



NVAO • NETHERLANDS

WO-BACHELOR PSYCHOLOGY & TECHNOLOGY

Eindhoven University of Technology

(ADVISORY) REPORT

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LIMITED INITIAL ACCREDITATION (ADVISORY) PANEL REPORT

19 DECEMBER 2019

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1 Executive summary

The Accreditation Organisation of the Netherlands and Flanders (NVAO) received a request for an initial accreditation procedure regarding a proposed wo-bachelor Psychology & Technology at Eindhoven University of Technology. NVAO convened an expert panel, which studied the information available and discussed the proposed programme with representatives of the institution and the programme during a site visit.

The intended independent programme wo-bachelor Psychology & Technology previously was delivered as a track within the existing programma bachelor Innovation Sciences. Registration as a separate programme requires an initial accreditation. The bachelor Innovation Sciences was assessed in the beginning of 2017 (site visit: 14 February 2017) and accredited on 31 August 2017 (005705). The panel was informed on the previous assessment and the programme systematically addressed all suggestions for improvement by the previous panel. Since this is an existing programme the initial accreditation comprises also standard 4: Achieved Learning Outcomes

The following considerations have played an important role in the panel's assessment.

The Psychology & Technology programme's main objective is to teach students to understand and influence the complex relationships between innovation and technology from a user, socio-economic and technological perspective. Students will learn the specific language and culture affiliated with the engineers who develop and adapt technological innovations. The programme offers three different specialisations which define the context of the innovation process being studied: ICT, Living, and Robotics. Most students of the Psychology & Technology programme pursue a career with a multidisciplinary focus. Students who aspire a more technical career acquire the required knowledge and skills, provided they chose the appropriate electives.

The panel established that the intended learning outcomes comply with the criteria for academic curricula as outlined by the Dutch Universities of Technology (3TU) for the bachelor's level (Academic Competences and Quality Assurance (ACQA) framework). The programme's Advisory Board, which gives advice to every programme of the Department of Industrial Engineering & Innovation Sciences, is well-structured, comprising both profit and non-profit organisations. The panel appreciates that the programme is actively engaging its stakeholders in terms of knowledge and competencies, as well as in terms of the English language. As a result, the programme is filled with relevant subject matters and trends from the professional working field.

The panel is of the opinion that the curriculum is well structured, as it covers all of the intended learning outcomes and addresses the programme-relevant subjects. The programme offers a strong psychological profile of Human-Computer Interaction within the three pillars: psychology, research methods and engineering, thereby offering students to either deepen or broaden their (inter)disciplinary knowledge and understanding. The ICT, Living, and Robotics specialisations, contribute a proper solution to the societal need for T-shaped researchers in these particular fields. Furthermore, the panel noticed a good connection between research topics and Bachelor End Projects. The options to switch to other fields, indicate a sufficient foundation for a wide range of follow-up masters.

All of the lecturers are experienced lecturers who have a PhD and are active researchers with a multidisciplinary focus. The panel was particularly pleased to hear that the programme strives to balance workload between education and research tasks. This balance ensures that the latest research results can be used within the programme.

The programme is delivered in English. The following arguments convinced the panel of the need to adopt English as the working language of the programme. It prepares students for the subsequent master programmes and the professional work field. In nearly all companies and organisation in which

the students will pursue their future (international) careers English will be the principal language. Next there is the necessity for the innovative ‘top sectors’ in the Dutch economy to attract international students. Students have to be prepared to work in an intercultural environment. Attracting staff members with a different cultural background is essential to make an intercultural learning environment possible.

The teaching concept and the course methods are suitable. The course documents are well thought out and clear and transparent. Learning concepts and formats are sound and there is a good combination and variation of appropriate working methods. A point of concern for the panel was the study success of the programme. Approximately 75% of the students need more than three years to graduate for their bachelor’s programme. The panel investigated whether this was caused by an overloaded or not well organised programme. Based on the interviews with programme management, lecturers, students and alumni, the panel finally came to the conclusion that this is not the case. The delay in general is explained by extracurricular activities, additional courses followed and students who switch to the Psychology & Technology programme from other programmes. Moreover, the panel is positive about the guidance students are provided with throughout the programme. The student advisors and student mentors are approachable and deliver effective support to students; advancing integration into the student community as well as choosing a proper study path.

The quality assurance of the examination process is well-thought-out. Exams and assessments are well structured and adequately monitored. The Examination Committee is very involved and pro-active in the bachelor programme, which the panel appreciates. The type of assessment is in line with the learning objectives of the programme and the rubrics are clear. The programme is frequently evaluated in different ways. The panel values that, at the time of the site visit, lecturers were working to replace the old assessment form of the Bachelor End Project by a rubric of the learning outcomes to support calibration of assessments. This is one of the improvements suggested by the recent Assessment of the programme Innovation Sciences.

The panel studied a selection of 15 theses from the track Psychology & Technology. The selection covered the three pillars in comparable numbers and included a balanced range of final marks. The panel determined from this that the Bachelor End Projects display a clear emphasis on analytic skills. Students demonstrate mastering the intended learning outcomes in their thesis more than sufficiently. The panel established that the theses are of good quality. Also, there is sufficient evidence that the Psychology & Technology graduates are well qualified for subsequent studies (such as the Human-Technology Interaction (HTI) master as well as non-HTI masters like Data Sciences) and to meet the expectations of the job market. Based on these findings the panel concludes that the intended learning outcomes are achieved.

The panel does -however- remark that the emphasis within the programme lies mainly on psychology and research methods from psychology. The panel suggests that the programme could strengthen its profile if it focused more on engineering and/or engineering applications. The panel also suggests the programme management to consider to revise the ICT specialisation into Artificial Intelligence or Data Science. This would bring the ICT specialisation more in line with current social and technological developments.

The panel comes to the conclusion that the programme meets all assessments standards. Given these considerations, the panel advises NVAO to take a positive decision regarding the quality of the proposed programme wo-bachelor Psychology & Technology at Eindhoven University of Technology.

