

The HVET/ VET centre 4.0 as the key element for providing the requested Advanced Manufacturing skills: Capabilities for matching Advanced Manufacturing sectoral demands

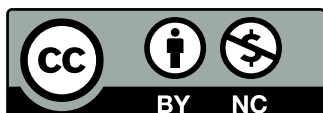
Advanced manufacturing 4.0 LABs

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Abbreviations

AM	Advanced Manufacturing
CAD	Computer-Aided Design
CAM	Computer Aided Manufacturing
EXAM 4.0	Excellent Advanced Manufacturing 4.0
HVET	Higher Vocational Education and Training
VET	Vocational Education and Training
VR	Virtual Reality

Industry 4.0 sets new demands on workers, new technologies require innovative solutions, thus innovative workers who can adapt to the required adjustments and provide value to the Industrial sector. The new demands on workers do in turn generate new requirements for education. Institutions have a major impact on education, with a great responsibility to ensure that the right educational approach is used. Institutions need to go through lifelong improvement, constantly be reviewed and revised to match provided education with the evolving industry. A model for describing institutions in a humble and time-efficient way has been developed to make it possible to compare and discuss institutional approaches.

The first step in the process of analysing VET/HVET-centres, in aspects of both organisational structure and education, is to create a model to describe VET/HVET centres institutions. Important aspects of centres institutions that should be described were researched. The EXAM 4.0 consortium found the ETF-questionnaire as a good foundation for describing institutions. The European Training Foundation, ETF, is an agency of the European Union and interacts with non-European countries with the goal to improve their vocational training systems. The ETF-questionnaire is a Self-Assessment Framework developed by ETF's Network for Excellence, ENE. A fulfilled Self-Assessment Framework questionnaire provides relevant information regarding the VET/HVET centre in question. The information provided by the answers enables the VET/HVET centre to analyse and evaluate its stage of development. It allows the VET/HVET centre to detect shortcomings in the institutional model, information that is useful for further development of the VET/HVET centre's institutional model.

The ETF-questionnaire was on this account harmonized and used as a base to create the model for describing institutions. The model plays a key role in a larger picture and will be used on the upcoming EXAM 4.0 platform to evaluate the status of European VET/HVET centres. The five VET/HVET-centres and consortium partners Curt Nicolin Gymnasiet, Tknika, Miguel Altuna LHII, Da Vinci College and Baden-Württemberg Cooperative State University have tested the model and they will be the first centres in the process of evaluating, developing, and creating excellence amongst European VET/HVET-centres.

MODEL FOR A DESCRIPTION OF VET/HVET CENTRES

The model is based on the ETF-questionnaire, produced to give the reader information regarding a VET/HVET centre's institutional model. Internal and external partners can use this model to describe their institutional model efficiently to easily demonstrate their institution. The ETF-questionnaire is a well-developed questionnaire adapted to handle different aspects of institutions. The EXAM 4.0 model for the description of institutions consists of tables providing similar questions, the tables are however a better tool for displaying the answers.

KEY FACTORS IN AN INSTITUTIONAL MODEL

Almost all parts of an institution affect the student. The parts with a direct or indirect effect on the student are key factors of an institutional model. The institutions' provided education is affected by these key factors, we have searched and categorized the following key factors:

Education-business collaboration and cooperation

Cooperation between VET/HVET-centres and industry is essential to provide the industry with a workforce, skilled employees. The questions in this section display the status of collaboration between the institution and the industry. Collaboration between education providers and businesses results in learners who are further prepared for real-life tasks by completing real case education presented by the industry. Industrial companies often supply higher knowledge of the industry in the form of internships etc. It is also important for VET/HVET-centres to cooperate with other centres and specialist organisations to coordinate education and obtain new ideas and perspectives.

Pedagogy and professional development

The second section is regarding the pedagogy and professional development of the teachers in the VET/HVET-centres. The teachers are a keystone in creating VET/HVET-excellence and these gathered questions could be used as a reference for centres to validate their institution. Educational factors such as learning content and equipment are very important, but they are not effective if the centre does not provide the learners with excellent teachers.

Autonomy, institutional improvement, and resources

The questions gathered in this section are more general regarding the institution, e.g., board and structure of the organisation.

Lifelong learning in VET

Lifelong learning plays a key role in Industry 4.0, both for individual learning but also for organisations. Lifelong learning does therefore have a key role for EXAM 4.0 and the VET/HVET-centres, in the consortium as well for future partners of the platform. The questions gathered in this section are focused on learning for adults, for the institution to be able to provide all workers with lifelong learning, making the learners up to date with the needs of today's industries.

Smart specialisation, mobilising innovation, ecosystems, and SMEs

Institutions need to get other perspectives on education, innovation, smart specialisations, and external organisations. These questions are gathered to see the collaboration between the VET/HVET-centre and other organisations regarding the aspects.

Industry 4.0 and digitalisation

This section has questions gathered concerning Industry 4.0 and digitalisation. These are important aspects to include when describing an EXAM 4.0 partners centres' institutions. VET/HVET-centres will provide the industries with a workforce, it is therefore important that the education is up to date concerning Industry and digitalisation.

Going green and supporting sustainable goals

Environmental questions are one of the most important subjects today. Going green aspects and the ability to support sustainable goals are therefore vital parts of an institution.

DESCRIPTION OF INTERNAL PARTNERS INSTITUTIONS

The internal consortium partners have described their institutions with the EXAM 4.0 created model for the description of a VET/HVET centre's institution.

The consortium partners have used this model to ensure that, in the description, they cover all important aspects of a VET/HVET centre's institution. The consortium partners thereafter described their VET/HVET centre's institution in detail, covering all important aspects included in the EXAM 4.0 created model.

1	Education-business collaboration and cooperation					
		TKNIKA	Curt Nicolin	Miguel Altuna	Da Vinci	DHBW
1.1	Learning in the real workplace (for example, an internship at enterprises)	Yes	Yes	Yes	Yes	Yes
1.2	Are representative employers involved in school governance?	No	Yes	No	To some degree	Yes
1.3	Are employers consulted by the VET/HVET centre concerning curriculums?	Yes	To some degree	Yes	To some degree	Yes
1.4	Is a higher management person coordinating the school-industry cooperation?	Yes	Yes	Yes	To some degree	Yes
1.5	The VET/HVET centre has signed long-term contracts with at least two enterprises to provide, for instance, internship	Yes	Yes	Yes	Yes	Yes
1.6	Work placements for all learners are equivalent to at least 10% of curriculum time	Yes	To some degree	Yes	Yes	Yes
1.7	At least one teacher benefits from a minimum of 5 training days in an enterprise every year	No	To some degree	Yes	To some degree	Yes
1.8	VET/HVET systematically develop training programmes adapted to requirements of initial and continuing vocational training	Yes	To some degree	Yes	To some degree	To some degree
1.9	Enterprises regularly contribute to assessment processes for students, for example, participate in assessment juries	Yes	Yes	Yes	Yes	Yes
1.10	Do studies show that at least 30% of graduates continue in sectors related to their programme?	Yes	To some degree	Yes	Yes	To some degree
1.11	Do enterprises contribute with funding/equipment, worth at least € 5000, over the last two years?	Yes	Yes	Yes	Yes	To some degree
1.12	Does the VET/HVET centre form partnership with specialist organisations at a national and regional level?	Yes	Yes	Yes	No	Yes
1.13	The VET/HVET centre cooperates with other VET/HVET centres to coordinate placements or other work-based learning for adult learners	Yes	To some degree	To some degree	No	To some degree
1.14	The VET/HVET centre cooperates with other VET/HVET centres to coordinate placements for teachers in an industrial workplace	Yes	To some degree	Yes	No	To some degree

The main focus amongst the five partners is real case education at companies, all partners' centres have internships at companies and have all signed a long-term contract with at least two companies for this objective. All partners do also have enterprises that contribute to assessment processes for students and 80% have internships at least 10% of their curriculum time. This shows that the partners' centres have a strong connection and cooperation with companies, which is important in industrial education.

Fewer partners did however have representative employees involved in the school governance and few partners had at least one teacher with 5 or more training days in enterprises each year. Most of the partners do not or do only to some degree cooperate with other VET/HVET centres to coordinate education for adult learners.

2	Pedagogy and professional development					
		TKNIKA	Curt Nicolin	Miguel Altuna	Da Vinci	DHBW
2.1	Does the VET/HVET centre have a person in charge of professional development?	Yes	Yes	Yes	Yes	Yes
2.2	Does the VET/HVET centre provide mentoring for all new teachers?	Yes	Yes	Yes	Yes	Yes
2.3	75% or more of the teachers attended at least one in-service training event in the last 12 months	Yes	To some degree	To some degree	To some degree	Yes
2.4	Teachers regularly create learning tasks that resemble real, up-to-date asks in the world	Yes	Yes	Yes	Yes	To some degree
2.5	All trainers have appropriate knowledge, skills and competencies which qualify them to teach in their field	Yes	Yes	Yes	Yes	Yes
2.6	Does the VET/HVET centre systematically manage development training for all its staff?	Yes	To some degree	Yes	Yes	To some degree
2.7	Do all teachers regularly practise pedagogies that are appropriate to vocational subjects for different learners?	Yes	To some degree	Yes	To some degree	To some degree
2.8	The school or centre makes systematic use of assessment data to evaluate and improve its performance	Yes	To some degree	Yes	To some degree	Yes
2.9	Senior managers and pedagogues regularly observe teaching and providing feedback to all staff	Yes	Yes	To some degree	To some degree	To some degree
2.10	The VET/HVET centre plans its in-service training events at least three times each year to achieve its training plan	Yes	Yes	Yes	Yes	Yes
2.11	Do all teachers and trainers have relevant industrial or professional work experience from relevant enterprises?	No	To some degree	To some degree	To some degree	Yes
2.12	At least 80% of teachers regularly collaborate with each other to prepare and support their teaching	Yes	Yes	Yes	To some degree	To some degree
2.13	Regular assessment of learning is used to decide what learning tasks should be set for individuals and groups of learners	Yes	Yes	Yes	To some degree	To some degree
2.14	Does the VET/HVET centre evaluate the impact that professional development has on the quality of teaching and learning?	Yes	To some degree	To some degree	To some degree	Yes
2.15	The VET/HVET centre supports the overall development of pedagogy, for example, by sharing instructional materials	Yes	Yes	Yes	No	Yes
2.16	The VET/HVET centre works in partnership with industry, universities, etc to design and organise in-service training for trainers	Yes	To some degree	To some degree	To some degree	To some degree
2.17	The VET/HVET centre participates in national or international networks to share good practices or research in teaching and learning	Yes	Yes	To some degree	To some degree	Yes
2.18	The VET/HVET centre has a budget to develop and provide in-service training	Yes	To some degree	Yes	Yes	Yes

All partners have a person in charge of professional development and all its staff have appropriate knowledge, competencies, and skills for their educational field. All partners provide new teachers with mentoring and the centre plans in-service events at least three times each year to achieve its training plan and maintain a staff with applicable knowledge, competencies, and skills.

Far from all partners have staff with work experience from relevant enterprises. It is arguable if this is negative or positive, it is clearly important to have teachers with real-life work experience, it is however not sure that the best approach is that all staff are ex-employees from industrial companies.

3	Autonomy, institutional improvement, and resources					
		TKNIKA	Curt Nicolín	Miguel Altuna	Da Vinci	DHBW
3.1	Does the VET/HVET centre have an independent Board of Governors that exercises authority and holds the principal to account?	No	To some degree	No	Yes	Yes
3.2	The VET/HVET centre, has in consultation with its stakeholders, defined its mission and institutional development plan	Yes	To some degree	Yes	Yes	Yes
3.3	Does the VET/HVET centre have an institutional quality assurance system that it implements?	Yes	To some degree	Yes	Yes	Yes
3.4	Does the VET/HVET centre have the authority to independently enter contracts with other organisations (for business purposes)?	Yes	Yes	To some degree	Yes	Yes
3.5	The VET/HVET centre can earn and retain income, for example, by selling training services or products	Yes	Yes	Yes	Yes	To some degree
3.6	The VET/HVET centre can make changes to nationally defined curriculum frameworks or profiles to adapt the curriculum to local needs	Yes	No	To some degree	To some degree	Yes
3.7	The Board of Governors has the authority to appoint and dismiss the principal	To some degree	No	Yes	Yes	Yes
3.8	Does the VET/HVET centre have the authority to appoint its staff, for example, part-time teachers, maintenance staff, trainers?	To some degree	Yes	No	Yes	Yes
3.9	The VET/HVET centre plans and monitors its budget, deciding independently how to use the resources	Yes	Yes	Yes	Yes	To some degree
3.10	The VET/HVET centre has appropriate laboratories, classrooms, and workshops to educate competences requested by stakeholders	Yes	Yes	Yes	Yes	To some degree
3.11	The VET/HVET centre has appropriate tools, equipment and consumables which permit it to develop the requested competencies	Yes	Yes	Yes	Yes	Yes
3.12	The VET/HVET centre has the authority to decide its learning programmes and to close current programmes	Yes	To some degree	To some degree	To some degree	Yes
3.13	The school or centre has the authority to take loans, for example, to fund investment	No	Yes	No	Yes	To some degree
3.14	Does the VET/HVET centre coordinate the planning and provision of training programmes together with other skill providers?	Yes	To some degree	Yes	To some degree	To some degree
3.15	The VET/HVET centre leads, and even initiates, national or international projects involving more than one other organisation	Yes	Yes	Yes	Yes	Yes
3.16	The VET/HVET centre joint owns assets or enterprises with other schools or organisations	Yes	No	Yes	No	To some degree
3.17	The VET/HVET centre shares services or staff with other schools, for example, accounting services, technical maintenance services	Yes	No	Yes	Yes	Yes

All partners centres have appropriate tools, equipment, and consumables and almost all partners have fully appropriate laboratories, classrooms and workshops that make it possible to educate competencies requested by stakeholders. All partners lead or initiate national and international projects which involve more than one other organisation. This shows that the partners' VET/HVET-centres have good educational resources.

