education and assessment

In line with our view on learning, we have a view on assessment in which assessment of "doing", and assessment of group efforts and results are important.

Assessment of "doing" is the somewhat blunt way to refer to assessment of skills and knowledge "in context".

A lot of Creative Technology assessment is based on students going through a number of assignments. The early assignments are mostly for learning. The results are important for (self-)diagnosis and feedback. The sequence culminates in one or two larger assignments. The examiner takes the diagnoses of early assignment together with the work the student hands in for the final assignments, and answers the question to what extent there is evidence that the student has reached the learning objectives. The answer is expressed in a mark (and sometimes just in a pass or fail).

Quite often Creative Technology students work towards a joint result in a project group, Here the role of the examiner is to consider the following questions

- does the group result show that the group as a whole has reached the intended learning objectives;
- is there sufficient evidence that individual group members reached those learning objectives;
- is there enough evidence in the way the group process evolved to conclude that the group and group members reached intended learning objectives.

The balance between individual and group assessment is a very important issue. Looking back at the first five years of Creative Technology, the attention for individual assessment has been growing.

Another issue is the balance between applying knowledge and skills in context, which is a typical characteristic of assessment by assignments, and just showing the presence of skills and knowledge, as in assessment by written exams, making exercises, answering questions.

We definitely don't want to abandon the simple and straightforward check on the presence of knowledge and skills by written exams, despite our emphasis on the "doing" and the "group work".

Assessment of subjects and assessment of modules

!!!TO BE PROVIDED

Reaching intended learning outcomes, assessment of graduation work

We are convinced that our graduates have reached the intended learning outcomes. But we can only admit that there are just a few graduates at this moment. The results of this small group are perhaps not entirely representative.

We have a larger group of students who made the transition from the second to the third year. At that point in their student career, they enter courses outside Creative Technology, in preparation of a Master's programme, or as a foreign exchange student, or in a minor programme, either at the University of Twente or elsewhere. We are not aware of any problems the Creative Technology students encounter in that transition. We conclude that their progress towards a degree at academic Bachelor's level is comparable to the level of other students in other Bachelor's programmes.

In the second half of their third year, the Creative Technology students enter elective courses. These courses are mostly designed with research into an application area in mind. The Creative Technology students stand out in that context as original designers and makers, they have reached learning outcomes in the Creative Technology core triangle. But this is a point where they finalize their capabilities in academic skills, and the area of societal value.

Graduation work is assessed on the basis of an assessment form, which is included in annex 22. In fact annex 22 is a list of all graduation projects and their assessments.

Graduation work has two supervisors, one member of university staff, and one (often) external. We strive for our students to do their graduation work with an external party, but in some cases the external party is closely tied with the university and/or the faculty. The university staff member decides about the grading.

Graduation work is confined in time. Students can start working on their assignment at the beginning of a semester (September or February, it must be finished at the end of that semester. In some cases an extension is granted of at most 6 weeks. But we have seen cases where students failed their graduation work, and had to start again.

The Creative Technology teaching staff is a group of people who have different backgrounds, and have roots in different traditions. And the nature of graduation work varies a lot among students, as can be expected for Creative Technology. These factors make it hard to establish uniformity of assessment. We are organizing peer review sessions where we confront ourselves with the various ways we have been looking at graduation work. The desired outcome is a set of uniformly accepted and respected guidelines for assessment.

At the same time we have to ensure that graduation work fits Creative Technology, and can serve for students to make the final step towards the intended learning outcomes, and for us to assess whether these outcomes have been reached. Our peer-reviewing also addresses this question.

A related initiative, primarily to underpin our conviction that our students do reach the intended learning outcomes, has been to ask the external supervisors of graduation work about to pass their judgement on our students: did they reach the learning outcomes, or not? The results of this survey are in annex 23.

Free-riding

A relatively large proportion of assessment in Creative Technology is based on group work. We cheer learning in a group, but in the end, every individual in the group must have reached learning objectives, and we have to assess this properly.

In practice, group work is assessed on two or three criteria: the result delivered by the group, the contribution to that result of the individual members, and (not always) the process which lead to the result. For assessment of the individual contribution, group members are often asked to hand in a separate essay or document, or they are invited to explain and defend their contribution in a separate interview.