The Hague, 19 December 2019

On behalf of the assessment panel convened for the initial limited accreditation assessment of the wo-bachelor Psychology & Technology at Eindhoven University of Technology,

Prof. dr. Ir. D. Heylen
(Chair)

Y. Blom
(Secretary)

2 Introduction

2.1 The procedure

NVAO received a request for an initial accreditation procedure including programme documents regarding a proposed academic bachelor Psychology & Technology. The request was received on 8 July 2019 from Eindhoven University of Technology.

An initial accreditation procedure is required when a recognised institution wants to award a recognised bachelor's or master's degree after the successful completion of a study programme. The procedure for initial accreditation is slightly different as compared to the approach for programmes that have already been accredited. Initial accreditation is in fact an *ex ante* assessment of a programme. The programme becomes subject to the normal accreditation procedures once initial accreditation has been granted.

To assess the program, the NVAO convened an international panel of experts. The panel consisted of:
Chair

- Prof. dr. ir. Dirk Heylen, (*voorzitter*), professor Socially Intelligent Computing at University of Twente

Panel members

- Dr. ir. Maka De Lameillieure, director Research and Valorization, Antwerp Management School;
- Prof. dr. Eric Postma, professor in Artificial Intelligence at Tilburg University

Student member

- Wietske Rem BSc, (*student-lid*) student MSc Mechanical Engineering, University of Twente

On behalf of the NVAO, Frank Wamelink and Yvet Blom MSc, were responsible for the process-coordination and the drafting of the experts' report.

This composition reflects the expertise deemed necessary by NVAO. All the panel members signed a statement of independence and confidentiality.

The panel has based its assessment on the standards and criteria described in the NVAO Assessment framework for limited programme assessment for the higher education accreditation system of the Netherlands (Stcrt. 2019, nr 3198).

The following procedure was undertaken. The panel members prepared the assessment by analysing the documents provided by the institution (Annex 3: Documents reviewed). The panel organised a preparatory meeting on 29 October 2019, the day before the site visit. During this meeting, the panel members shared their first impressions and formulated questions for the site visit.

The site visit took place on 30 October 2019 at Eindhoven University of Technology. During this visit, the panel was able to discuss the formulated questions and to gather additional information during several sessions (Annex 2: Schedule of the site visit). Afterwards, the panel discussed the findings and considerations and pronounced its preliminary assessments per theme and standard. At the end of the site visit, the initial findings were presented to the institution.

Based on the findings, considerations and conclusions the secretary wrote a draft advisory report that was first presented to the panel members. After the panel members had commented on the draft report, the chair endorsed the report. On 9 December 2019 the advisory report was sent to the institution, which was given the opportunity to respond to any factual inaccuracies in the report. The institution replied on 19 December 2019. All suggested corrections were adopted. Subsequently the final report was endorsed by the panel chair. The panel composed its advice fully independently and offered it to NVAO on 19 December 2019.

2.2 Panel report

The first chapter of this report is the executive summary of the report, while the current chapter is the introduction.

The third chapter gives a description of the programme including its position within the institution, the Eindhoven University of Technology and within the higher education system of the Netherlands.

The panel presents its assessments in the fourth chapter. The programme is assessed by reviewing the themes and standards in the Initial Accreditation Framework. For each standard the panel presents an outline of its findings, considerations and a conclusion.

The outline of the findings are the objective facts as found by the panel in the programme documents, in the additional documents and during the site visit. The panel's considerations consist of the panel's judgments and subjective evaluations regarding these findings and their relative importance. The considerations presented by the panel are at the basis of a concluding overall assessment.

The panel concludes the report with a table containing an overview of its assessments per standard.

3 Description of the programme

3.1 General

Country	Netherlands
Institution	Eindhoven University of Technology
Programme	Psychology & Technology
Level	bachelor
Orientation	academic (wo)
Degree	Bachelor of Science
Location(s)	Eindhoven
Study Load (EC)	180 EC
Field of Study	Technology

3.2 Profile of the institution

Eindhoven University of Technology (TU/e) is divided into nine departments that offer 12 bachelor programmes and 15 graduate programmes. The bachelor programme consists of a total of 15 majors and the graduate programmes of 23 master's degree programmes. TU/e aims to be an international leading university by excelling in key research areas and education, specialising in engineering science and technology. The university seeks to promote the development of engineering sciences and technological innovation as a result of which they want to contribute to solving major societal issues in the energy, health and smart mobility industries, in and outside of the Eindhoven area.

The TU/e began an extensive educational restructuring in 2012 by placing its educational bachelor programmes into the Bachelor College (BC). Two years later, in 2014, the university changed the organisation of its master and PhD programmes by positioning those into the Graduate School (GS). In both the BC and the GS construction, students have more options to create a tailored study programme based on their personal ambitions and interests. This allows them to become T-shaped engineers with a sound scientific foundation and depth, combined with the necessary skills to successfully flourish in challenging multidisciplinary working environments.

3.3 Profile of the programme

The Bachelor programme Psychology & Technology is a School of Innovation Sciences programme (School of IS) within the Department of Industrial Engineering & Innovation Sciences (Department of IE & IS) at the Eindhoven University of Technology. Psychology & Technology is currently part of the bachelor programme Innovation Sciences and is one of two majors that the programme offers.

For three reasons the Department of IE & IS has decided to apply for an initial accreditation application to launch a Bachelor Psychology & Technology programme:

1. The current programme exceeds a well manageable number of students;
2. The major Psychology & Technology subsequently developed, and will further develop, a differentiated profile;
3. Name and communication on the programme will be clearer to address prospective students.

The curriculum consists of a total study load of 180 European Credits (EC) and is a three-year programme. The objectives of the bachelor programme includes teaching students to understand and influence the complex relationships between innovation and technology. The programme provides an academic foundation to research analyse innovations and innovation processes from a user, socio-economic and technological perspective. The programme offers three specialisations which define the context of the innovation process being studied: Information and Communication Technology (ICT), focusing on innovations in a computing context, Living, involving innovations in the built environment, and Robotics, which focusses on innovations involving robots and artificial intelligence.