The VET/HVET-centres autonomy varies, some can take loans to fund investments and own assets together with other organisations. They also have the authority to decide their learning programmes, close existing programmes and can make changes to nationally defined curriculum frameworks to adapt to local needs. The rest of the partners do not or do only to a certain degree have this autonomy.

4	Lifelong learning in VET					
		TKNIKA	Curt Nicolin	Miguel Altuna	Da Vinci	DHBW
4.1	The VET/HVET centre has an explicit mission to provide education or training programmes to adults	Yes	To some degree	Yes	Yes	To some degree
4.2	The VET/HVET centre has performed an adult education programme with at least 8 weeks duration for 20 or more learners over the last two years	Yes	Yes	Yes	Yes	To some degree
4.3	The VET/HVET centre is formally accredited as a provider of adult education	Yes	To some degree	Yes	Yes	To some degree
4.4	Does the VET/HVET centre systematically support the development of key competences for all learners?	Yes	Yes	Yes	Yes	Yes
4.5	The VET/HVET centre has delivered at least three different programmes for adults continuously over the last two years	Yes	No	Yes	Yes	To some degree
4.6	Various learning-programmes are offered to meet the needs of different learners	Yes	To some degree	Yes	Yes	To some degree
4.7	Does the VET/HVET centre offer specialised advice regarding training and careers to adult learners?	To some degree	Yes	Yes	To some degree	To some degree
4.8	Trainers have received training that has helped them to develop skills to support adult learning and career counselling	To some degree	To some degree	To some degree	To some degree	Yes
4.9	Learning outcomes from adults' skills programmes are assessed using criteria that have been validated by employers	Yes	To some degree	Yes	To some degree	Yes
4.10	More than 50% of programmes provided by the VET/HVET centre are also accessible for adult learners	Yes	No	Yes	To some degree	To some degree
4.11	There is dedicated funding that makes it possible for adult learners to study	Yes	Yes	Yes	To some degree	To some degree
4.12	Do adult programmes lead to diplomas that have value on the labour market?	Yes	Yes	Yes	Yes	To some degree
4.13	Graduates from adult programmes are regularly tracked to monitor destinations and/or future learning needs	To some degree	To some degree	To some degree	No	To some degree
4.14	The VET/HVET centre provides adult education outside of a school environment, for example, in the workplace or online	Yes	To some degree	Yes	Yes	To some degree
4.15	The VET/HVET centre recognises informal learning of adults so that they can benefit from prior learning outside of the school or centre	Yes	To some degree	Yes	To some degree	To some degree
4.16	The VET/HVET centre collaborates with or supports other adult education providers	Yes	No	To some degree	No	To some degree
4.17	The VET/HVET centre has well-established partnerships with businesses or employment agencies, for example, to provide training	Yes	Yes	Yes	To some degree	To some degree
4.18	The VET/HVET centre has a coordinating role regarding adult education, for example, in several organisations	Yes	Do not know	To some degree	No	To some degree

Some of the partners place great focus on lifelong learning for adults while some partners put less focus on this dimension. Almost all partners have performed an adult education programme with at least 8 weeks duration for 20 or more learners over the last two years and systematically supports the development of key competences for all its learners. All students do however get diplomas after training that have or to some degree have value on the labour market.

The model shows that most partners only to some degree have trainers that have received the training necessary to support adult learning and career counselling. The partners only to some degree or do not track graduates to monitor destinations or future learning needs. Only one partner collaborates with or supports other adult education providers.

5	Smart specialisation, mobilising innovation, ecosystems, and SMEs					
		TKNIKA	Curt Nicolin	Miguel Altuna	Da Vinci	DHBW
5.1	The VET/HVET centre gathers and analyses labour market knowledge such as employers' needs	Yes	To some degree	Yes	To some degree	Yes
5.2	Does the VET/HVET centre collaborate with local or regional actors responsible for development?	Yes	To some degree	Yes	Yes	Yes
5.3	Does the VET/HVET centre collaborate with the local or regional business associations and civil society?	Yes	To some degree	Yes	Yes	Yes
5.4	The VET/HVET centre has developed or modified its curriculum in response to labour market analysis in the last three years	Yes	To some degree	Yes	To some degree	Yes
5.5	Does the VET/HVET centre provide enterprise/entrepreneurship skills to 75% of its adult learners?	Yes	To some degree	Yes	To some degree	Yes
5.6	The VET/HVET provides training or other services targeting Small and Medium Enterprises (SMEs)	Yes	Yes	Yes	Yes	Yes
5.7	The specialist programmes offered are matching the current and future employment needs of local and regional enterprises	Yes	To some degree	To some degree	To some degree	Yes
5.8	The VET/HVET centre contributes to regional research strategy, for example, by helping to transfer and apply new technologies	Yes	Yes	Yes	To some degree	Yes
5.9	The VET/HVET centre provides incubation services, thus support for business start-ups, such as accommodation, mentoring or loans	Yes	No	Yes	Yes	To some degree
5.10	The VET/HVET centre collaborates with industry to create new training programmes which address innovation at a regional level	Yes	To some degree	Yes	Yes	Yes
5.11	The VET/HVET centre has entered into formal agreements with organisations to jointly address local or regional economic needs	Yes	To some degree	Yes	Yes	To some degree
5.12	The VET/HVET centre leads or coordinates partnerships, beneficial for the region, by hosting meetings for instance	Yes	Yes	Yes	To some degree	To some degree
5.13	The VET/HVET centre collaborates with other schools or research organisations, for example to develop projects or training programmes	Yes	Yes	Yes	To some degree	Yes
5.14	The VET/HVET centre is formally recognised to lead the development of identified skills or technologies at a regional or national level	Yes	To some degree	To some degree	No	Yes

All partners provide training that targets small and medium enterprises and almost all centres collaborate with local or regional actors responsible for the development, business associations and society. The centres also contribute to regional research strategy, e.g., helping to transfer and apply new technologies. The partners collaborate with the industry to create new training programmes that address innovation at a regional level and other schools or research organisations, e.g., to develop projects or training programmes.

Three out of five partners answered that their offered specialist programmes are only to some degree matching the current and future employment needs of local and regional enterprises. This is a good example of the benefits of the model. These partners have now identified these facts and then decide if they want to work with this aspect to improve education programmes.

6	Industry 4.0 and digitalisation					
		TKNIKA	Curt Nicolin	Miguel Altuna	Da Vinci	DHBW
6.1	Does the VET/HVET centre develop digital skills and competences in at least five different learning programmes?	Yes	Yes	Yes	Yes	Yes
6.2	Digital instructions are regularly used as a teaching method for at least 50% of the learners	Yes	Yes	To some degree	Yes	Yes
6.3	The VET/HVET centre can provide 80% of its students with digital tools for distance learning	Yes	Yes	Yes	Yes	Yes
6.4	The VET/HVET centre promotes and uses Open Educational Resources	Yes	To some degree	Yes	No	Yes
6.5	An explicitly defined set of digital skills are taught to all learners as part of their key competences	Yes	Yes	Yes	To some degree	Yes
6.6	The VET/HVET centre uses digital learning to provide work-related learning situations, for example, video simulations, business games, VR	Yes	Yes	Yes	To some degree	Yes
6.7	At least 50% of learners learn to code.	No	To some degree	To some degree	No	Yes
6.8	At least 80% of learners learn computational thinking	No	Yes	To some degree	To some degree	Yes
6.9	Does the VET/HVET centre ensure safety, privacy, and responsible behaviour in digital environments?	Yes	Yes	Yes	Yes	Yes
6.10	The VET/HVET centre develops digital competences for all staff, in line with the institutional development plan	Yes	To some degree	Yes	To some degree	Yes
6.11	All teachers and learners use digital learning environments or systems for learning and assessment, for example, Microsoft 365	Yes	Yes	Yes	Yes	Yes
6.12	Digital learning technologies are used to provide learning for all learners in any place	Yes	Yes	Yes	To some degree	Yes
6.13	At least 50% of the learning programmes involve up-to-date industrial digital technologies, such as CAD, CAM, 3D printing	Yes	Yes	Yes	No	To some degree
6.14	The VET / HVET has defined plans to ensure that the development of its own digital infrastructure is in line with pedagogy and curriculum	Yes	Yes	Yes	To some degree	Yes
6.15	Does the VET/HVET centre provide at least two specialised profiles that explicitly address digital competences relevant to Industry 4.0?	Yes	To some degree	Yes	Yes	Yes
6.16	Does the VET/HVET centre work in partnership with employers to address new digital technological development?	Yes	Yes	Yes	To some degree	Yes
6.17	The VET/HVET centre collaborates digitally with other skills providers, for example through e-twinning, videoconferencing, or platforms	Yes	Yes	Yes	To some degree	Yes
6.18	Does the VET/HVET centre support the development of digitalisation for other skills providers?	Yes	Yes	Yes	To some degree	To some degree
6.19	VET / HVET supports the development of digitization carried out by other skills providers	Yes	Yes	To some degree	No	No

The model shows that the partners are competitive when it comes to Industry 4.0 and digitization aspects. All partners do for example develop digital skills and competences in at least five of their learning programmes and can provide at least 80% of its students' digital tools for distance learning, further investigation could have shown that the partners can provide all their students with these digital tools. All partners work with digital learning environments or systems for learning and assessment. Industry 4.0 results in the necessity of cybersecurity, all partners do therefore ensure safety, privacy, and responsible behaviour in their digital environments.

7	Going green and supporting sustainable goals					
		TKNIKA	Curt Nicolin	Miguel Altuna	Da Vinci	DHBW
7.1	Some awareness raising activities have already taken place in the VET/HVET, for example campaigns regarding waste reduction	Yes	Yes	Yes	To some degree	To some degree
7.2	Learning programmes include competences that are relevant to making the economy sustainable	Yes	To some degree	Yes	To some degree	To some degree
7.3	The VET / HVET supports science of climate change and exploring critical aspects of environmental change	Yes	To some degree	No	No	Yes
7.4	The VET/HVET centre addresses explicitly sustainability issues in its institutional strategy	Yes	Yes	Yes	No	To some degree
7.5	The VET/HVET centre provides at least one training programme that explicitly addresses a current or emerging green occupation	Yes	To some degree	To some degree	To some degree	To some degree
7.6	The VET/HVET centre systematically develops skills in green technologies, for example solar or wind power, insulation, electric batteries	Yes	To some degree	To some degree	To some degree	To some degree
7.7	The VET/HVET centre audits and controls its own environmental footprint	To some degree	To some degree	No	No	To some degree
7.8	The VET/HVET centre is providing adult training that provide green skills, give access to green technologies, and open green occupations	Yes	No	To some degree	No	No
7.9	The VET/HVET centre helps to develop new programmes, curricula or technologies associated with green sustainability	Yes	To some degree	No	No	Yes
7.10	The VET/HVET centre has successfully implemented a strategy for green transformation	To some degree	To some degree	To some degree	No	To some degree
7.11	The VET/HVET centre is reducing its own carbon footprint in line with national and international targets by 2030	To some degree	To some degree	To some degree	No	To some degree
7.12	The VET/HVET centre empowers learners and staff to innovate and collaborate to bring about a sustainable economy	Yes	To some degree	To some degree	No	No
7.13	The VET/HVET centre is collaborating with industry or research institutes to develop learning programmes which address sustainability	Yes	To some degree	Yes	To some degree	To some degree
7.14	The VET/HVET centre is collaborating with other stakeholders to achieve measurable progress in collective sustainability goals	Yes	To some degree	No	To some degree	No

According to the answers in the model does the partners VET/HVET-centres focus least on green sustainability. This aspect will be interesting to further analyse when this model has been used by more VET/HVET-centres in Europe to get a more comprehensive view of the status in Europe regarding green sustainability. These answers do however not indicate that the centres are not environmentally conscious or that they do not have green sustainable institutions. The questions are mainly focusing on educational programmes that are specialized towards green sustainability.

CONCLUSION

The answers in these tables displays the actual status of the institutions of the EXAM 4.0 consortium. This is not enough to define the institutional status of VET/HVET-centres in Europe but can to some degree reflect it. This model will be used on the upcoming EXAM 4.0 platform and will then, with further VET/HVET-centres joining the platform, show a broader and more comprehensive view of the status of, as well as information regarding, VET/HVET-centres in Europe.

The model is divided into seven different sections, analysing the answers from each section shows which aspects that the VET/HVET-centres focuses the most on. The model shows that, according to the answers from the model filled in by the consortium partners, VET/HVET-centres focus least on green transformation and sustainable goals. A more comprehensive research regarding the institutions is necessary to determine the definitive reason for this. The questions do however work as an eyeopener, now the results are on paper, and measures can be taken to develop in this field and achieve excellence.