Despite our efforts to assess not the just the result achieved by the group as a whole, but also the contribution of the individual members, we do see students who "hide" in the group, and worse, we see free-riding students who try to use the group to get a positive assessment on the base of the group result, without actually contributing to it, or at least not enough. (The subtle difference between hiding and free-riding is that the contribution of "hiders" is adequate but only supportive, almost subordinate, with little or no independence, while the contribution of free-riders is far from adequate, if not mostly absent)

We do two things to counteract free-riding.

Firstly, we monitor the group process, and intervene if we get signals of free-riding. Secondly, we use a system of peer assessment, so students can signal inadequate contributions of fellow group members. In fact, the peer assessment system is a system of red, yellow and green cards, which allows students to indicate that

- (red) student must be removed from the team;
- (yellow) student cannot take full credit for the team result, since his contribution was less than what was agreed upon;
- (green) student deserves extra credit[6] for the team result, because his contribution was more than what was agreed upon.

[6] Not credit as a measure of study load, but credit as a reward, like e.g a higher mark.

We view the peer assessment as a token of professional behaviour. It is a valuable experience to confront a co-worker with your perception of his or her contribution to the work at hand. And to be confronted with the verdict of your co-workers is an equally valuable experience.

Unfortunately (but not entirely surprisingly) students are inclined to feel “betrayal” in a negative verdict by fellow students. And it is not just the person who gets the negative verdict who feels betrayed, the persons passing the verdict feel they are betraying. This feeling of betrayal stands in the way of acting as a professional team member. So, using these cards is difficult. It works fine with green cards. It works less fine with red and yellow cards. But we believe students can learn a lot of it. So we stick to it.

Fraud and plagiarism

The rules and regulations of the Examination Board (included in annex 0) define fraud by the following clauses:

- students submitting work for assessment and marking which is *not* their own
- students deceiving the examiner
- students using resources whose use has been prohibited by the examiner
- students copying work of others (unless the copy is a proper citation)
- students giving others the opportunity to commit fraud.

Examiners who suspect fraud, refer the case to the Examination Board. Examiners underpin their suspicions, but they don’t have the authority to decide about cases of fraud, and they can take measures in cases of fraud directed by the Examination Board only.

The organization of written examinations is directed to the prevention of fraud.

Prevention of fraud when assessment is based on assignments (often homework assignments) is a complicated issue. There is a thin line between students working together on an individual assignment reaching the learning objectives independently on one another, and students working together where one student instructs others how to deal with the assignment, without the others getting closer to the learning objectives. Since the first scenario, students working together in order to reach learning objectives (individually) fits perfectly in our view on teaching and learning. So our measures to prevent the undesired and fraudulent forms of cooperation cannot be too radical: radical measures could make cooperation totally impossible. When prevention is difficult, fraud detection is important. in case of assessment through assignments a common practice is, to ask students for a short “interview” to explain and justify the work they handed in.

In project work, fraud is not often an issue. Free-riding is, as we discussed in the previous section.

Strong points and challenges

!!!TO BE PROVIDED

Standard 3b: Achieved learning outcomes

The first larger group of graduates finished their studies at the end of the academic year 2013-2014. This makes it a bit hard to substantiate claims about the achieved learning outcomes. At the start of the academic year 2014-2015, 27 students have a Creative Technology BSc degree.

So we report our first observations pertaining to the achieved level. These observations are

- about the graduation work,
- about the further careers of the graduates,
- about contributions to research, and
- about startup companies

Graduation work

Annex 22 is an overview of all finished graduation projects so far.

These are serious projects, at Bachelor's degree level. A question which we are considering, as part of our peer-reviewing of the assessment of graduation work (cf. *Assessment of graduation work* in Chapter Standard 3b), is whether all these assignments are really fit for Creative Technology. Most are, definitely, but we feel that close monitoring is necessary.

The projects we make our students work on for graduation are of the right level. The achievements of our students completing the work are carefully measured. Most students "pass the test", external parties tend to value the work even higher than we do.