The Psychology & Technology programme gives students access to several TU/e master programmes depending on the electives they chose. Students who successfully complete the mandatory major and electives are offered access to the School of IS master programmes: the Master Innovation Sciences, the Master Human-Technology Interaction, and the Master Innovation Management. Subject to the mandatory electives, students may also be eligible for certain TU/e engineering programmes or from other universities.

At present, there are no comparable university-level research bachelor programmes in the Netherlands that focus on both psychology and technology. The working language of the programme is English, to match the working language in subsequent master programmes and the professional work field.

The intended start date of the programme is September 2020, with a maximum of 100 students in the first year.

4 Assessment per standard

This chapter presents the evaluation of the standards by the assessment panel. The panel has reproduced the criteria for each standard. For each standard the panel presents (1) a brief outline of its findings based on the programme documents and on documents provided by the institution and the site visit, (2) the considerations the panel has taken into account and (3) the panel's conclusion. The panel presents a conclusion for each of the standards, as well as a final conclusion.

The assessment is based on the standards and criteria described in the NVAO Assessment framework for the higher education accreditation system of the Netherlands (Stcrt. 2019, nr 3198). Fundamental to the assessment is a discussion with peers regarding the content and quality of the new programme.

Regarding each of the standards, the assessment panel gives a substantiated judgement on a three-point scale: meets, does not meet or partially meets the standard. The panel subsequently gives a substantiated final conclusion regarding the quality of the programme, also on a three-point scale: positive, conditionally positive or negative

4.1 Standard 1: Intended learning outcomes

The intended learning outcomes tie in with the level and orientation of the programme; they are geared to the expectations of the professional field, the discipline, and international requirements.

Outline of findings

The Psychology & Technology programme's main objective is to teach students to understand and influence the complex relationships between innovation and technology from a psychological perspective. The information submitted to the panel prior to the site visit, outlines the programme's focus on the relationship between technology and people, matching technical systems to the needs, requirements, abilities and limitations of human users. Psychology & Technology offers an academic foundation for both design and research skills to be able to study and to analyse innovations and innovation processes from a user, socio-economic and technological perspective. Students will learn the specific language and culture affiliated with the engineers who develop and adapt technological innovations. Additionally, students learn to combine and integrate technical and social science analyses to enable them to make recommendations on innovations or innovation processes and reflect on the anticipated improvements. The programme also teaches students to convey the results of their analyses and improvements to scientists, politicians, and the general public.

The programme offers three specialisations which define the context of the innovation process being studied: the computing context in the ICT specialisation, the built environment context in the Living specialisation, and a robot and artificial intelligence context in the Robotics specialisation.

Students who obtain a bachelor's degree are eligible to start a master's degree at TU/e. The programme gives students access to several TU/e master programmes depending on the electives they chose. Students who complete the mandatory major and electives are eligible for the master programmes of the School of IS: the Master Innovation Sciences, the Master Human-Technology Interaction, and the Master Innovation Management. Subject to the mandatory electives, students may also be eligible for engineering programmes at the TU/e or other universities.

Intended learning outcomes

The programme management and lecturers interviewed by the panel emphasised that acquiring a solid understanding of psychological methodology while at the same time gaining engineering knowledge and skills, sets this bachelor programme apart from other programmes at TU/e and other Dutch universities. The programme management has demonstrated that the learning outcomes are in line with the criteria for academic curricula as outlined by the Dutch Universities of Technology (4TU), which forms the Academic Competences and Quality Assurance (ACQA) framework. ACQA exceeds the general Dublin

descriptors by making the notion of academic education explicit and measurable and adding the competence Designing which is an essential competence for universities of technology. The ACQA framework specifies seven different competence areas that cover the Dublin descriptors, but in a more detailed way, for students to gain proficiency in a) one or more scientific fields; b) doing research; c) designing; d) a scientific approach; e) basic intellectual skills; f) cooperating and communicating; g) the temporal and social context.

The learning outcomes of the programme are in line with ACQA. The ACQA framework looks at each course of the programme individually regarding to which extent and to which level academic skills are addressed. From this information, a complete programme profile is determined. Both the bachelor's as well as the master's level are demonstrated by the quality of student supervision, the level of complexity and structure in the assignments, and in the level of multidisciplinary engineering problems. Based on the ACQA framework, it is clear that the intended learning outcomes comply with the bachelor's level.

According to the information provided to the panel, the intended learning outcomes also correspond with the Domain Specific Frame of Reference for Innovation Sciences (DSFR). The DSFR has been drafted by the management of the innovation sciences programmes of the Eindhoven University of Technology, Vrije Universiteit Amsterdam and Utrecht University. It is based on the current academic views where innovation focusses on the successful introduction of new or improved products, processes, or services. IS programmes incorporate different areas of expertise, in particular natural sciences and social sciences, and they focus on micro, meso and macro perspectives. Consequently, according to the information dossier, the DSFR therefore covers the programme's focus on psychology and technology.

Professional working field

The professional working field is represented by the Advisory Board of the Department IE&IS. The advisory board has recently been split into a scientific and a professional branch. The scientific advisory board consists of representatives from different universities. The professional advisory board consists of representatives from profit as well as non-profit organisations. To be able to have the two bodies work as effectively as possible, one representative has a bridging role and sits on both advisory boards.

The professional advisory board, partially consisting of alumni, advises the department on the alignment of the department's activities with requirements from the professional working field, including the educational and research matters of the departments' educational programmes. The board meets at least twice a year and plays an active role in determining the level and content of the educational programmes in relation to the needs of the labour market. The advisory board has played a large role in determining the outline of the programme. The representative of the advisory board explained to the panel that the outline of the programme came about during discussions between members of the board in which they established that there is an increasing need for multidisciplinary professionals who understand people's interaction with technology. The School of IS followed the board's proposal to focus on the mutual influence of people and technology, resulting in the profile that professionals who graduate from the School of IS have when entering the job market. This profile has gotten positive feedback from the Advisory Board.