The other sections were equally answered by the consortium. According to the answerers in the model, the focus for the VET/HVET-centres, with a small margin, seems to be concerning Industry 4.0 and DIGITALISATION. The VET/HVET-centres are part of the EXAM 4.0 consortium, it is therefore good to know that these centres focus on Industry 4.0 and digitalisation.

This model should be used for the EXAM 4.0 platform and the answers should be analysed. This could give a comprehensive view of the status of VET/HVET-centres in Europe.

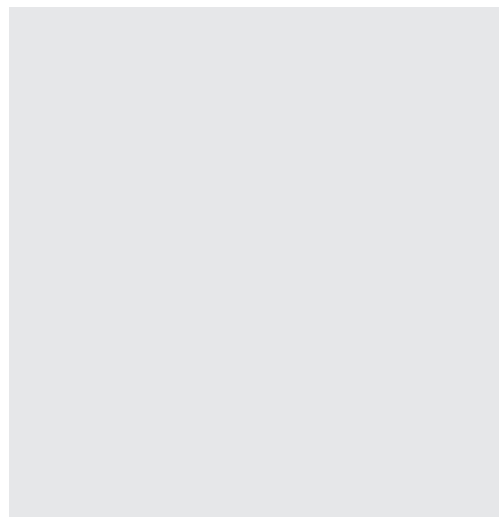
This model ensures that relevant aspects of a VET/HVET centre's institutions are covered in a non-time-consuming description. The model describes a VET/HVET centre's institution efficiently but can also be used as a summary of a broader description.

All EXAM 4.0 partners tested the model for describing AM LABs by describing all their LABs. The information regarding the LABs can be used for both internal and external partners. It is beneficial to see how other VET/HVET centres approach education and implementation of Advanced Manufacturing technology in their LABs. It is possible to obtain new knowledge regarding educational aspects by evaluating the information from other LABs. The description of LABs will also be used as a reference for the creation of the final version of EXAM 4.0's model for describing VET/HVET centres' AM LABs 4.0.

DESCRIPTION MODEL FOR INSTITUTIONS

The model is based on the ETF-questionnaire, produced to give the reader information regarding a VET/HVET centre's institutional model. Internal and external partners can use this model to describe their institutional model in an efficient way to easily demonstrate their institution. The ETF-questionnaire is a well-developed questionnaire adapted to handle different aspects of institutions. The EXAM 4.0 model for description of institutions consists of tables providing similar questions, the tables are however a better tool for displaying the answers.

The colour in the box underneath will be used to display the answers in the tables:



1	Education-business collaboration and cooperation					
1.1	Learning in the real workplace (example, internship at enterprises)	Yes	No	To some degree	Do not know	Not relevant
1.2	Are representative employers involved in school governance?	Yes	No	To some degree	Do not know	Not relevant
1.3	Are employers consulted by the VET/HVET centre in relation to curriculums?	Yes	No	To some degree	Do not know	Not relevant
1.4	Are a higher management person coordinating the school-industry cooperation?	Yes	No	To some degree	Do not know	Not relevant
1.5	The VET/HVET centre has signed long-term contract with at least two enterprises to provide, for instance, internship	Yes	No	To some degree	Do not know	Not relevant
1.6	Work placements for all learners are equivalent to at least 10% of curriculum time	Yes	No	To some degree	Do not know	Not relevant
1.7	At least one teacher benefits from a minimum of 5 training days in an enterprise every year	Yes	No	To some degree	Do not know	Not relevant
1.8	The VET/HVET centre systematically develop training programmes adapted to requirements of initial and continuing vocational training	Yes	No	To some degree	Do not know	Not relevant
1.9	Enterprises regularly contribute to assessment processes for students, for example, participate in assessment juries	Yes	No	To some degree	Do not know	Not relevant
1.10	Studies show that at least 30% of graduates continue in sector related to their programme	Yes	No	To some degree	Do not know	Not relevant
1.11	Enterprises contribute with funding/equipment, worth at least €5000, over the last two years	Yes	No	To some degree	Do not know	Not relevant
1.12	The VET/HVET centre forms partnerships with specialist organisations at national and regional level	Yes	No	To some degree	Do not know	Not relevant
1.13	The VET/HVET centre cooperates with other VET/HVET centres to co-ordinate placements or other work-based learning for adult learners	Yes	No	To some degree	Do not know	Not relevant
1.14	The VET/HVET centre cooperates with other VET/HVET centres to coordinate placements for teachers in an industrial workplace	Yes	No	To some degree	Do not know	Not relevant

2	Pedagogy and professional development					
2.1	The VET/HVET centre has a person in charge of professional development	Yes	No	To some degree	Do not know	Not relevant
2.2	The VET/HVET centre provides mentoring for all new teachers	Yes	No	To some degree	Do not know	Not relevant
2.3	75% or more of the teachers attended at least one in-service training event in the last 12 months	Yes	No	To some degree	Do not know	Not relevant
2.4	Teachers regularly create learning tasks that resemble real, up-to-date tasks in the world of	Yes	No	To some degree	Do not know	Not relevant
2.5	All trainers have appropriate knowledge, skills and competences which qualify them to teach in their field	Yes	No	To some degree	Do not know	Not relevant
2.6	The VET/HVET centre systematically manage development training for all its staff	Yes	No	To some degree	Do not know	Not relevant
2.7	All teachers regularly practise pedagogies that are appropriate to vocational subjects and to different learners	Yes	No	To some degree	Do not know	Not relevant
2.8	The VET/HVET centre makes systematic use of assessment data to evaluate and improve its own performance	Yes	No	To some degree	Do not know	Not relevant
2.9	Senior managers and pedagogues regularly observe teaching and provide feedback to all staff	Yes	No	To some degree	Do not know	Not relevant
2.10	The VET/HVET centre plans its own in-service training events at least three times each year to achieve its training plan	Yes	No	To some degree	Do not know	Not relevant
2.11	All teachers and trainers have relevant industrial or professional work experience from relevant enterprises	Yes	No	To some degree	Do not know	Not relevant
2.12	At least 80% of teachers regularly collaborate with each other to prepare and support their teaching	Yes	No	To some degree	Do not know	Not relevant
2.13	Regular assessment of learning is used to decide what learning tasks should be set for individuals and groups of learners	Yes	No	To some degree	Do not know	Not relevant
2.14	The VET/HVET centre evaluates the impact professional development has on the quality of teaching and learning	Yes	No	To some degree	Do not know	Not relevant
2.15	The VET/HVET centre supports the overall development of pedagogy, for example, by sharing instructional materials	Yes	No	To some degree	Do not know	Not relevant
2.16	The VET/HVET centre works in partnership with industry, universities, etc to design and organise in-service training for trainers	Yes	No	To some degree	Do not know	Not relevant
2.17	The VET/HVET centre participates in national or international networks to share good practices or research in teaching and learning	Yes	No	To some degree	Do not know	Not relevant
2.18	The VET/HVET centre has a budget to develop and provide in-service training	Yes	No	To some degree	Do not know	Not relevant

3	Autonomy, institutional improvement, and resources					
3.1	The VET/HVET centre has an independent Board of Governors that exercises authority and holds the principal to account	Yes	No	To some degree	Do not know	Not relevant
3.2	The VET/HVET centre, has in consultation with its stakeholders, defined its own mission and institutional development plan	Yes	No	To some degree	Do not know	Not relevant
3.3	The VET/HVET centre has an institutional quality assurance system which it implements	Yes	No	To some degree	Do not know	Not relevant
3.4	The VET/HVET centre has the authority to independently enter contracts with other organisations (for business purposes)	Yes	No	To some degree	Do not know	Not relevant
3.5	The VET/HVET centre can earn and retain income, for example, by selling training services or products	Yes	No	To some degree	Do not know	Not relevant
3.6	The VET/HVET centre can make changes to nationally defined curriculum frameworks or profiles to adapt curriculum to local needs	Yes	No	To some degree	Do not know	Not relevant
3.7	The Board of governors has the authority to appoint and dismiss the principal	Yes	No	To some degree	Do not know	Not relevant
3.8	The VET/HVET centre has the authority to appoint its own staff, for example part-time teachers, maintenance staff, trainers	Yes	No	To some degree	Do not know	Not relevant
3.9	The VET/HVET centre plans and monitors its own budget, deciding independently how to use the resources	Yes	No	To some degree	Do not know	Not relevant
3.10	The VET/HVET centre has appropriate laboratories, classrooms, and workshops to educate competences requested by stakeholders	Yes	No	To some degree	Do not know	Not relevant
3.11	The VET/HVET centre has appropriate tools, equipment and consumables which permit it to develop requested competencies	Yes	No	To some degree	Do not know	Not relevant
3.12	The VET/HVET centre has the authority to decide its learning programmes and to close current programmes	Yes	No	To some degree	Do not know	Not relevant
3.13	The school or centre has the authority to take loans, for example, to fund investment	Yes	No	To some degree	Do not know	Not relevant
3.14	The VET/HVET centre coordinates the planning and provision of training programmes together with other skill providers	Yes	No	To some degree	Do not know	Not relevant
3.15	The VET/HVET centre leads and initiates national or international projects involving more than one other organisation	Yes	No	To some degree	Do not know	Not relevant
3.16	The VET/HVET centre owns assets or enterprises with other schools or organisations, for example, a training company	Yes	No	To some degree	Do not know	Not relevant
3.17	The VET/HVET centre shares services or staff with other schools, for example, accounting services, technical maintenance services	Yes	No	To some degree	Do not know	Not relevant

4	Lifelong learning in VET					
4.1	The VET/HVET centre has an explicit mission to provide education or training programmes to adults	Yes	No	To some degree	Do not know	Not relevant
4.2	The VET/HVET centre has performed an adult education programme with at least 8 weeks duration for 20 or more learners over the last two years	Yes	No	To some degree	Do not know	Not relevant
4.3	The VET/HVET centre is formally accredited as a provider of adult education	Yes	No	To some degree	Do not know	Not relevant
4.4	The VET/HVET centre systematically supports the development of key competences for all learners	Yes	No	To some degree	Do not know	Not relevant
4.5	The VET/HVET centre has delivered at least three different programmes for adults continuously over the last two years	Yes	No	To some degree	Do not know	Not relevant
4.6	Various learning-programmes are offered to meet the needs of different learners	Yes	No	To some degree	Do not know	Not relevant
4.7	The VET/HVET centre offers specialised advice regarding training and career to adult learners	Yes	No	To some degree	Do not know	Not relevant
4.8	Trainers have received training that has helped them to develop skills to support adult learning and career counselling	Yes	No	To some degree	Do not know	Not relevant
4.9	Learning outcomes from adults' programmes are assessed using criteria that have been validated by employers	Yes	No	To some degree	Do not know	Not relevant
4.10	More than 50% of programmes provided by the VET/HVET centre are also accessible for adult learners	Yes	No	To some degree	Do not know	Not relevant
4.11	The VET/HVET centre has dedicated funding which makes it possible for adult learners to study	Yes	No	To some degree	Do not know	Not relevant
4.12	Adult programmes lead to diplomas which have value on the labour market	Yes	No	To some degree	Do not know	Not relevant
4.13	Graduates from adult programmes are regularly tracked to monitor destinations and/or future learning needs	Yes	No	To some degree	Do not know	Not relevant
4.14	The VET/HVET centre provides adult education outside of a school environment, for example, in the workplace or online	Yes	No	To some degree	Do not know	Not relevant
4.15	The VET/HVET centre recognises informal learning of adults for them to benefit from prior learning outside of the school or centre	Yes	No	To some degree	Do not know	Not relevant
4.16	The VET/HVET centre collaborates with or supports other adult education providers	Yes	No	To some degree	Do not know	Not relevant
4.17	The VET/HVET centre has well-established partnerships with businesses or employment agencies, for example, to provide training	Yes	No	To some degree	Do not know	Not relevant
4.18	The VET/HVET centre has a coordinating role regarding adult education, for example, in several organisations	Yes	No	To some degree	Do not know	Not relevant

5	Smart specialisation, mobilising innovation, ecosystems, and SMEs					
5.1	The VET/HVET centre gathers and analyses labour market knowledge such as employers' needs	Yes	No	To some degree	Do not know	Not relevant
5.2	The VET/HVET centre collaborates with local or regional actors responsible for development	Yes	No	To some degree	Do not know	Not relevant
5.3	The VET/HVET centre collaborates with the local or regional business associations and civil society	Yes	No	To some degree	Do not know	Not relevant
5.4	The VET/HVET centre has developed or modified its curriculum in response to labour market analysis in the last three years	Yes	No	To some degree	Do not know	Not relevant
5.5	The VET/HVET centre provides enterprise/entrepreneurship skills to 75% of its adult learners	Yes	No	To some degree	Do not know	Not relevant
5.6	The VET/HVET provides training or other services targeting Small and Medium Enterprises (SMEs)	Yes	No	To some degree	Do not know	Not relevant
5.7	The specialist programmes offered are matching the current and future employment needs of local and regional enterprises	Yes	No	To some degree	Do not know	Not relevant
5.8	The VET/HVET centre contributes to regional research strategy, for example, by helping to transfer and apply new technologies	Yes	No	To some degree	Do not know	Not relevant
5.9	The VET/HVET centre provides incubation services, thus support for business start-ups, such as accommodation, mentoring or loans	Yes	No	To some degree	Do not know	Not relevant
5.10	The VET/HVET centre collaborates with industry to create new training programmes which address innovation at regional level	Yes	No	To some degree	Do not know	Not relevant
5.11	The VET/HVET centre has entered formal agreements with organisations to jointly address local or regional economic needs	Yes	No	To some degree	Do not know	Not relevant
5.12	The VET/HVET centre leads or coordinates partnerships, beneficial for the region, by hosting meetings for instance	Yes	No	To some degree	Do not know	Not relevant
5.13	The VET/HVET centre collaborates with other schools or research organisations, for example to develop projects or training programmes	Yes	No	To some degree	Do not know	Not relevant
5.14	The VET/HVET centre is formally recognised to lead development of identified skills or technologies at regional or national level	Yes	No	To some degree	Do not know	Not relevant