Not every student completes graduation with ease, and in some cases the assessment resulted in a pass only after an extra period of work in order to improve on the initial outcome of the project. There have been two cases where the student failed to complete the graduation project successfully. These two have to start again.

Graduates and their further career

Our first graduate started in 2009 as a "volunteer" in our pilot group, and took the degree cum laude in 2012, after three years of study. He continued in the Human Media Interaction (HMI) Master's programme (a two years programme), and he intends, finalizing his MSc degree after two years, to apply for a PhD position, with the support of the HMI department . A definite example of someone who achieved an adequate level.

The graduates that followed a year later continued in Master's programmes as well. Almost all of them in in the HMI Master's programme as well. Without exception they are progressing successfully. One of the graduates of the second batch continued for a Master's degree in Computer Science at the

University of Twente. He too is progressing according to plan in his programme. And one returned to his home country (Germany) for a Master's degree in Computer Science.

For the third and larger group of graduates of 2014, it is too early to say anything about their further career.

In annex 24 there is a full overview of our "student career monitoring", from choice of personal profile through choice of electives to "career after taking the degree".

There is one side remark which we feel to be of some relevance in this context. When Creative Technology graduates start in Master's programme (in most cases so far that would be HMI), they mix with students with another Bachelor's degree (in most cases so far with Computer Science students). The broad scope of the Creative Technology programme, the educational approach of "learning by doing", and the emphasis upon self-directed learning and self-management in designing, makes the Creative Technology graduates rather different from their fellow students in the Master's programmes. We hear that Creative Technology students themselves, but also their fellow students worry about the expertise of the Creative Technology graduates, and about the depth of their knowledge. There seems to be the vague feeling that Creative Technology students have learned less than their colleagues from other Bachelor's programmes.

First experiences here indicate that in practice it works rather the other way round: the Creative Technology students turn out to be the fast learners, and they can organize, and get a job done, which are qualities they don't always find in their fellow students. The feeling that they may have learned less turns into the feeling that perhaps they have learned more.

Contributions to research

Graduation work is not research oriented, it concentrates on design,

We have seen students in projects in their second year who contributed to research of PhD students. The work of one group of students led to a conference publication

Startup companies

One of the ideas we had in mind when initiating Creative Technology, was for successful students to start their own company, after their graduation. We have seen two examples of startups originated by Creative Technology students.

One is PrintR, which focuses on 3D printing services. (cf http://printr.nl/). The other one is Athom, which is developing Homey, a speech interface for every possible piece of electronic home equipment. (cf. http://athom.nl/)

Strong points and challenges

!!!TO BE PROVIDED

Remaining issues

Institutional quality assurance

!!!TO BE PROVIDED

Institutional quality assurance report (annex)

User and teacher satisfaction

!!!TO BE PROVIDED

Explain how user and teacher satisfaction are measured, how the outcome of such measurements is analysed, and how action is taken.

Outcome of the initial accreditation

!!!TO BE PROVIDED

Explain how the recommendations of the initial accreditation have been handled.

Analysis of strengths and weaknesses

!!!TO BE PROVIDED

Appendices

annex 1 Organization Chart of the University of Twente

annex 2 Organization Chart of the EEMCS faculty.

annex 3 Intended learning outcomes for a Creative Technology graduate

annex 4 A.W.M. Meijers, C.W.A.M. van Overveld, J.C. Perrenet.
Criteria voor academische Bachelor en Master Curricula

annex 5 Evaluation of learning outcomes relative to Meijers' criteria

annex 6 The domain specific frame of reference

annex 7 Evaluation of learning outcomes relative to the domain specific frame of reference

annex 8 The Twente Educational Model (TOM)

annex 9 Floorplan of the Creative Technology curriculum (pre-TOM)

annex 10 Floorplan of the Creative Technology curriculum (TOM)

annex 11 Learning objectives of Creative Technology courses (pre-TOM)

annex 12 Learning objectives of Creative Technology modules (TOM)

annex 13 Matching course objectives with learning outcomes (pre-TOM)

annex 14 Matching course objectives with learning outcomes (TOM)

annex 15 Rules of admission for Creative Technology

annex 16 Open Days presentation of the Creative Technology Programme Set-up

annex 17 The Creative Technology Intake events

Conclusions