The representatives of the professional working field, who were interviewed by the panel, and are not a member of the Advisory Board, confirmed the need for graduates who have gained psychology knowledge and skills while honing in on engineering. Due to the fast-changing society where artificial intelligence has become increasingly vital, there is a growing demand for people who look at technology from a different perspective, i.e. the perspective of the users of those technologies. Furthermore, the international focus of the programme is necessary, according to the interviewees, as most engineers will be working globally and in, or with, international teams.

Considerations

The panel appreciates the relatively unique programme with a clear relevant profile in the Netherlands. The programme's management, the lecturers, and the professional working field, all emphasise the need for a bachelor's programme that focuses on user experience of innovations and innovation processes. This is achieved by combining psychological methodology with engineering. The programme is well-structured by having a multidisciplinary approach that focusses on acquiring both academic skills as well as designing and engineering skills. The panel reviewed the intended learning outcomes of the programme and confirms that they comply with the ACQA framework for the bachelor's level. The requirements for the bachelor level are also met in regards to the academic input in terms of knowledge and understanding of relevant fields, research skills and academic skills.

The panel notes that the programme is primarily focused on psychology and research, whereas the technical component of the programme is limited to design requirements. The limited focus on the technical component in the Psychology and Technology major has raised the question of whether the aforementioned learning outcomes enable students to gain sufficient engineering knowledge to pursue a master's programme or a professional career within a more technical field. During the conversations with the programme management, the lecturers, students, alumni and the professionals from the working field, the panel noticed that most students pursue a career with a multidisciplinary focus. Students who aspire a more technical career acquire the required knowledge and skills, provided they chose the appropriate electives. The panel therefore does not consider it to be a problem that the programme's primary focus is on psychology and research, as long as the programme representatives are open and transparent towards prospective students about the limited focus on engineering.

Furthermore, the panel has assessed the DSFR and finds that the core of the programme is not completely consistent with the framework's objective. The unique feature of the programme, its combination of psychology and technology, would better fit a framework where this combination of disciplines is at its core. Also, the programme is less focused on innovation. The panel advises looking into multidisciplinary programmes, as well as looking into frames of reference that include multidisciplinarity.

The programme's Advisory Board, which gives advice to every programme of the Department of IE & IS, is well-structured, comprising of both profit and non-profit organisations. Based on the interviews with the professional working field, the panel notices that the programme is actively engaging its stakeholders in terms of knowledge and competencies, as well as in terms of the English language. As a result, the programme is filled with relevant subject matters and trends from the professional working field.

Finally, the panel gathers that the international positioning of the programme can be improved if the programme is more strongly embedded internationally, and therefore advises to pursue a more vigorous international profile.

The panel is of the opinion that the intended learning outcomes have been adequately formulated. The programme's focus is relevant and meets the needs of the professional working field. The panel considers standard 1 to meet the requirements.

Conclusion

The programme meets standard 1.

4.2 Standard 2: Teaching-learning environment

The curriculum, the teaching-learning environment and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.

Outline of findings

The Bachelor of Psychology & Technology is a three-year English programme, with a total study load of 180 European Credits (EC). The curriculum is in line with the Bachelor College structure of Eindhoven University of Technology. This means that every BSc programme consists of major courses (90 EC), basic courses (30 EC), User Society Enterprise (USE) packages (15 EC) which comprises three USE courses, and elective courses (45 EC). TU/e aims to enhance the educational organisation and feasibility of the programmes, by aligning the BC courses into three courses per quartile, each course consisting of 5 credits.

The major of the Psychology & Technology programme consists of so-called learning lines. Each learning line includes three courses. All three of the courses cover closely related topics. First there is an introductory level-1 course on the topic, followed by an in-depth level-2 course, and lastly an advanced level-3 course. The learning lines are intertwined with the three pillars of the major: Psychology, Research methods, and Engineering. This is to ensure the vertical connection between the learning lines and thus creating coherence between the structure of the programme and the learning process of the student. The major courses on psychology cover topics on brain perception action, cognition, social interaction and consumer behaviour. The Behavioural Research Methods courses cover statistics methods, research designs and qualitative and quantitative research. The Engineering courses cover four mandatory specialisation courses (20 EC) that students do at other departments of the TU/e, with a focus on ICT, Living or Robotics. The programme also includes mandatory engineering electives (15 EC) and basic engineering courses (20 EC).

The final phase of the programme is dedicated to the Bachelor's End Project (BEP, 10 EC). Students make a list with preferred topics for the BEP, after which they are assigned to a lecturer who matches one or more of their preferences. The lecturer then suggests a project. It is the student however who formulates the project's research question. A group, comprising of a maximum of 5 students will work together to collect the necessary data. Students are also allowed to choose their own project as long as their supervisor agrees to it. Students are actively supervised throughout their BEP. They will be strengthening and deepening their knowledge, insights and skills from a variety of fields by collecting data, literature and other sources. Students are allowed to start with the BEP as soon as they obtain their year-1 certificate, have 120 credits or more, and have successfully completed the Behavioural Research Methods 2: Dealing with data course, or the Advanced research methods and research ethics course.

The basic courses are five main courses which cover a number of topics and skills that every BC programme shares, which are programmed in each quartile in year-1 and in the first quartile of year-2. The basis courses form the foundation for the TU/e engineering profile and focus on generic engineering skills. The five courses are Calculus, Physics for Technology, Data Analytics for Engineers, Engineering Design, and Humanities & Social Sciences (USE).

The USE courses look at engineering from different perspectives. The user perspective, the society perspective and the entrepreneurial perspective. These perspectives address the impact that artefacts have on users, the business and society as a whole. In 2018-2019 ten USE packages were offered. Each package is organised around a theme and consists of an exploratory subject (5 EC), an in-depth subject (5 EC), and an applied subject/project (5 EC).