6	Industry 4.0 and digitalisation					
6.1	The VET/HVET centre develops digital skills and competences in at least five different learning programmes	Yes	No	To some degree	Do not know	Not relevant
6.2	Digital instructions are regularly used as teaching method for at least 50% of the learners	Yes	No	To some degree	Do not know	Not relevant
6.3	The VET/HVET centre can provide 80% of its students with digital tools for distance learning	Yes	No	To some degree	Do not know	Not relevant
6.4	The VET/HVET centre promotes and uses Open Educational Resources	Yes	No	To some degree	Do not know	Not relevant
6.5	An explicitly defined set of digital skills are taught to all learners as part of their key competences	Yes	No	To some degree	Do not know	Not relevant
6.6	The VET/HVET centre uses digital learning to provide work-related learning situations, for example, video simulations, business games, VR	Yes	No	To some degree	Do not know	Not relevant
6.7	At least 50% of learners learn coding	Yes	No	To some degree	Do not know	Not relevant
6.8	At least 80% of learners learn computational thinking	Yes	No	To some degree	Do not know	Not relevant
6.9	The VET/HVET centre ensures safety, privacy, and a responsible behaviour in digital environments	Yes	No	To some degree	Do not know	Not relevant
6.10	The VET/HVET centre develops digital competences for all staff, in line with institutional development plan	Yes	No	To some degree	Do not know	Not relevant
6.11	All teachers and learners use digital learning environments or systems for learning and assessment, for example Microsoft 365	Yes	No	To some degree	Do not know	Not relevant
6.12	Digital learning technologies are used to provide learning for all learners at any place	Yes	No	To some degree	Do not know	Not relevant
6.13	At least 50% of the learning programmes involves up-to-date industrial digital technologies, such as CAD, CAM, 3D printing	Yes	No	To some degree	Do not know	Not relevant
6.14	The VET / HVET has defined plans to ensure that the development of its own digital infrastructure is in line with pedagogy and curriculum	Yes	No	To some degree	Do not know	Not relevant
6.15	The VET/HVET centre provides at least two specialised profiles that explicitly address digital competences relevant to Industry 4.0	Yes	No	To some degree	Do not know	Not relevant
6.16	The VET/HVET centre works in partnership with employers to address new digital technological development	Yes	No	To some degree	Do not know	Not relevant
6.17	The VET/HVET centre collaborates digitally with other skills providers, for example through e-twinning, videoconferencing, or platforms	Yes	No	To some degree	Do not know	Not relevant
6.18	The VET/HVET centre support development of digitalisation for other skills providers	Yes	No	To some degree	Do not know	Not relevant

7	Going green and supporting sustainable goals					
7.1	Some awareness raising activities have already taken place in the VET/HVET, for example campaigns regarding waste reduce	Yes	No	To some degree	Do not know	Not relevant
7.2	Learning programmes include competences that are relevant to making the economy sustainable	Yes	No	To some degree	Do not know	Not relevant
7.3	The VET / HVET supports science of climate change and exploring critically aspects of environmental change	Yes	No	To some degree	Do not know	Not relevant
7.4	The VET/HVET centre addresses explicitly sustainability issues in its institutional strategy	Yes	No	To some degree	Do not know	Not relevant
7.5	The VET/HVET centre provides at least one training programme that explicitly addresses a current or emerging green occupation	Yes	No	To some degree	Do not know	Not relevant
7.6	The VET/HVET centre systematically develops skills in green technologies, for example solar or wind power, insulation, electric batteries	Yes	No	To some degree	Do not know	Not relevant
7.7	The VET/HVET centre audits and controls its own environmental footprint	Yes	No	To some degree	Do not know	Not relevant
7.8	The VET/HVET centre is providing adult training that provide green skills, give access to green technologies, and open green occupations	Yes	No	To some degree	Do not know	Not relevant
7.9	The VET/HVET centre helps to develop new programmes, curricula or technologies associated with green sustainability	Yes	No	To some degree	Do not know	Not relevant
7.10	The VET/HVET centre has successfully implemented a strategy for green transformation	Yes	No	To some degree	Do not know	Not relevant
7.11	The VET/HVET centre is reducing its own carbon footprint in line with national and international targets by 2030	Yes	No	To some degree	Do not know	Not relevant
7.12	The VET/HVET centre empowers learners and staff to innovate and collaborate to bring about a sustainable economy	Yes	No	To some degree	Do not know	Not relevant
7.13	The VET/HVET centre is collaborating with industry or research institutes to develop learning programmes which address sustainability	Yes	No	To some degree	Do not know	Not relevant
7.14	The VET/HVET centre is collaborating with other stakeholders to achieve measurable progress in collective sustainability goals	Yes	No	To some degree	Do not know	Not relevant

DESCRIPTION OF EXAM 4.0

PARTNERS INSTITUTIONS

Curt Nicolin Gymnasiet – Sweden

■ **City:**

Finspång, Sweden

■ **General information:**

Curt Nicolin Gymnasiet is one of Sweden's first independent schools, opened in 1996. Curt Nicolin Gymnasiet is owned by the region's industry and Finspång's municipality. The school is a non-profit company, and all profit is reinvested into the school.

■ **Number of students:**

550

■ **Number of employees:**

55

EDUCATION-BUSINESS COLLABORATION, AND COOPERATION

Curt Nicolin Gymnasiet cooperates with companies to give the students the possibility to gain real work experience and meet the requirements of the Swedish curriculum, in most cases accomplished through internships. Some of the cooperation companies are shareholders in the company, thus the school. Representatives from the owner companies are also formally involved in the school governance as members of the board.

The deputy principal at the school is the manager of the industrial section and workshop at the school. The deputy principal is together with the CEO of the company in charge of the cooperation between the school and industrial companies.

The school directs a large part of its industrial education towards the demands of the regional companies, especially the largest owner company. The largest company owner has about 3000 employees in Finspång, a city with 13 500 citizens. This company provides students from the school with vital experience through internships, study visits, etc, and Curt Nicolin Gymnasiet provides the company with work force.

The owner companies provide the school with funding, these funds are used to improve the equipment at the school, thus the education. This helps the school to be in the front edge of industrial and technical education in Sweden.

The school cooperates with other schools and organizations to ensure front edge education. Curt Nicolin Gymnasiet do for instance provide adult training at the evenings and students from other schools can in certain courses be educated at Curt Nicolin Gymnasiet. Curt Nicolin Gymnasiet can provide education with technologies and equipment that the students' ordinary school is not able to provide.

Curt Nicolin Gymnasiet is currently developing an advanced mobile educational environment, it is a technical container containing advanced manufacturing equipment. Curt Nicolin Gymnasiet can later send this mobile environment to schools that are lacking the resources required to educate specific advanced manufacturing skills and competencies.

PEDAGOGY, AND PROFESSIONAL DEVELOPMENT

Each educational section at the school has a “first teacher”, this teacher oversees development regarding education in her or his specific field. The current development topic at Curt Nicolin Gymnasiet is DIGITALISATION of education.

The primarily used learning strategy at the school is challenge-based learning through projects. The teachers set up learning tasks that resembles real world challenges and students work in teams to face and solve real-life challenges and problems.

All personnel at the school have appropriate knowledge, skills, and competencies to be qualified teachers within their subject area. The teachers have different professional backgrounds, they are teachers, engineers, and staff with long experience from working at different companies. The reason for the diversity is to ensure that the school has staff with relevant experience and skills for their teaching area.

Teachers at the school are working in different teams, math and physics teachers have one team for instance. Managers and pedagogues do regularly observe educational methods and thereafter provides each team thus the individual teachers with feedback. The teachers within these teams are collaborating to improve their lectures. Different teams do of course collaborate with each other as well, most projects that the students participate in extends over different educational subjects. In a lot of projects, the student needs to create everything from idea to finished product, the projects often involve various elements such as CAD/CAM, topology optimization, cost calculation, manufacturing of product and report writing. These projects do therefore involve various teachers and it is therefore important that the staff are used to collaborate beyond teams with each other as they have different competencies and skills.

Teachers and pedagogues are continuously involved in meetings and discussions regarding students' needs. These meetings are implemented for the school to obtain the possibility to provide required support for the students, with respect on both learning and wellbeing.

Curt Nicolin Gymnasiet participates in national and international networks to share practices and research regarding teaching and learning.

AUTONOMY, INSTITUTIONAL IMPROVEMENT, AND RESOURCES

Curt Nicolin Gymnasiet has together with stakeholders defined its institutional and development plan.

Curt Nicolin Gymnasiet is not a governmental school, it is a non-profit company. The school has therefore the authority to independently enter contracts with other organisations, such as to buy and sell equipment. All profit is further reinvested into the school in terms of education such as new equipment and benefits for students. Benefits such as driving license, personal computer, restaurant food, national and international educational trips, etc. This also ensures that the school can provide sufficient laboratories, classrooms, and workshops.

The school has the authority to act as a company thus employee its own staff as well as decide its own budget. In this way, Curt Nicolin Gymnasiet can both lead and participate in regional, national, and international projects involving more than one other organisation.

LIFELONG LEARNING IN VET

The school has, as aforementioned, delivered at least one education programme for adults, the educational programme is continuous through the whole school year. The learners are offered different learning-programmes to meet their needs. The learning outcomes of the education, such as competencies, are assessed to ensure that the student meets the requirements of regional companies. Learners that are willing to learn and take care of their internships do in most cases get employment after graduation.

SMART SPECIALISATION, MOBILISING INNOVATION, ECOSYSTEMS, AND SMES

Curt Nicolin Gymnasiet are to some degree analysing labour market knowledge by keeping close contact with national and regional companies and institutions.

Curt Nicolin Gymnasiet contributes to activities that identifies the region's smart skills, smart development, DIGITALISATION etc. The school hosts meetings and events regarding DIGITALISATION. The school is currently collaborating with research organisations, for example in a project called Visual Lift, this project is about visualization, virtual reality, and augmented reality.

Curt Nicolin Gymnasiet is adapting its education regarding changing requirements of the regional, national, and international market.

The programmes offered by the school are matching the current and assumed future employment needs of local and regional enterprises. Curt Nicolin Gymnasiet's collaboration with the regional industries is one contributing factor vital to match the requirements of local enterprises.

INDUSTRY 4.0, AND DIGITALISATION

Curt Nicolin Gymnasiet is a digitalized school, and its programmes are regularly using online instructions. The school uses digital tools to provide 100% of its students with online education, if needed. All students learn computational thinking, it is important for the students to acquire computer skills to be able to successfully work within the future industrial sector, thus Industry 4.0. Computers are used by both students and teachers at almost all lectures, it is therefore important that the school ensures safety and privacy regarding digital environments. All learners use Microsoft 365 as a part of their education, more than 50% of the students use industrial digital technologies such as CAD and CAM.

The school is investing in Virtual Reality and are currently performing research regarding the optimal implementation level it can have in education, this is done in collaboration with other research partners. Curt Nicolin Gymnasiet works in partnership with other organisations to address new digital technological development.

GOING GREEN, SUPPORTING SUSTAINABLE GOALS

Waste disposal and recycling is an important aspect in Sweden, awareness raising activities regarding this have therefore taken place. Environmental issues are therefore often included in the education at the school. The school is aware of sustainability issues and are continuously addressing these together with the students in projects, however the programmes are not directly directed towards green technologies. The school is all though investing in green technologies, the roof of the school is filled with solar panels for example.

TKNIKA, Basque Centre of Applied Research and Innovation in Vocational Education and Training – Basque Country (Spain)

■ **City:**

Errenteria

■ **Is the centre/school part of a formal cluster or association with another vocational schools/centre:** YES

Tknika is organically attached to Vice ministry of Vocational Education and Training of the Department of Education of the Basque Government.

We coordinate innovation and applied research projects in all the Basque VET centres, public and private.

At international level, we belong to the following networks: World Federation of Colleges and Polytechnics, UNESCO-UNEVOC, the Transatlantic Technology and Training Alliance, the European Forum of Technical and Vocational Education and Training, Chain 5, and the European Training Foundation Network of Excellence. Most of our VET centres are also becoming involved in these networks.

At regional and national levels, we are members of the Additive & 3D Manufacturing Technologies Association of Spain (ADDIMAT), the Basque Energy Cluster, and the Basque Construction Cluster (Eraikune).

EDUCATION-BUSINESS COLLABORATION, AND COOPERATION

Tknika works with teachers only, we do not train students. We cooperate with several enterprises in our projects.

Being a public centre organically attached to the Vice ministry of Vocational Education and Training of the Basque Government, we do not have employers or representatives of them involved in the governance of our centre. We all are civil servants, and we will not be allowed to do so under the current legislation.

However, we regularly meet companies and different types of enterprise associations to be aware of their needs or to directly cooperate in projects. This gives us a good awareness of technology trends and training needs of the labour market.

