NVAO • THE NETHERLANDS

ASSESSMENT CONDITIONS

HBO-BACHELOR

APPLIED DATA SCIENCE & ARTIFICIAL INTELLIGENCE

Breda University of Applied Sciences

REPORT

17 May 2022

1 NVAO Procedure

NVAO takes a decision on the accreditation of a programme on the basis of a panel report. If the accreditation decision is conditionally positive NVAO sets a time limit of maximum two years for the programme to meet the conditions.

At the request of the institution of higher education a panel of independent experts will assess whether the conditions are met. The institution sends the advisory report to NVAO before the end of the term. The assessment should make clear that the programme meets the NVAO quality criteria.

The NVAO decision and the panel report are published on the agency's website.[1] There you can also find more information on NVAO and the assessment of conditions.

2 Panel

Peer experts

1. Prof. Dr. Rob Koper (*chair*); University professor at the Open University, focusing on educational innovation educational sciences, ICT in education and data science;
2. Fiona Schrage MSc; Program manager Bachelor Creative Media & Game Technology. Project leader (TNO) Associate Degree Mechatronics in the Smart Industry and teacher of Professional Skills Engineering;
3. Drs. Frans van den Akker; Business developer at Industry BL Digital RHDHV. Program manager Digitalization TKI E&I, TKi Nieuw Gas and Liason officer NL AI Coalition. Member at research & innovation NI AI coalition;
4. Kevin Voorn (*student)*; Studied at the HBO-ICT course of the Hanzehogeschool Groningen. He has experience in both central and decentralized employee participation.

Assisting staff

Yvet Blom, secretary;

Lotte Ninaber van Eijben, NVAO policy advisor and process coordinator.

Panel meeting (online)

29 April 2022

3 Programme

3.1 General Data

Institution	:	Breda University of Applied Sciences
Programme	:	HBO-Bachelor Applied Data Science & Artificial Intelligence
Mode of study	:	full time
Degree	:	Bachelor of Science
Location	:	Breda
Study load	:	240 ECTS[2]
Field of study	:	Technology (Techniek)

3.2 NVAO Conditional Accreditation Decision

Report	conditionally positive
Decision	14 April 2022
Term	1 June 2022

[1] https://www.nvao.net/nl/besluiten

[2] European Credits

4 Assessment of Conditions

4.1 Condition 1

Expand the research methods and approaches used during the programme to cover problem-solving as well as being able to transfer knowledge to contexts outside of the programme.

Judgement
The condition is met.

Findings, analysis and considerations
BUas submitted information (titled Research) regarding the research component of the hbo-bachelor Applied Data Science & Artificial Intelligence (ADS&AI) to justify the way research has been set up within the programme. After reviewing the information, the panel concludes that BUas sufficiently described the focus on teaching both problem-solving skills and skills to transfer knowledge to contexts outside of the programme.

During year 1 of the ADS&AI bachelor, students will develop research skills and learn the fundamentals of Data Science research methodologies with the CRISP-DM cycle[3]. The CRISP -DM cycle is a series of steps that data professionals use to create projects and products. Each project focuses on one or more CRISP -DM cycle steps. The information BUas submitted, describes the different Data Science research methodologies taught in the first year of the programme. Topics include variables, probability, data analysis, modelling. Students further develop research skills such as critical thinking, reviewing literature and academic writing. Year 2 of the programme outlines the systematic approach to research and includes conducting desk research and quantitative and qualitative research. Students learn how to formulate research questions, how to systematically review literature, assess the reliability and validity of research results, and write research papers.

The panel is positive about the effort BUas puts in to developing students' (methodological) research skills. By learning about the Data Science research methodology CRISP-DM, students will be able to solve data-related problems by focusing on identifying data sources to solve particular problems, proposing automated analysis processes, testing and validating analysis processes and sharing the results. Research methodologies in the technical sciences are aiming at finding new technological solutions for classes of problems by creating or using technology independent, transferrable knowledge, captured in models. With concrete prototypical implementations, students can evaluate to what extent the model and its implementation, is effective. The panel recommends introducing methodological research in year 1, instead of year 2. Introducing methodological research early on in the bachelor will help students to understand the differences between Data Science research and methodological research in the technical sciences.

4.2 Condition 2

Offer a learning environment where students don't have to primarily rely on self-study to acquire the necessary knowledge and skills. The main responsibility should lie with BUas, not with the students.

Judgement
The condition is met.

Findings, analysis and considerations
The panel extensively reviewed the document 'Didactic approach' that BUas provided and it is clear to the panel how students will acquire the required knowledge and skills needed to become successful data professionals.

[3] The CRISP-DM cycle has the following phases: Business Understanding, Data Understanding, Data Preparation, Modeling, Evaluation, and Deployment.

Students spend three days a week on self-study (non-contact hours) and two days in DataLabs[4] (contact hours). This split is based on the flipping-the-classroom principle and the Competence Based Learning model (CBL). The flipping-the-classroom principle entails that students watch online instruction videos and study online materials outside contact hours. The online materials will help students gain theoretical knowledge they have to put into practice during the DataLabs. Self study is useful for gaining so-called lower order thinking skills. Lower order thinking skills are remember, understand and apply. These skills will help students retain the information during the contact hours (DataLabs) better and give them the opportunity to apply them. Contact hours are specifically useful to develop higher order thinking skills. Higher order thinking skills are analyse, evaluate and create. The DataLabs are designed to turn lower order thinking skills into higher order thinking skills through feedback from fellow students and lecturers.