The elective courses allow students to put together their own individual programme. Students can opt for coherent elective packages that are comprised by the TU/e departments, or separate elective

courses. In order to ensure the technical level of the programme and to maintain a close link to their ICT, Living or Robotics specialisation, the bachelor Psychology & Technology requires students to choose at least one in-depth engineering package (15 EC).

The BC strives for coherency by incorporating measures intended to integrate the different courses into coherent educational programmes. To ensure coherency between the courses of the programmes, the BC has laid down coherence requirements in the Examination Rules and Procedures document. The BC requires coherency between the four specialisation courses of the major programme, as well as in the USE packages and in the elective packages. If elective courses of an individual programme consists of at least two coherent packages, the individual programme automatically satisfies the coherence requirement. Individual programmes with only one coherent package, will be checked by the Examinations Commission for coherence.

Students need to construct their total programme with at least 45 EC of advanced level-3 courses. The elective part of the programme (including USE) has to consist of at least 30 EC of in-depth level-2 or advanced level-3 courses. During the site visit, students stated that the BC offers a plan app which generates a clear overview of the major, basic and USE courses as well as the level of the courses they have already passed.

The option to spend time studying abroad during the bachelor's programme is limited. This is mainly because of the way the Bachelor College has been set up, as well as the fact that the master's programmes of the GS include a mandatory semester abroad.

Didactics

The programme has a study load of 40 hours a week, with a maximum of 24 contact hours a week. The programme's teaching methods include lectures consisting of mid-term tests and quizzes, guided self-study, tutorials, feedback meetings, project work, individual study time, exam preparation, and Design-Based Learning (DBL). During DBL students work in teams on different design projects to gain professional skills, activate their thinking process, learn to co-operate, be creative, and acquire further multidisciplinary knowledge.

Admission and enrolment

To be eligible to start the programme, applicants need to have a Dutch vwo diploma (or equivalent) including Mathematics B (or equivalent). Students who successfully complete the first year of a hbo bachelor's programme (or equivalent) in an engineering field, provided that they (at least) hold a vwo Mathematics B certificate (or equivalent) are also eligible.

The TU/e offers a variety of programme related activities prior to their possible enrolment, which allows students to make a well-versed decision as to whether or not Psychology & Technology matches their expectations. Activities include online assessments and the opportunity to spend a day at the university, including classes.

Language

The working language of the programme is English. The programme management, lecturers, students, alumni, and the professional working field, have given the panel several reasons for this choice. Reasons include students future (international) careers, the necessity for the innovative 'top sectors' in the Dutch economy to attract international students, and the different backgrounds of staff members. Future career perspective reasons have been taken into account specifically, because approximately half of all graduates will continue with the master's programme Human-Technology Interaction (HTI), which is also in English. Additionally, many of the graduates will eventually be working in, or with, international teams, in companies where the working language will be English. The second reason reflects the ambition of the top sectors to attract international students and to make sure they will remain in the Netherlands after completing the programme. The third reason is based on the fact that approximately one third of all lecturers teach in English, due to their international background.

Staff

The IE&IS department selects lecturers based on their expert knowledge and extensive teaching experience. The proposed lecturers of the Psychology & Technology programme are mostly affiliated with the HTI group within the School of IS and combine psychology with technology in their research. In line with TU/e requirements, the faculty members of the programme who are involved in teaching have to hold a PhD, are active researchers in their field, and have a University Teaching Qualification (UTQ¹) or will obtain a UTQ certificate within three years after being appointed. During the site visit, the panel discovered that approximately 85% of the programme's lecturers have a UTQ. The other 15% of the lecturers are in the process of obtaining this certificate. Through the TU/e's extensive course programme TEACH, courses are available for lecturers who do not have the UTQ certificate (yet), or who would like to improve their skills. During these courses, lecturers will acquire essential academic and teaching skills. Lecturers may be required by Education Management to attend one or more TEACH courses, for example after poor course evaluation results.

The workload at the faculty consist of approximately 50% teaching and 50% research (including potential management tasks). The panel wondered whether lecturers could manage the workload, due to the fact that the BC demands to incorporate more assignments, mid-term tests, coaching and elective packages into the bachelor programmes, while the number of students are growing. This implies that lecturers are expected to be researchers, educators, coaches as well as assessors. Lecturers indicate that appropriate measures have been taken to address the increase of the educational side of the workload, such as employment of new faculty staff members and by generating innovations in education, for instance blended modules that combine online education with traditional classroom methods.

The programme is also actively aiming to increase the number of female faculty staff members. The goal for the programme is to have at least 30% female lecturers.

Study support

The programme offers different ways of support to promote successful studying, including an introductory kick-off meeting at the beginning of the programme, student advisors, teacher coaches and student mentors. The kick-off meetings are organised by student advisors and Education Management, and is held on the first day of the academic year. Students will attend one kick-off meeting to become acquainted with the set-up of the programme and its potential pitfalls, deadlines, and regulations.

The course advisors provide information regarding the programme, regulations and study facilities. They are the main point of contact for students regarding programme-related or personal matters. Student advisors also monitor students' progress and issue the (pre-)binding study advice, on behalf of the Examinations Committee, at the end of the first year. If concerns arise whether or not the programme is right for a specific student within the first semester, student advisors will help students to seek a more appropriate programme, either within or outside the TU/e. The student advisor with whom the panel spoke, informed the panel that between 25 to 30 percent of the students struggle with the programme and receive a negative binding study advice. The BC structure allow students to easily switch between bachelor programmes, since basic and USE courses will remain the same in any bachelor programme, and successfully completed major courses of the initial programme can be used as electives in the new major. According to the student advisor, not many students switch from Psychology & Technology to other TU/e majors. However, switching to the Psychology & Technology programme happens more and more frequently with currently approximately 25 of 125 students who have switched to Psychology & Technology.