Regarding the VET colleges of the Basque Country, all of them have a person in charge of relationships with companies. This person is also in charge of work placements for apprenticeships and for regular training periods of students in companies. Work placements are compulsory in all VET degrees. The period in a company is considered as a compulsory module that every student must pass to get the certification.

During the work placement in the company, the student has a company tutor who is responsible for monitoring the learning process of the student and giving feedback to the VET centre. The final mark of the student reflects what the company tutor observes.

In the case of dual students, apprenticeships, the company also participates in the elaboration of the training plan of the student, together with the VET centre.

Both, Tknika and the Basque VET colleges, have signed several memorandums of understanding (MoU) with companies.

The staff of Tknika does not regularly go to a company for a work placement and neither do so VET centre teachers. There are, nevertheless, some teachers who have taken part in this type of programmes. This is not something systematic or compulsory.

Apart from technology innovation projects, VET providers, coordinated by Tknika, take part in the following hubs:

- Advanced manufacturing
- Digital and connected factory
- Energy
- Biosciences

In the hubs, reference companies help the Basque VET System to identify future training needs and to prioritise them. Inside each one of these hubs, meetings are organised between companies and VET centre representatives, where VET centres can know what the real skills needs of the companies are and they can start planning how to answer them.

Basque VET centres¹ are what we call “Integrated”. In our context integrated means that our VET centres are training students (initial training), workers and unemployed persons (continuous training).

¹ There are other institutions providing VET studies as well, but in the text, I am only referring to real VET centres.

Apart from these types of collaborations, enterprises also contribute to equip VET centres. Although most of the funding comes from the public sector, there are some examples of companies economically contributing to VET centres. I will cite two examples:

- There are cooperative VET centres, such as Mondragon Goi Eskola Politeknikoa, Lea Artibai, or Politeknika Ikastegia Txorierri, which have companies as members of their cooperatives.
- There are public centres, like Miguel Altuna LHII, who have some of their equipment partly purchased by companies.

However, the flagship of collaboration between Basque VET centres and companies is the Tkgune programme. With the aim of providing innovation services to SMEs, the Vice Ministry and Tknika launched the Tkgune programme.

TKgune is a network of Vocational Educational Training centres aimed at facilitating bidirectional knowledge transfer between VET centres and companies. The goal is achieved by developing technological projects, mainly by collaborating with SMEs in the Basque Country. Nowadays, there are 40 VET centres with more than 200 teachers involved in the programme.

The kind of projects developed in Tkgune are:

- Technological innovation and improvement projects: We develop innovation and improvement projects in collaboration with companies, adapting to their needs. To do this, we take advantage of the potential in each strategic setting, based on the trust provided by working within a network.
- Assessment for innovation: We offer organisational assessment adapted to each company's reality and provide companies with methodological tools to implement innovation plans or creative dynamics. We support companies when participating in contests for grants related to innovation.

Currently around 300 projects are held each year by the faculty members of the TKgune network. These projects are mainly related to industrial manufacturing, transport technologies (automotive, aeronautics, railways, or naval industry), automation, energy and environment, bio sanitary and biosciences technologies, creative industries, in line with the RIS3 Strategy.

They way of working in TKgune follows certain phases:

- **Identification:** Companies approach the centres, thanks to the pre-existing relationship or centres approach companies to identify their needs and offering partnerships for collaborative projects.
- **Definition:** A project is specifying, to meet the detected needs, defining participants, resources, deadlines, and a budget is agreed upon and signed with the company.
- **Development:** The project is kicked off, with monitoring throughout the entire process. When both parties meet their commitments, the project is invoiced and concluded, measuring fulfilment and satisfaction.
- **Exploitation:** The contents worked on are not only brought to the classroom by the teacher and transferred to the students, but also to the rest of the teachers that are interested in and in other cases even to the partner company.

The Basque companies, especially the SMEs, get many benefits from the TKgune programme. Within the current economic context, driving innovation is essential to guarantee competitiveness for a company. Through its specialised offering, TKgune allows to improve products and processes, thus accessing new markets thanks to greater added value.

This programme started to run 6 years ago, as a decision from the Basque Government to unify the different programmes that were running in the Basque VET centres for more than two decades, and by now more than 3000 companies have had a relationship with our VET centres.

Academic year	Number of VET centres	Number of collaborations with companies
2013-2014	5	96
2014-2015	22	257
2015-2016	29	354
2016-2017	30	404
2017-2018	34	427
2018-2019	35	303
2019-2020	40	--

Finally, it is worth emphasizing that Basque VET centres work in networks. Ikaslan, HETEL, and AICE are the most important VET centre networks.

PEDAGOGY, AND PROFESSIONAL DEVELOPMENT

Under the leadership of Tknika, Basque VET centres are changing their management models to be transformed in intelligent organisations.

Up to now, in the regular management, each VET centre had a person in charge of the relationship with companies.

All the Basque VET centres are certified with different quality labels. All of them have the ISO 9001. Among other things, the norm obliges them to receive all new teachers and to give them a basic introduction to the VET centre.

Apart from that, according to our Law, it is compulsory for all teachers of the Basque Country to spend some time every school year attending in-service trainings. Each VET centre must define the training plan for the teachers of the VET centre.

To design this plan, the centre should conduct an analysis and identification of training needs on the VET centre.

Currently, the Basque VET centres are undergoing a reform in the teaching methodology: ETHAZI.

The ETHAZI model has four main characteristics:

1. It is modular, with the design of challenges simulating as closely as possible the real work/life situations.
2. It has self-managed teaching teams where teachers are encouraged to work in teams and, if needed, adjust their schedules according to students' needs. Each teacher is fully available to students during their working hours.
3. It includes evaluations to guide the evolution of competency development. The evaluation is integrated as a key element in the students' own learning process, providing frequent feedback on their evolution.
4. Learning spaces are adapted in a way that their design mainly addresses the characteristics of flexible, open, and interconnected spaces that foster collaborative work. Workspaces are much more than the walls forming a classroom. These are flexible,

comfortable spaces with good acoustics and flexible connections that facilitate the use of ICTs.

There are two types of teachers in public Basque VET centres:

- Secondary Education Teachers: theory teachers
- Lab teacher: technical teacher

There are different requirements to become a teacher in each of these groups, but in general, all of them need to have:

- A higher VET degree, or University degree
- Basque Language C1 level certificate
- A Master in pedagogy

Requirements in private and semi-private VET centres vary. Whether we are talking of public or other type of VET centres, it is not compulsory for teachers to have work experience in their areas.

AUTONOMY, INSTITUTIONAL IMPROVEMENT, AND RESOURCES

Tknika is a public centre organically attached to the Vice ministry of Vocational Education and Training of the Department of Education of the Basque Government. As a public body, it is governed by civil servants only.

However, there are stakeholders from different fields involved in the Basque VET system.

At Government level, the Consejo Vasco de FP.

At VET centre level, there are different types of VET centres:

- Public
- Private
- Semi-private (some of them being cooperatives)

It is common for private or semi-private VET centres to have different stakeholders involved in their boards.

Regardless of their nature (public, private or semi) all Basque VET centres have autonomy to enter contracts with other organisations, all of them can earn and retail income, and are able to adapt the curricula.

For personnel matters, there are many differences between public and private and semi-private VET centres:

- The personnel of public VET centres come from. VET centres have the autonomy to define, to some extent, the requirements of the specific teacher they want.
- Private and semi-private VET centres have a huge autonomy to decide which person they hire.

Principals of VET centres are usually selected among teachers. They do not have a specific preparation for that. They must present a project and to be elected by the rest of the teachers. The rest of the teachers can also end their mandate under specific circumstances.

VET centres also have autonomy to manage their own budget. There are more restrictions for public VET centres than for private or semi-private ones, but all of them have at least some degree of autonomy.

Tknika and all the Basque VET centres follow strict quality assurance protocols which implies that:

- All centres have defined their mission, vision, and values.
- All centres must plan a four-year strategy and a plan every school year
- All centres must undergo an external quality audit every year.
- All centres

The Basque Government has investment a lot of resources in equipment for VET centres and most of them have appropriate and sufficient laboratories, classrooms, and workshops.

It is relatively common for Basque VET centres to participate in projects (regional, national international) with other VET centres and other institutions.

LIFELONG LEARNING IN VET

Basque VET centres are what the Spanish Law calls “integrated VET centres”. Integrated means that they are providing training to students, unemployed persons, and workers. All these types of training are officially certified and are valid in the whole country.

There are different learning modalities to acquire these certificates: part time, dual, regular, night offer, etc.

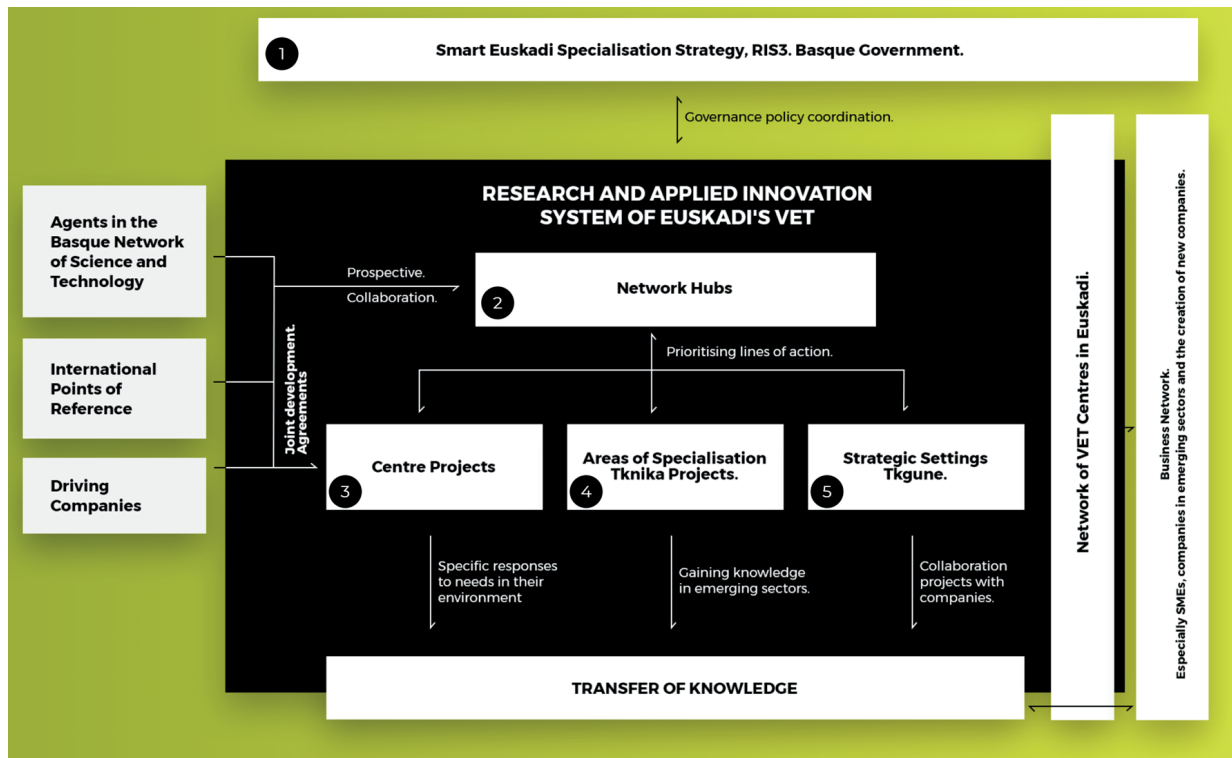
All the courses in Basque VET centres can be free. Funding comes from the Department of Education and the Department of Employment of the Basque Government. The Department of Employment manages the European Social Fund at regional level and part of the activities are funded with it.

SMART SPECIALISATION, MOBILISING INNOVATION, ECOSYSTEMS, AND SMES

The innovation model of the Basque VET system can be summarised in the image below. The model differentiates three basic fields:

- Centre projects.
- Areas of specialisation.
- Strategic Settings. TKgune.

All these fields and all the initiatives and projects carried out in the VET system are completely aligned to the Regional Smart Specialisation Strategy of the Basque Country. The Vice Ministry of VET and Tknika analyse the RIS3 Strategy, and they select those priorities which are relevant for the Basque VET system.



Once these priorities have been selected, a distinction is made between these technologies where the VET centres have knowledge and these technologies where the VET centres do not have enough knowledge.

The Hubs and Tkgune programme have been described above. As for entrepreneurship, there are two programmes which deserve a mention.

1. Entrepreneurship is a compulsory module in all VET degrees in Spain. In the Basque Country, Tknika manages a programme called Ikasenpresa to support the acquisition of entrepreneurial competences of students. It is a programme aimed at assisting teachers of the compulsory entrepreneurship module.
2. All VET centres of the Basque Country are involved in Urratsabat programme. Urratsbat is a programme where VET centres can act as business incubators for former students.