The other method responsible for the split of three days self-study and two days DataLabs is the Competence Based Learning Model (CBL). The use of this model is recommended by the EDISON Framework on which the ADS&AI profile is based. CBL is a model that has been designed to master given competencies. Only when a student has mastered a given competency, can they move on to the next competency. CBL allows students to learn in their own pace, practicing necessary skills as much as they need to achieve the necessary mastery level. CBL works with both individual self-study and lecturer supervised contact hours. Self-study days end with an online Q&A session with a lecturer.

The first block of year 1 (10 weeks) is used to familiarise students with flipping-the-classroom and the CBL-model. Students learn how to use rubrics, GitHub[5], the continuous feedback loop, and bi-weeklies[6]. BUas has also added introduction classes to the first year which are held prior to so called 'knowledge units'[7]. During introduction classes, the importance of a topic in the context of that block's project is clarified and students are told what is expected of them to complete a project.

DataLab-days start off with a stand-up session, supervised by mentors. In groups of 15, students discuss the project, the project plans for the coming days, and the things they learned and problems they encountered during self-study days. After the stand-up session, students are divided into three groups: students who didn't properly prepare for the class, students who did prepare, but need some extra help with the theory they read during the self-study days, and students who prepared the class and don't require extra help. Students in the first group get the opportunity to catch up on their GitHub material and will have to continue working on the project at home. The second group gets help from an industry expert and the third group works on their project. BUas hopes that with the introduction classes, where students get acquainted with the overall educational system and the stand-up sessions during DataLab-day, that students will be able to use the theory during the DataLabs and ask for help when they need it.

The panel is positive about the progressive setup of the ADS&AI, where students gain a fair amount of knowledge with low contact hours. Using GitHub is a good choice because it allows students to gain experience with a tool they will also likely use during their careers. The panel is also pleased with the way the stand-up sessions are designed. The fact students are divided into groups at the start of the day based on their preparation and understanding of the theory is a good way to encourage students to stay on track. The stand-up sessions also enable BUas to keep a close eye on the progress of students. Nevertheless, the panel asks BUas to be aware of the different backgrounds of students at the start of the programme (mbo-4, havo and vwo). The panel expects that mbo-4 students in particular will have difficulty understanding the theory on their own. The panel therefore recommends BUas to inform students accordingly during ADS&AI information days and the intake procedure. It is

[4] In the DataLabs students work on projects consisting of real-life data related cases.
[5] Github is an online software development platform that students will be using during both self-study days and contact hours.
[6] Bi-weeklies focus on 30-minute formative feedback sessions between the mentor and the student.
[7] A knowledge unit is a thematic group about a given subject of multiple, related topics. For example, Responsible and Explainable AI: Bias and Fairness. Related topics are Deep learning: Introduction to Neural Networks, Deep Learning: Tensor Flow, Responsible and Explainable AI: Explainable AI methods, Human Centered AI: Interaction and information processing fundamentals.

important that BUas pays attention to students that struggle with a lot of self-study hours and offer them extra guidance to be able to keep up with the rest of the students.

4.3 Condition 3

Provide a realistic contingency plan that deals with the situation in which BUas is not able to recruit enough teaching staff before the start of the programme.

Judgement
The condition is met.

Findings, analysis and considerations
The panel has reviewed the 'Emergency plan staff' document provided and notes that BUas hired 3 extra lecturers. BUas has also drafted a proposal in case a shortage of lecturers arises. BUas started recruiting lecturers internationally in February 2022, via LinkedIn. BUas wanted to appoint an Artificial Intelligence lecturer, a Machine Learning lecturer, and a Digital Transformation lecturer. The recruiting resulted in 27 applicants of which BUas invited 15 for an interview. BUas achieved their goal of filling all 3 vacancies. With the appointment of 3 extra lecturers, the team consists of wide range experts who cover the programme's core topics. The panel believes that with these extra 3 lecturers, BUas has enough lecturers to start the programme. BUas has also provided the panel with a number of emergency actions in the event lecturers leave, such as approaching the applicants BUas invited for an interview but did not hire at the time, requesting part-time lecturers to (temporarily) work full-time, have another recruitment campaign via LinkedIn (specifically targeting international lecturer), using hybrid lecturers, and ask lecturers/researchers within the organisation the help out (temporarily).

The panel is positively surprised by BUas' successful recruitment campaign on LinkedIn and is pleased with the results. The options BUas presented in case shortages do unexpectedly arise are also seen by the panel as positive. However, new lecturers require training and that takes time. Specifically lecturers from abroad. They will most likely not be familiar with the didactic concept of the ADS&AI. BUas has to be aware of the time it might require for new lecturers to get familiarised with this type of education. The panel therefore advises to also consider other solutions to limit the risk of shortages.

4.4 Final judgement

The panel concludes that the programme meets the conditions. The programme has properly addressed the shortcomings which were identified in the previous peer review. Therefore, the panel reaches a positive conclusion regarding the quality of the programme.

This report is the outcome of the assessment of the NVAO conditions imposed on the new programme Applied Data Science & Artificial Intelligence of Breda University of Applied Sciences

NVAO

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