Teacher coaches are members of the scientific staff who inform students during information meeting about course packages, electives, and elective packages. Students will get a teacher coach assigned to them at the beginning of the programme and can contact their teacher coach about electives during

¹ In Dutch: Basiskwalificatie Onderwijs (BKO)

course of the entire programme. Student mentors are senior students who offer new students peer-to-peer coaching throughout their first year. During mentor group meetings, consisting of ten to twelve students, mentors assist students with practical matters. In particular with supporting students making decisions regarding their specialisation and electives. Additionally, student mentors provide social support and help students get familiarised with the student community. Student mentors are appointed by their department and are trained by the BC before starting as a mentor. The training provides student mentors with the necessary skills to effectively and appropriately provide guidance to new students.

During the site visit, the panel questioned the study success rate of the programme, since only 22% of the students graduated within the set duration of three years. Programme management, lecturers, students and alumni all clarified that students increasingly chose to extend their studies by undertaking additional activities such as participating in committees or student/study association boards. Another reason according to the interviewees is the relatively large number of switching students from one programme to another. As each course only starts once a year, students have an increased chance to experience study delays.

The panel also learned that Intermate, the study association for students from the School of IS, plays an active role in providing a place of leisure, broadening students' (career) horizons, and enhancing the quality of education. An example of the latter is study association members who commit themselves to becoming 'college followers', who observe lectures and question students about their opinion on the course. The college follower will approach lecturers if they see reason to do so.

Quality assurance

The programme management emphasised that the programme has a sound quality control system that monitors course results and student evaluations. In order to promote and monitor quality, courses are evaluated using online surveys. The programme is also evaluated at set times throughout the year and in different formations, with students, lecturers, the programme chair, the director of education, the Examinations Committee, and the Programme Committee. Findings are shared with stakeholders, and, if necessary, procedures for improvement are put in place, such as adjusting course material, adjusting the difficulty of exercises, rescheduling deadlines, adjusting tutors' instruction and organising feedback sessions.

Considerations

The panel is of the opinion that the curriculum is well structured, as it covers all of the intended learning outcomes and addresses the programme-relevant subjects. The programme provides a strong psychological profile of Human-Computer Interaction within the three pillars: psychology, research methods and engineering, thereby offering students to either deepen or broaden their (inter)disciplinary knowledge and understanding. Although research methods and techniques are taught adequately, the panel recommends strengthening and extending the programme's research methodology to meet the objectives of a research focused bachelor programme.

The three specialisations, ICT, Living, and Robotics, provide a proper solution to the societal need for T-shaped researchers in these particular fields. Furthermore, the panel noticed a good connection between research topics and BEP projects. The options to switch to other fields, indicates a sufficient foundation for a wide range of follow-up masters.

During discussions with staff members, the panel spoke with motivated and engaging lecturers. All of the lecturers are experienced lecturers who have a PhD and are active researchers with a multidisciplinary focus. The panel was particularly pleased to hear that the programme strives to balance workload between education and research tasks. This balance ensures that the latest research results can be used within the programme. The panel is also convinced that the workload of lecturers is manageable, due to hiring extra faculty staff and the educational actions that have been taken by the programme management.

The proportion of 85% of the lecturers having obtained their UTQ and another 15% of the lecturers being in the process of acquiring this certificate is satisfactory. The panel is also positive about the monitoring of the male/female ratio, with a minimum goal of reaching 30% female lecturers. The panel did note that most faculty staff are Dutch. In order to offer an international programme, the panel advises to aim for a more diverse international staff. Students are very positive about the interaction between students and staff, which is also reflected in students' willingness to evaluate and providing feedback to lecturers.

The working language of the programme is English. Reasons include students' future (international) careers, the necessity for the innovative 'top sectors' in the Dutch economy to attract international students, and the different backgrounds of staff members. The panel is convinced follows the programme's choice to adopt English as the working language of the programme, to match the working language in subsequent master programmes and the professional work field.

The panel has examined the study guides and comes to the conclusion that the course documents are clear and transparent. The teaching concept and the course methods are suitable. Learning concepts and formats are sound and there is a good combination between a wide range of different types of working methods.

A point of concern for the panel was the study success of the programme. Approximately 75% of the students need more than three years to graduate for their bachelor's programme. The panel investigated whether this was caused by a overloaded or not well organized programma. Based on the interviews with programme management, lecturers, students and alumni, the panel finally came to the conclusion that this is not the case. The delay in general is explained by extracurricular activities, additional courses followed and students who switch to the Psychology & Technology programme from other programmes. Moreover, the panel is positive about the guidance students are provided with throughout the programme. The student advisors and student mentors are approachable and deliver effective support to students. Advancing integration into the student community as well as choosing a proper study path.

In conclusion, the panel finds that the curriculum, lecturers and programme-specific services and facilities enable first-year students to achieve the intended learning outcomes. The panel, therefore, considers standard 2 to be met.

Conclusion

The programme meets standard 2

4.3 Standard 3: Assessment

The programme has an adequate system of student assessment in place.

Outline of findings

The Psychology & Technology bachelor's programme falls under the School of Innovation Sciences. The school manages the rules, regulations and procedures regarding assessments of each accredited bachelor's and master's programme which are outlined in the Examination Policy of the School of Innovation Sciences. The examination policy of the school corresponds with the Examination Framework of Eindhoven University of Technology. Prior to and during the site visit, the panel examined several documents, such as study guides, course rubrics and the Teaching and Examination Regulations (OER).

Each programme (group) should, in accordance with the Dutch Higher Education and Research Act, have an Examinations Committee. At TU/e, the School of IS has one Examinations Committee and one Assessment Committee acting as an umbrella that cover both the bachelor's as well as the master's programmes of the School of IS. The Examinations Committee is responsible for the quality assurance of

teaching and assessment, and aims to ensure that examinations are valid, reliable and transparent. The responsibilities of the board also include appointing examiners and monitor their performance. The Examinations Committee is supported by the Assessment Committee. The Assessment Committee examines course evaluations and determines whether assessments are in line with the intended learning outcomes of the programme. The Assessment Committee will provide lecturers with feedback and recommendations for improvements when course evaluations give reasons for such actions.