INDUSTRY 4.0, AND DIGITALISATION

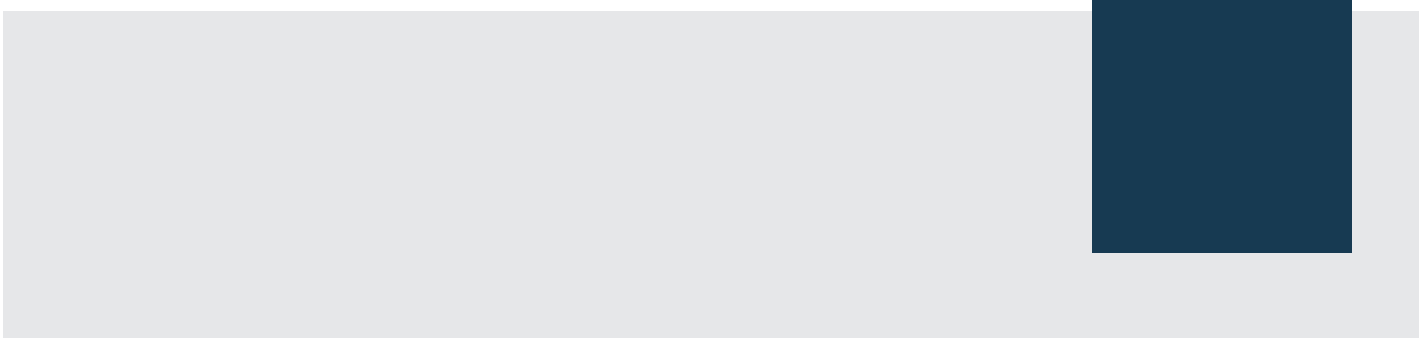
The Vice ministry of Vocational Education and Training has recently written a Digitalisation Strategy for the Basque VET system.

In this Strategy, digitalisation is understood as an overarching issue that should be applied to everything, from school management to teaching.

GOING GREEN, SUPPORTING SUSTAINABLE GOALS

The Vice ministry of Vocational Education and Training has a sustainability strategy for all the VET centres.

Tknika has an area to promote sustainable development in the Basque VET system. This area also works in the fields of solidarity.



Miguel Altuna LHII – Basque Country (Spain)

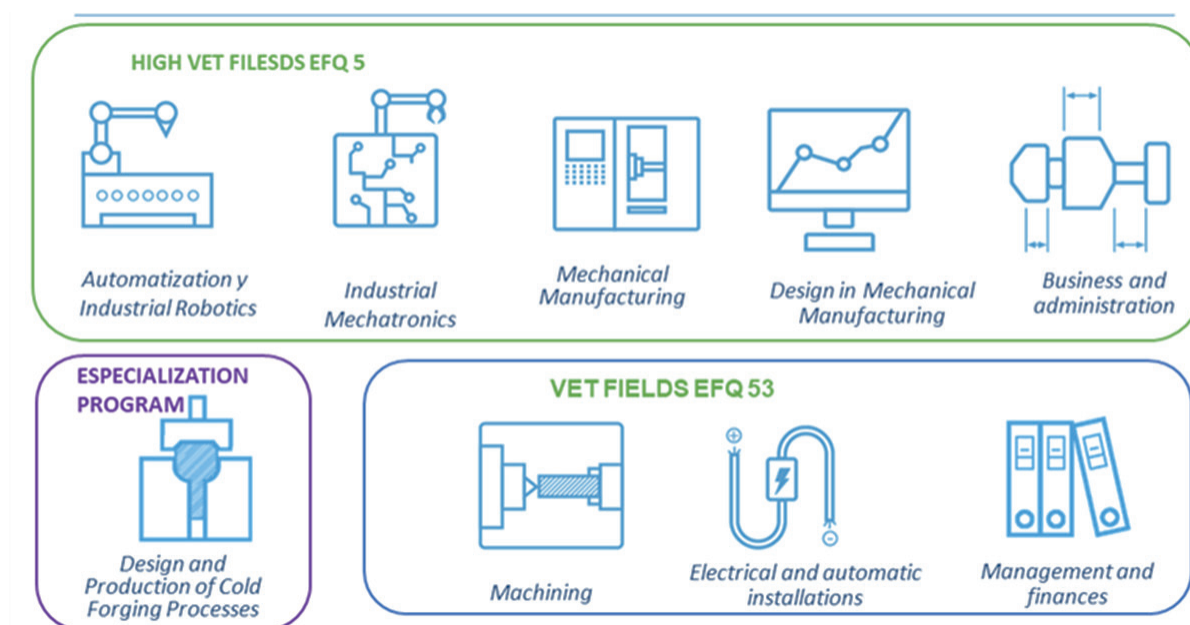
■ City:

Bergara

■ General information:

Miguel Altuna LHII is a Joint State High Vocational Education and Training Centre. Qualified professionals are here trained dynamically, encouraging talent-based learning on each student's personal development. Collaborative methodologies are continually adapted to obtain updated and progressive knowledge. As social agents, our objectives aim at fulfilling society's and companies' commitments through all the resources at hand.

Study fields offered (2020-2021)



Note: Continuous training catalogue and upskilling programmes are not included.

Full info: www.maltuna.eus

■ Number of students (2020-2021):

635

■ Staff:

81

- **Is the centre/school part of a formal cluster or association with another vocational schools/centre:**

Miguel Altuna LHII is integrated in the Basque VET centres' network coordinated and led by **Tknika**, taking part in many actions launched by Tknika.

Ikaslan is an association of all the public VET centres in the Basque Country. There are 3 ikaslan groups, one per province. We are directly part of Ikaslan Gipuzkoa who represents 27 centres; 16 of which are what we call "Integral centres". MIGUEL ALTUNA LHII also collaborates actively with TKNIKA in many activities and projects. TKNIKA is not a cluster, it is a public body devoted to work & collaborates with and for Basque VET centres. In the list I added VET centres with which Miguel Altuna LHII has projects running in 2020.

VET centres with which we collaborate: IMH LHII, Tolosaldea LHII, Bidasoa LHII, Usurbil LHII, Armeria Eskola LHII, Don Bosco LHII, Mendizabala LHII, Iurreta LHII, Zornotza LHII, Txorierri LHII, Mondragon Goi Eskola Politeknikoa MGEP, Goierri Eskola, Maristak Durango Ikastetxea.

At international level, we belong to the following networks: World Federation of Colleges and Polytechnics, UNESCO-UNEVOC, the Transatlantic Technology and Training Alliance, the European Forum of Technical and Vocational Education and Training, Chain 5, and the European Training Foundation Network of Excellence. Most of our VET centres are also becoming involved in these networks.

At regional and national levels, we are members of the Additive & 3D Manufacturing Technologies Association of Spain (ADDIMAT), the Basque Energy Cluster, and the Basque Construction Cluster (Eraikune).

EDUCATION-BUSINESS COLLABORATION, AND COOPERATION

The following statements provide an indication of the different services or processes that are going on in Miguel Altuna LHII VET centre and which provide evidence of development in education-business collaboration and cooperation. The indicators are grouped according to the level of development: Foundational, Developing and Mature.

The fourth group of indicators addresses the extent to which Miguel Altuna LHII has taken on a leadership or coordinating role in relation to other schools or centres.

- Miguel Altuna LHII cooperates with enterprises in diverse actions:
 - Around 250 collaboration agreements signed with companies to carry out workplace training, DUAL training, collaborative project, to provide work placements for learners or visits, train the trainer's activities.
- Representatives from employers are formally involved in school governance, they are included in the Governing Body, Scholar Board.
- Employers are regularly consulted by Miguel Altuna LHII regarding the curriculum. Miguel Altuna LHII collaborates with the Basque organism to develop curriculum, design, and implement new specialization programmes, called IVAC-KEI (Basque institute of knowledge for VET). Employers and their associations are consulted when carrying out those actions.
- The position of "industry collaboration representative" at the centre is occupied by a senior person in Miguel Altuna LHII, leading and coordinating school-industry cooperation.
- Miguel Altuna LHII systematically develops and updates a catalogue of training programmes designed to meet the needs of identified employers for both initial and continuing vocational training.
- Follow-up studies demonstrate that around 80% of graduates enter employment, self-employment, or further study in the sector related to their programme. This figure is even higher for industrial programmes (nearly 90%)
- Enterprises contribute to infrastructure, equipment, or other costs in Miguel Altuna LHII (value of contribution at least € 5000 over last two years).

Examples of a good practice in Cooperation with Enterprise at Miguel Altuna LHII:

- An interesting output of the collaboration enterprise-Miguel Altuna LHII is the opportunity of upskilling teachers and trainers in enterprises. The Basque education department launches every year a call for all VET centre teachers to carry out workplace trainings. Miguel Altuna LHII manages the placement for teachers in workplace individually, finding the companies that better fit their training needs. These training programmes are recognized by the Basque Education Ministry, in teachers' curriculums.

- Collaborative innovation/applied research projects where business-education staff work together. These are usually funded by national innovation programmes.
- Technical services and applied innovation. Teachers of VET centres carry out projects or technical services to companies. This activity is coordinated in a programme called Tkgune, led by Tknika. In some big projects, teachers from different centres can cooperate in the same project giving different expertise. Tkgune projects are private funded. At MIGUEL ALTUNA LHII during 2019-2020 we carried out 21 projects/services.
- Participation of staff from companies in learning activities: some of the challenges/projects carried out by the students of different fields are proposed by companies, real cases. In some specific cases, the staff of the companies can guide the students when working on the challenge/project.

PEDAGOGY, AND PROFESSIONAL DEVELOPMENT

The following statements provide an indication of the different services or processes that are going on at Miguel Altuna LHII and provide evidence of development of pedagogy and professional development.

There is a big commitment with the pedagogy at Miguel Altuna LHII as shown in the following actions:

- Miguel Altuna LHII systematically conducts identification of training needs for its entire staff. These needs are gathered in the annual staff training plan, and training programmes for teachers are launched in accordance. Miguel Altuna LHII plans its own in-service training to achieve its training plan (in addition to participating in external training events)
- Teachers and trainers have relevant industrial or professional work experience which they have either obtained outside of teaching or through placements and training in relevant enterprises. For junior teachers, these placement trainings are especially relevant.
- All teachers at Miguel Altuna LHII regularly practise a range of pedagogies that are appropriate to vocational subjects and to different learners (active approaches like group work, problem solving, critical thinking, role play).

- Miguel Altuna LHII makes systematic use of assessment data to evaluate and improve its own performance.
- Miguel Altuna LHII regularly assesses the needs of all learners and provides special support to meet individual needs (with respect to both learning and wellbeing) where appropriate.
- As a regular basis, teachers collaborate to prepare and support their teachings, using coordination meetings and joint lesson preparation.
- Miguel Altuna LHII evaluates the impact of professional development on the quality of teaching and learning, and the information is used to plan future professional development.

Lead or Coordinating pedagogy activities in collaboration with other VET centres:

- Miguel Altuna LHII supports the development of pedagogy across a group of other schools or learning centres through the offer of in-service training or by sharing instructional materials.
- Miguel Altuna LHII works in partnership with industry, universities, or donors to design and organise in-service training for teachers and trainers.
- Miguel Altuna LHII participates in national or international networks to share good practices or research in teaching and learning.

Example of good practice in pedagogy and professional development at Miguel Altuna LHII

At Miguel Altuna LHII we are using a pedagogical framework called ETHAZI (high performance programmes). All the study programmes are based on challenge based collaborative learning methodology. Teachers are divided in groups by study programmes. The coordination of those groups is essential. There is a pedagogical coordinator, who coordinates the performance of all the groups, the issues that may arise, the needed training etc. From the learners' point of view, there is an assessment tool, including the assessment of transversal skills. TKNIKA has a department devoted to the development of the ETHAZI framework, so there is cooperation among centres using the ETHAZI model, there are specific trainings for teachers, sharing of good practices, a repository of challenges to be used by other centres etc. The ETHAZI framework is a live framework so it is changing and improving. New items are introduced in the framework: interdisciplinarity, digital tools, remote working and so on. COVID-19 has brought new challenges: how to work on this framework remotely. We do not have an implemented methodology to measure and evaluate the impact of professional development on the quality of teaching and learning. It is something we do informally.

AUTONOMY, INSTITUTIONAL IMPROVEMENT, AND RESOURCES

- Miguel Altuna LHII has an independent Board of Governors with some elected members that exercise authority and hold the principal to account.
- The school or centre, in consultation with its stakeholders, has defined its own mission and institutional development plan.
- Miguel Altuna LHII has an institutional quality assurance system that implements ISO9001 and EFQM.

Academic independence:

- The centres can apply for new programmes and can apply to close current programmes, but the ministry is the relevant authority that decides upon the assignment. The administration plans and decides on the educational offer, considering the educational offer and needs, assuring a coherent regional VET offer distribution and avoiding overlapping.
- On the other hand, the centre has the authority to decide for the continuous training offer provided at the centre.
- Miguel Altuna LHII can make some changes to the nationally defined curriculum frameworks or profiles to adapt the curriculum to local needs. The 35% of the curriculum can be adapted.

Staff hiring:

- Miguel Altuna LHII has no authority to appoint its own fixed term staff (for example, part-time teachers, maintenance staff). The appointment of staff follows the regulations of public bodies, assuring transparency and equality of opportunities.
- The centre has no authority to appoint full-time, permanent teaching staff, subject to approval. All the permanent staff goes to public and open examination processes. However, the centre has the authority to appoint different positions among the staff.

Financial aspects:

- Miguel Altuna LHII plans and monitors its own budget, deciding independently how to use the resources. In that sense we can affirm that the centre has appropriate and sufficient laboratories, equipment, infrastructures, classrooms, and workshops which enable it to develop the competences required by employers.
- Miguel Altuna LHII being a public body has to some degree, the authority to enter independently into contracts with other organisations such as businesses, training providers and donors e.g., to buy or sell services or equipment. There is a limitation in the maximum number of contracts and the nature of them.
- Miguel Altuna LHII is funded mainly by the government. However, it can earn and retain income (for example, by selling training services) to fund investments, research, or other activities.
- However, Miguel Altuna LHII has not the authority to take out loans, for example, to fund investment.