In line with TU/e's policy, the bachelor's programme has an examination plan, including an overview of the individual courses, the type(s) of assessment per course, and the various learning outcomes of the programme. The examination plan is constructed by linking the learning goals of a course with rubrics that reflect student performance for each learning outcome. Courses usually have various assessments throughout the quartile which often includes, multiple-choice exams. These are complemented by a variety of different assignments and other types of examinations that together lead to the final grade of a course. The programme assessors are responsible for the validity, reliability and transparency of examinations. To ensure validity, lecturers use test matrixes, to check the exam items with the course learning outcomes. Moreover, lecturers apply the four-eyes principle and review each other's exams. To foster reliability, lecturers use rubrics for the assessments of examinations.

In accordance with the Dutch Higher Education and Research Act, the Bachelor of Psychology & Technology programme will also have a Programme Committee. This committee monitors and maintains the quality of the bachelor programme by analysing, assessing and providing feedback on educational matters related to the bachelor programme, including the OER.

Bachelor's End Project

The BEP consists of academic research in the Psychology & Technology domain. The study guide Final Project Bachelor Psychology & Technology, was reviewed by the Examination Committee and has clear and strict guidelines for graduation, including learning outcomes, learning goals, assessment criteria and the procedures to graduate. The student must formulate clear research questions, have a transparent and relevant research methodology, collect data and conduct an analysis. Students may collect the necessary data in with a group of students, although they will have to be working individually to formulate their research question and write their thesis. The programme has formulated the thesis learning outcomes, which are in line with the intended learning outcomes. The thesis is supervised and assessed according to the intended learning outcomes by means of an assessment form. The Examinations Committee stated that they have asked lecturers to specify the rubrics to a rubric of the learning outcomes which helps lecturers mark in a consistent way, and enable them to provide constructive feedback to students. The rubric will have clearly defined criteria, level descriptors and marking guidelines to support the transparent and explicit use of criteria, generate clear grades and provide extra clarification to students about their performance. At the time of the site visit, the first draft of the specified rubrics was under review from the lecturers, after which the document is submitted to the Examination Committee.

Performance of students is evaluated by the TU/e supervisor and a second assessor who will determine a final grade together. If the student carries out his research in an organisation or business, the external party that supervises the performance of the student, will be asked to advise the TU/e assessors on whether the final project results are a sufficient description of the formulated problem and if the diagnosis provides a good starting point to find a solution to that problem. TU/e assessors determine the final grade during the final assessment meeting and provide feedback to the student.

Considerations

The panel concludes that the programme Psychology & Technology has suitable procedures in place. The quality assurance of the examination process is well-thought-out. Exams and assessments are well structured and adequately monitored. The Examination Committee is very involved and pro-active in the bachelor programme, which the panel appreciates. The type of assessment is in line with the

learning objectives of the programme and the rubrics are clear. The programme is regularly evaluated in different ways.

The panel noted however that there are certain aspects that could be improved, such as clear calibration of qualitative grading (good – poor) into generated grades. The panel values that, at the time of the site visit, lecturers were working on a rubric to replace the old assessment form of the BEP by a rubric of the learning outcomes. This is one of the improvements suggested by the recent Assessment of the programma Innovation Sciences.

Another element that requires improvement is the fact that lecturers didn't seem to be aware of the existence of the Assessment Committee. The programme management explained that this committee only intervenes in case of poor results on course evaluations. Although the panel understands the explanation of the programme management, the panel recommends raising awareness amongst lecturers regarding the existence of the committee. Lastly, interviewed students mentioned that the marking of exams and assignments could be done faster. Following the comments of the students, the panel advises to grade exams faster.

The examination methods are in line with the course contents to be assessed. The courses are assessed by different ways of examination, although multiple-choice exams dominate. In the opinion of the panel, the programme's choice to assess students with mostly multiple-choice exams is acceptable as long as the programme maintains a focus on adequately covering the course materials.

The panel noted the programme's procedure to assess the BEP by two examiners, using forms with relevant criteria and rubrics to calibrate grades, leading to reliable assessments. Consequently, the panel regards the processes of supervision and assessment for the BEP to be adequate.

Conclusion

The programme meets standard 3.

4.4 Standard 4: Achieved learning outcomes

The programme demonstrates that the intended learning outcomes are achieved.

Outline of findings

Students demonstrate the achievement of their competences on a bachelor's level by conducting their Bachelor's End Project (10 EC). To judge whether students achieve the intended learning outcomes by the end of the programme, the panel studied the graduation guide, spoke to students and alumni and reviewed a selection of 15 theses from the major Psychology & Technology. The selection covered the three pillars in comparable numbers and included a balanced range of final marks. The panel determined from this that the Bachelor End Projects display a clear emphasis on analytic skills.

Almost all students start a master's programme after they complete the bachelor's programme. Approximately half of the number of students continue their education in Human Technology Interaction. A quarter of students start an engineering master's programme at Eindhoven University of Technology, such as Electrical Engineering, Innovation Science or Data Technology and Entrepreneurship. The remaining percentage of the students choose a different master's programme at TU/e or other universities. Some students choose to start working after graduating their bachelor's programme.

Considerations

The panel has reviewed assessments, assignments, reports, and BEPs, and is positive about the use of rubrics and the attention to make criteria transparent to students. The BEPs display a clear emphasis on analysing skills, and students more than sufficiently demonstrate mastering the intended learning outcomes in their thesis. Based on the good quality of the theses and the performance of Psychology &

Technology graduates in subsequent studies such as HTI masters as well as non-HTI masters like Data Sciences, and their performance in the job market, the panel comes to the conclusion that the intended learning outcomes are achieved.

The panel does note however that the emphasis within the programme lies mainly on psychology and application-oriented research. According to the panel, the programme could strengthen its outline if the engineering and/or engineering applications would be given more prominence than they are giving now. The panel also suggests the programme management to consider adapting the programme's ICT domain into Artificial Intelligence or Data Science, which would be more in line with social and technological developments.