LIFELONG LEARNING IN VET

Miguel Altuna LHII has an explicit mission to provide education or training programmes to adults.

Upskilling and reskilling programmes are a priority for Miguel Altuna LHII. Digital and green transitions have accelerated and accentuated that need.

- Miguel Altuna LHII is formally accredited as provider of adult education and is providing various programmes every year. Different kinds of learning-programmes are offered to different kinds of adult learners, to meet their needs
- In that sense, Miguel Altuna LHII systematically supports the development of key competences (including soft skills as well as basic skills) for all learners. The learning outcomes (or competences) from adult skill programmes are assessed using criteria that have been validated by employers (or their representatives).

- Miguel Altuna LHII offers specialised advice on training and careers to adult learners. The centre is also accredited to officially recognize experience-based qualifications. Linked to that, learning from adult skill programmes is accredited, i.e., the programmes lead to diplomas which have value in the labour market.
- More than 50% of the programmes provided by Miguel Altuna LHII are also accessible to adult learners, either as special courses or by joining existing programmes. There is dedicated funding which makes it possible for adult learners to study.
- Graduates from adult programmes are regularly tracked (e.g., by tracer studies) to monitor destinations and/or future learning needs.
- Miguel Altuna LHII provides adult education programmes outside (either partially or fully) of a school environment (for example, in the workplace, online, etc.). Tailored training for companies is included in the centre's offer.

SMART SPECIALISATION, MOBILISING INNOVATION, ECOSYSTEMS, AND SMES

The strategy of Miguel Altuna LHII follows the 5th Basque plan for VET, which is based on the course of action of the RIS3. Some features of Miguel Altuna LHII regarding this topic are the following:

- Miguel Altuna LHII gathers and analyses labour market knowledge (information on employers' needs, research activities, networks, and association). We also take part in a technological observatory about advanced manufacturing coordinated by Tknika. (Manufacturing Hub). All the gathered information is communicated and filtered among the different layers of the organization.
- The centre collaborates with local or regional bodies responsible for local/regional development: regional development agency (DGA) Industrial associations: Enpresare, Saiolan. We are members of ICFG. We also collaborate with business associations and civil society. Lanbide, Mundukide, Adegi, Confebask, Asefi, Sife, Ihobe.
- The centre is involved in activities that help the region to identify priorities for the economic development ("smart skills specialisation"): Enpresare, Saiolan, D2030, Tknika. We also take part in the Basque Innovation Hub, concerning advanced metal forming together with many Basque agents. Miguel Altuna LHII has entered into formal agreements with private and public sector organisations to jointly address local or regional economic needs

Training provision and new study programmes:

- Miguel Altuna LHII has developed or modified its curriculum or the range of programmes that it offers in response to labour market analysis in the last three years: A specialization programme for precision forging was created with the collaboration of several companies to meet uncovered training demands. Currently Miguel Altuna LHII is working on various specialization programmes linked with Smart Manufacturing and digital + green transformations: smart & digital manufacturing, Smart maintenance programmes are in preparation (November 2020). The specialisation programmes offered match the current needs. However, those needs are evolving so fast that they are never fully matched, and we foresee the need to develop more programmes in the future. The aforementioned new specialisation programmes are being designed in cooperation with other VET centres and under the supervision of IVAC.

Entrepreneurship:

- The centre provides enterprise/entrepreneurship skills to learners.
- Miguel Altuna LHII provides a settlement service, called Urrats Bat service as support for new business start-ups. Entrepreneurs can use the centre's premises temporally.

Services to SMEs:

- Miguel Altuna LHII provides training and other services targeting Small and Medium Enterprises (SMEs). We contribute to regional research strategy, among other activities by helping to transfer and apply new knowledge and technologies: We collaborate with many R&D agents and universities to transfer knowledge to SMEs and micro-SMEs. For example, we organized many events for industry and other stakeholders. Technical workshops, study visits, job shadowing etc. We organized an international congress about cold forging in 2019 (ICFG 2019). Members of the staff have recently taken part in an international workshop organized by the EU commission in Brussels. We participate in different EU KA2 projects related to emerging technologies: EXAM4.0, Vetriangle, Fem forging, Dost, Maiatz Simulform.
- The school or centre leads or coordinates building partnerships, for example, by hosting meetings or mobilizing students, for the benefit of the region.
- Miguel Altuna LHII offers technical service and applied innovation service to SMEs, offering its knowledge, equipment, and facilities to SMEs. Staff from Miguel Altuna LHII is particularly devoted to carrying out applied innovation services to SMEs through the programme called Tkgune (coordinated by Tknika) and partially funded by the regional government.

INDUSTRY 4.0, AND DIGITALISATION

The following statements provide an indication of the different services or processes that are going on at Miguel Altuna LHII and which provide evidence of development of capacity to address Industry 4.0 and digitalisation.

The school or centre develops the digital skills and competences of learners. Most teachers and learners use digital learning environments or systems for learning and assessing (Moodle, Microsoft 365, classroom, etc.). The Digital Competence (DC) of staff and learners is benchmarked by using inner assessment tools. An explicitly defined set of Digital and On-line Skills are taught to all learners as part of their key competences. In that sense, Miguel Altuna LHII promotes and uses Open Educational Resources. We also ensure safety, privacy, and a responsible behaviour in digital environments.

Digitalisation plan

Miguel Altuna LHII develops digital competences of all staff, in line with the institutional development plan or the workforce development plan. In that sense the Basque Government is to publish the new digitalisation plan for all VET centres of the region. It is a very detailed and holistic plan covering many relevant aspects of the digitalisation in VET.

Nevertheless, Miguel Altuna LHII has its own digital strategy, totally aligned with the regional DIGITALISATION plan. Furthermore, we carried out medium-and long-term plans to ensure that the development is in line with pedagogy and curriculum.

Provision

DIGITALISATION of the educational offer. Online methods have been obviously accelerated during Covid-19 times. We use online learning, but it is not our main goal. We focus on face-to-face and hands-on training. Online tools are a support to complete training, but they do not replace face-to-face training, at least until Covid-19 arrived. A big issue online training brings about is, how to carry out the practical classes. In some programmes it is not possible to offer %100 of the contents online. It is important to distinguish digital and on-line skills and distance learning skills. We cover explicitly defined digital skills but so far, the main part of the training activity is carried out in our facilities. Students must use digital and on-line skills to co-work with other students and teachers.

At this stage, complementary training options are being developed and used. Miguel Altuna LHII uses digital and on-line learning to provide work-related situations (for example, video simulations, business games, videos of workplace, VR). All learning programmes develop the so-called digital competence so learners can use up-to-date industrial technology, e.g. CAD, CAM, 3D printing, ERP, cloud etc. The centre provides specialised profiles (qualifications) that explicitly address digital competences relevant to Industry 4.0. (robotics, AI, automatization, data scientist).

It is worth mentioning that Miguel Altuna LHII is participating in a collaborative project with 4 other VET centres led by TKNKA, called “Taller 4.0” meaning LABs 4.0 with the objective of developing digital LABs to further transfer the results to the rest of the Basque VET centres. The Exam 4.0 project is an example of development of digital skills.

GOING GREEN, SUPPORTING SUSTAINABLE GOALS

The following statements provide an indication of the different services or processes that are going on in Miguel Altuna LHII, and which provide evidence of development of skills for a green and sustainable economy.

Miguel Altuna LHII addresses explicitly sustainability issues in its institutional strategy, with respect to energy, curriculum, and consumables but we are at an early stage of implementation. A strategy for holistic green transformation is under development but not implemented yet. There is a responsible for green transition at the centre and some awareness raising activities such as campaigns to reduce and/or carefully manage waste, have already taken place. However, we do not audit and control the environmental footprint.

There is a new project to be implemented to measure and monitor energy consumption of the machines in the manufacturing LABs. There are also some actions running with IHOBE (Basque Institute for Environmental Management) which supports the Basque Government in the implementation of the environmental policy and in the expanding of the environmental sustainability culture in the Basque Autonomous Community.

Provision

The learning programmes provided include competences that are relevant to make the economy sustainable ('green skills'), for example, knowledge about energy conservation, skills in waste reduction. We offer trainings in green energy, photovoltaic, electric batteries and other that explicitly address a current or emerging green occupation. However, we do not provide learning programmes which address sustainability directly, meaning that the core of the learning is sustainability management or similar. Our learners address sustainability related topics as a transversal subject within other study programmes.

Da Vinci College – Netherlands

■ City:

Dordrecht

■ General description:

Da Vinci College is the result of a lengthy process of mergers between a great number of smaller educational institutions. This process was initiated in 1988 by the Dutch ministry of education. Nationwide, there were some 400 smaller sectoral vocational colleges, schools for Dutch as a second language, schools for general adult education etc. The intention was to reduce the number of institutions to some 50 regional colleges for VET and adult education, for purposes of efficiency and building a more powerful system. In 1995 Da Vinci College was officially registered as a so-called roc (regional centre of education). The college has four sectors: Technology and Media, Health and Care, Business and Entrepreneurship and Participation. The executive board is also responsible for a university of applied science (level 5 / 6).

There are about 7,800 VET students, and some 850 educational and support staff.

EDUCATION-BUSINESS COLLABORATION, AND COOPERATION

In our VET courses, Da Vinci College has a great many contacts with companies because internships and obligatory practical experience are part of every course. In a full-time course, students will gain practical experience during annual periods, alternating between school and work. In the work-based route, they will normally attend classes one day a week, and the rest of the week they will be working for a company.

Da Vinci College is an independent school, so companies do not own the school, and neither are they directly represented in the school board. The governing body consists of seven people, recruited from different parts of society. The Executive Board consists of two persons who have no direct ties to companies, but who do operate in different business networks. Each sector of the school has its own management team, who are responsible for the education provided and for maintaining contact with business, industry, and institutions.

The region in which Da Vinci College is active has some 300,000 residents. The main city is Dordrecht with 120,000 residents. We are in an area with a lot of maritime industry (e.g., shipbuilding, but also collateral companies), two large care organisations and a great many logistics companies. Companies vary in size, but there are a great many SME's. The Dutch VET system has a national curriculum set in qualification files. However, there is room for regional influence on the courses we offer. The system also has modules students can choose in addition to their main training. In some respects, these may lead to separate certificates. In our courses, we try to adapt the content to the requirements of the regional companies and local authorities. Though we try to provide sufficient workforce for the companies and institutions, there are quite a few gaps between supply and demand.

Our funding comes from several sources, the main one being the national government that pays a certain sum per VET student. 80% of government funding is based on a system of input funding, depending on the number of students counted in October. This money is paid slightly over a year after the counting date. 20% of government funding depends on the number of students getting their diploma. Part of our funding depends on the agreement made with the national government about working on the national Quality Agenda. After 2 and 4 years, the results are assessed, and a decision is made whether we receive the money for the Quality Agenda. A second source are subsidies for different goals such as the prevention of early school leaving. We may also acquire grants from the city, the province, special funds, or Europe. For the courses of Dutch as a second language, we have to compete with other providers in a tendering system. We also offer contract education, which is paid for by the parties asking for it. Our university of applied science is a private institution that receives no money from the government. Occasionally companies are willing to donate equipment to the school, e.g., a car for the automotive department, or a welding robot.

Da Vinci College is a member of the national board of VET providers. We cooperate with other schools in various networks, sharing knowledge. The pre-VET schools sometimes ask Da Vinci College to provide parts of technical education in their schools. We also have VET students working together in projects with students from higher VET. Our university of applied science has recently started a cooperation with the Amsterdam VET centre, who will become co-owners. Together we shall be offering mixed courses of VET and HVET, and associate degrees (level 5).

We participate in several European projects as a partner, and in some as lead partner. One of these is Edutrans, a project on energy transition. Each partner will develop two (mobile) models for a particular type of energy, and the curriculum associated with these models.

PEDAGOGY, AND PROFESSIONAL DEVELOPMENT

Our courses are offered by qualified teachers and practical instructors for the core subjects. The more general subjects are taught by teachers qualified in these subjects (e.g., Dutch, civil studies, arithmetic, and English). Each student has a personal counsellor, who is responsible for monitoring progress and for quarterly assessment. During his career, a student may have different counsellors, which is a point for improvement. Curriculum experts are responsible for the guidance of teams in curriculum development. They have had special training to do so. The student service centre caters for students with special needs. They do this in combination with the regular courses attended by students.

The learning strategy is a mix of “straight” classroom teaching, involvement in projects (e.g., in civil studies), challenge-based learning especially in Technology, and online learning. In health care students often get their training in “learning wards”. Since the outbreak of Covid 19, there has been a huge increase in online learning, since our schools were (partly) locked down and we cannot receive the same numbers of students in our buildings as before. Our strategic plan contains goals on developing hybrid learning environments and hybrid education. The different sectors of the college are at different stages of development in this respect.

Apart from teachers who have had regular teacher training, there is an increasing number of staff who have either worked in companies, or who are still working there. If an incoming teacher or practical instructor is not yet qualified, he has to attain a pedagogical certificate within a set time to be able to continue working. Da Vinci College has its own training academy that annually offers a wide range of courses and masterclasses to our staff. Part of the assessment of staff is that they show that they have been working on their own development. In HR, we strive for the composition of hybrid teams so that the concept of hybrid education and hybrid learning environments is strengthened.