The considerations have led the assessment panel to conclude that the achieved learning outcomes meet standard 4.

Conclusion

The programme meets standard 4.

4.5 Qualification and field of study (CROHO)

The panel advises to award the degree 'Bachelor of Science' to the wo-bachelor Psychology and Technology. The panel supports the programme's preference for the CROHO field of study 'Technology'.

4.6 Conclusion

The panel concludes that the programme meets all four standards and comes to the conclusion that the quality of the programme is sufficient. The new bachelor's programme has a relatively unique profile with a well-developed, structured and coherent curriculum. The programme's management and its enthusiastic, professional and skilled team of lecturers and supporting staff suitably prepares students for a master in Human-Technology Interaction, or in the fields of psychology, or engineering. The intended learning outcomes cover the bachelor's level and the curriculum ensures that students acquire the fundamentals of psychology, research methods, and engineering. The programme has a solid system of student assessment in place, including a sound quality control system.

Based on the findings, the panel formulated the following recommendations:

- Find a better fit for a frame of reference by looking into multidisciplinary programmes, as well as frames of reference where multidisciplinarity is at its core;
- Improve the international positioning of the programme by pursuing a more vigorous international profile;
- Strengthening the programme's research methodology to meet the objectives of a research focused bachelor programme;
- Aim for a more diverse international staff;
- Raise awareness amongst lecturers regarding the existence of the Assessment Committee;
- Grade exams faster;
- Include calibration of qualitative grading (good – poor) to numeric grading into the rubric to replace the old assessment form of the BEP by a rubric of the learning outcomes.

5 Overview of the assessments

Standard	Assessment
Intended Learning outcomes <i>Standard 1: The intended learning outcomes tie in with the level and orientation of the programme; they are geared to the expectations of the professional field, the discipline, and international requirements</i>	Meets the standard (weighted and substantiated).
Teaching-learning environment <i>Standard 2: The curriculum, the teaching-learning environment and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.</i>	Meets the standard (weighted and substantiated).
Student assessment <i>Standard 3: The programme has an adequate system of student assessment in place.</i>	Meets the standard (weighted and substantiated).
Achieved learning outcomes <i>Standard 4: The programme demonstrates that the intended learning outcomes are achieved.</i>	Meets the standard (weighted and substantiated).
Conclusion	Positive (weighted and substantiated)

Appendix 1: Composition of the panel

Chair

- Prof. dr. ir. Dirk Heylen, (*voorzitter*), professor Socially Intelligent Computing at Twente University

Panel members

- Dr. ir. Maka De Lameillieure, director Research and Valorization, Antwerp Management School;
- Prof. dr. Eric Postma, professor in Artificial Intelligence at Tilburg University

Student member

- Wietske Rem, (*student-lid*) student BSc Mechanical Engineering, Twente University

On behalf of the NVAO, Frank Wamelink and Yvet Blom MSc, were responsible for the process-coordination and the drafting of the experts' report.

Appendix 2: Schedule of the site visit

The panel visited Eindhoven University of Technology on 23 October 2019 as part of the external assessment procedure regarding the wo-bachelor Psychology & Technology.

09:00 – 09:30	Arrival of panel
09:30 – 10:00	Dean and Educational Director
10:00 – 10:45	Representatives of the Examinations Committee
10:45 – 11:00	Deliberations by panel
11:00 – 11:45	Educational management
11:45 – 12:45	Lunch break and deliberations by panel
12:45 – 13:15	Tour of the facilities
13:15 – 14:00	Lecturers
14:00 – 14:15	Deliberations by panel
14:15 – 15:00	Students
15:00 – 15:45	Professional working field
15:45 – 17:00	Deliberations by panel
17:00 – 17.15	Presentation of initial findings

Appendix 3: Documents reviewed

Programme documents presented by the institution

- Initial Accreditation Assessment BSc Psychology & Technology 2019
- Appendices to the information dossier:
 - o Intended learning outcomes
 - o Domain Specific frame of reference Innovation Sciences
 - o Curriculum overviews
 - o Learning outcomes versus courses
 - o Recommendations of 2017 panel
 - o List of scientific staff teaching in BSc PT 2019
 - o Examples of assessment
 - o OER BSc PT
- In addition, the panel was given access to extensive digital information about the programme

Appendix 4: List of abbreviations

ACQA	Academic Competencies and Quality Assurance
BC	Bachelor College
BEP	Bachelor End Project, BSc thesis
UTQ	University Teaching Qualification (Basis Kwalificatie Onderwijs)
BSA	Binding recommendation for the continuation of studies (Bindend Studie Advies)
BSc	Bachelor of Science
DBL	Design-Based Learning
DSFR	Domain-Specific Frame of Reference
EC	European credit point
hbo	professional higher education (hoger beroepsonderwijs)
HTI	Human-Technology Interaction
IE&IS	Industrial Engineering and Innovation Sciences
IS	Innovation Sciences
MSc	Master of Science
NVAO	Accreditation Organisation of the Netherlands and Flanders
OER	Teaching and Examination Regulations (Opleidings- en Examen reglement)
PhD	Doctor of Philosophy
PT	Bachelor of Psychology & Technology
TEACH	Teaching programme for TU/e staff
TU/e	Eindhoven University of Technology
USE	User, Society, and Enterprise
Vwo	pre-university education (voortgezet wetenschappelijk onderwijs)
wo	Academic orientation (wetenschappelijk onderwijs)

**The panel report was ordered by NVAO for the initial accreditation of the
programme wo-bachelor Psychology & Technology of Eindhoven University
of Technology**

Application no.: 008661



**Nederlands-Vlaamse Accreditatieorganisatie
Accreditation Organisation of the Netherlands and Flanders**

Parkstraat 28 • 2514 JK Den Haag
P.O. Box 85498 • 2508 CD The Hague
The Netherlands

T +31 (0)70 312 23 00
E info@nvaonet
www.nvaonet