Our teachers work in multidisciplinary teams, sharing the workload. For most students English is offered in a specialized language centre. Teachers of Dutch, arithmetic and civil studies have their own internal networks, but they are part of the different teams. The Da Vinci wide department of educational strategy and quality monitors development in these fields, offers guidance in curriculum development, and helps teams to improve quality standards and culture. The members of the department work in the service itself and in the different educational sectors. They also aid in preparing the audits of the educational inspectorate.

The challenge-based projects in technology are usually the result of contacts with companies and they are based on realistic problems that need to be solved. Teams of students take on the assignment and regularly meet the “client” to discuss progress and solutions. They are guided by teachers and will acquire “just-in-time” knowledge for continuing their project.

The teams responsible for the courses discuss students’ progress in regular meetings and are responsible for issuing a “binding study advice” in the first year of studies. This may be negative, meaning that the student will have to leave the course and will receive guidance for finding a more suitable course, being aided by the student service centre’s career counsellors.

The national government introduced the concept of appropriate education, which means that schools must work on integrating students with special needs. Some 25% of our students annually use the services of the student service centre, for a wide range of (multiple) needs. The issues they must deal with vary from behavioural problems, early pregnancy, dyslexia, psychological problems, addiction, and crime etc. Apart from this, we have also set ourselves strategic assignments for inclusion and diversity.

AUTONOMY, INSTITUTIONAL IMPROVEMENT, AND RESOURCES

The four-year strategic plan for 2019-2022 is called 'Breaking borders'. The national Quality Agenda is part of the strategic plan. We consulted regional stakeholders when drawing up the plan. Though we are a school mainly funded by the national government, we have the authority to enter into agreements with all kinds of parties. We receive government funds in a "lump sum", so there are no strict regulations for spending the funds on prescribed purposes. We do have to account to business accountants who monitor whether the money is spent efficiently and in concord with the purpose of VET.

We are not allowed to use public money for private purposes. The other way about is possible: we can use profits from private activities to improve public education. We are a not-for-profit organization, so the money we gain from for instance contract education is invested towards further development of the college.

As far as HR is concerned, we have the freedom to hire the staff we need. The qualifications required are monitored, but we have the authority to decide as a school who we hire. This may also be temporary staff from employment agencies or independent professionals.

We have entered a great many co-operations with business and industry, other schools, local government, and other parties to create hybrid learning environments or projects that may be beneficial to our students.

LIFELONG LEARNING IN VET

One of the mainstays of our strategic plans is Life-long development. We have concluded that an extra impulse is necessary for the college in this respect. We have appointed a project manager who is responsible for increasing the number of students participating in courses for re-skilling, upskilling and contract courses. She will coordinate the activities from the sectors and stimulate the development of a vision on life-long development. We are convinced that in the near future regular VET students will not be able to fill the gap between supply and demand on the labour market. We need to tap into target groups such as people with a distance to the labour market, non-traditional student groups such as refugees and immigrants, people already working but in need of further training etc. As a society, we cannot afford to leave people out in the cold. This is an assignment that requires the cooperation of all parties involved. Public VET institutions have a particular assignment. Now too many students leave the college either with or without a diploma and continue their way without being in contact with the college. Life-long development requires a recurrent contact with the college and frequent participation in upskilling or reskilling. We believe we should not let this just be the territory of private education.

SMART SPECIALISATION, MOBILISING INNOVATION, ECOSYSTEMS, AND SMES

We think analysing the market is vital for VET, but that there is quite some room for improvement. We have no department dedicated to doing so. Several staff members are very active in the marketing side of public relations and in innovative networks. Our Sustainability Factory is a hub for an increasing number of stakeholders. It is one of the Dutch Smart Industry Field Labs and vital in the development of our regional campus. It is the place where representatives of VET, local government, business, and industry meet on a regular basis.

It is also the place where start-ups may find a base for their own further development, being supported by services from the college or by the interaction between stakeholders who are willing to share knowledge and expertise irrespective of competition.

Last year we also started the Centre for Entrepreneurship, which will have a similar purpose as the Sustainability Factory. This centre will concentrate more on the non-technical sectors.

Curriculum development at Da Vinci College involves taking account of regional developments and needs, government regulations and international developments. There is a fine line between the set curriculum and the requirements of our business partners.

We feel it is necessary to break the borders between these parties and be creative without transcending the regulations. Especially in these Covid 19 times, thinking outside the box is required. This takes some nerve and conviction, but it is better than just passively waiting what will come next.

INDUSTRY 4.0, AND DIGITALISATION

Da Vinci College uses a mix of live education and online digitized activities. Microsoft Teams is an important tool for reaching out to students and keeping the educational process going. GDPR rules are being implemented. In the courses a variety of applications is used to support teaching or collateral processes.

In various projects, AR and VR are being implemented, for instance in health care, a crossover project with the technology department. The technology department makes frequent use of virtual welding machines to improve training without having to invest in welding equipment. In the Sustainability Factory there is a mix of equipment and facilities that enable the interaction between education and industry, between students from various courses and backgrounds and that facilitate different kinds of start-ups. The setting is an important ecosystem for (H)VET and a base for further development of the regional campus. The Da Vinci campus started in 2007 with the official opening by the present queen Maxima and is still developing into an ecosystem involving an increasing number of parties.

GOING GREEN, SUPPORTING SUSTAINABLE GOALS

This is a global issue in which we as a VET college have an important role. The college has taken measures concerning recycling and waste disposal. We are working on the raising of awareness, but the ETF questionnaire has made us aware that a structural approach is still lacking. The structural education on green issues in our courses is up for improvement. In several (international) projects this is a basic issue, but we need to incorporate these more into our daily activities. We have discussed making an inventory of our sustainability activities and linking them to the world-wide sustainability goals. This will be an important incentive to our performance as a sustainable organization.

We are aware that this is a strategic issue for the next few years and that the Sustainability Factory can be an important stimulus to further awareness. It is especially from our international involvement that we will profit from our partners' experience.

■ City:

Stuttgart

■ General information:

The '**Baden Wuerttemberg Cooperative University DHBW**' is the largest University of this Federal State, serving about 34.000 students with a broad range of undergraduate study programmes (EQF6) in the fields of business, engineering, and social work. In addition, DHBW offers postgraduate degree programmes with integrated on-the-job training (EQF 7). All degree programmes are both, nationally and internationally accredited (System Accreditation by ZEvA) and are rated as 'intensive study programmes' worth 210 ECTS credit points.

One of the special features of the DHBW is the **fully integrated system**, comprising academia and business as well as the public sector working together to provide study programmes. A balanced representation of the main stakeholders is guaranteed by a unique example of legislation: The constitution of DHBW is designed to ensure an equal partnership between the world of work and academia, respecting the governance of an academic institution at the same time. Another important aspect of the DHBW concept is the ability to implement cooperative research projects, thus tightening the bonds with the Dual partner enterprises and institutions eventually bringing academic studies on a more up-to-date level.

In sum, the focus of DHBW is on **working-lifetime employability** through enabling learners to gain holistic job-related experiences. Half of the study time is spent with the Dual Cooperation Partner, following a clear curriculum, similar to the university-based study period. Students' research projects derive from real issues identified during practical phases. Partner companies or institutions must meet requirements in terms of personal and technical equipment, as well as regarding their commitment being members of the DHBW and, truly important, with respect to the support provided for students. Like professors, Dual Partners can participate directly in the development of the Cooperative University. Equally, students are part of governing committees.

Is the centre/school part of a formal cluster or association with another vocational schools/centre?

The university's official seat is in Stuttgart. Based on the US State University System, the organization structure of DHBW is unique in Germany for it comprises both the central (DHBW headquarters) and the local level (DHBW locations and campuses). Throughout its **nine locations** and **three campuses**, the university offers a broad range of undergraduate study programmes in the field of business, engineering, and social work.

The so-called 'Dual Universities' in Germany are mostly public institutions, which provide a system of shared responsibilities between

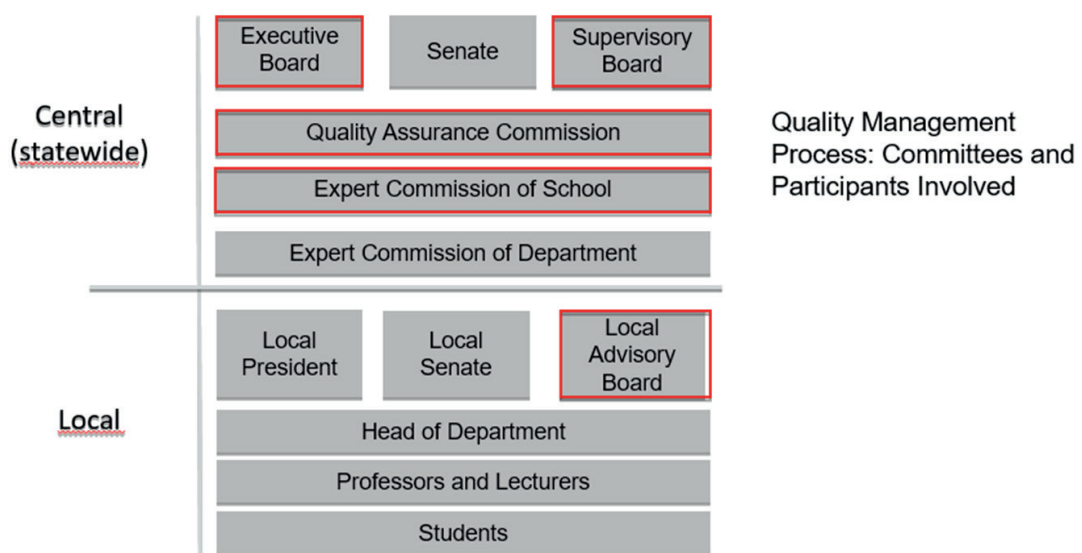
- a) the public authorities, providing for academic teaching and learning, and
- b) private (or public) companies or institutions.

The latter take care of the practical aspects of the training and pay a salary to the student, who is considered an employee with special working conditions. Such joint initiatives are not very common across Europe, because they can only exist if a country's prevailing economic conditions allow for a robust base of industries and trade, sustained by a mix of big and small companies. Industries' readiness for cooperation and investment in terms of education or upskilling of staff supports the development of Dual Study concepts.

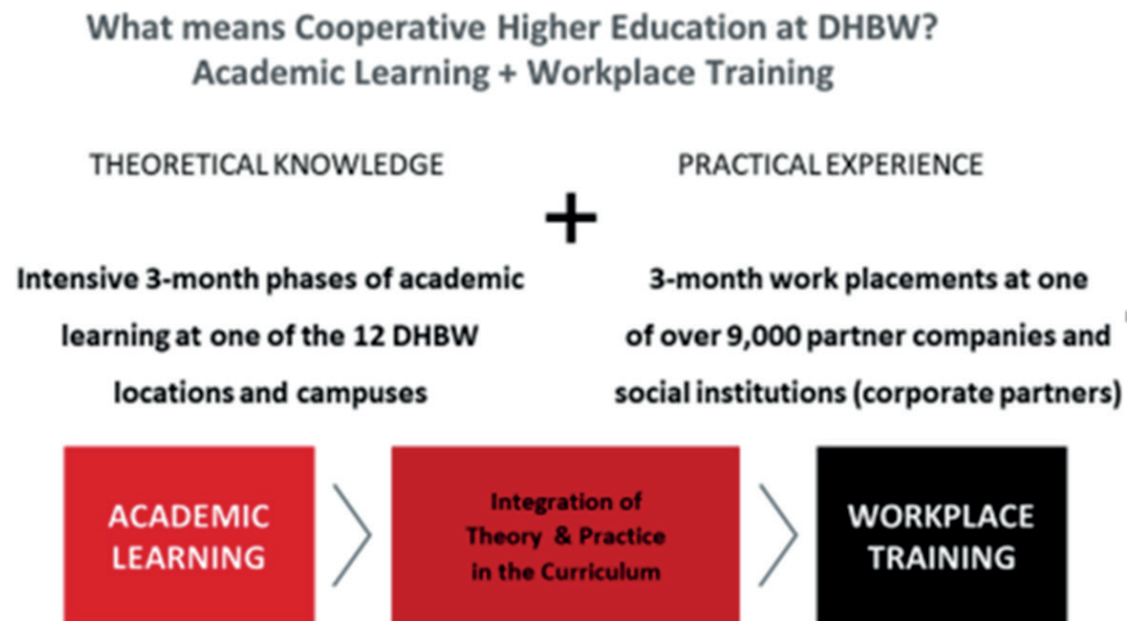
EDUCATION-BUSINESS COLLABORATION, AND COOPERATION

The DHBW welcomes cooperating companies and social institutions as equal partners to the university. All partners work together to continuously develop and improve the 'dual study concept' and to achieve mutual goals. The **dual partner companies are declared factual members of the university through the university law of the state of Baden-Wuerttemberg.**

Organizational structure of DHBW as a State-University



The dual partners select their students themselves and, as members of the university, they are responsible for the practice-oriented part of the studies. A high intensity of the cooperation between the university and the dual partners exists through personal contact and institutionalised collaboration in committees. Via the committees the partners can participate in important university decisions.



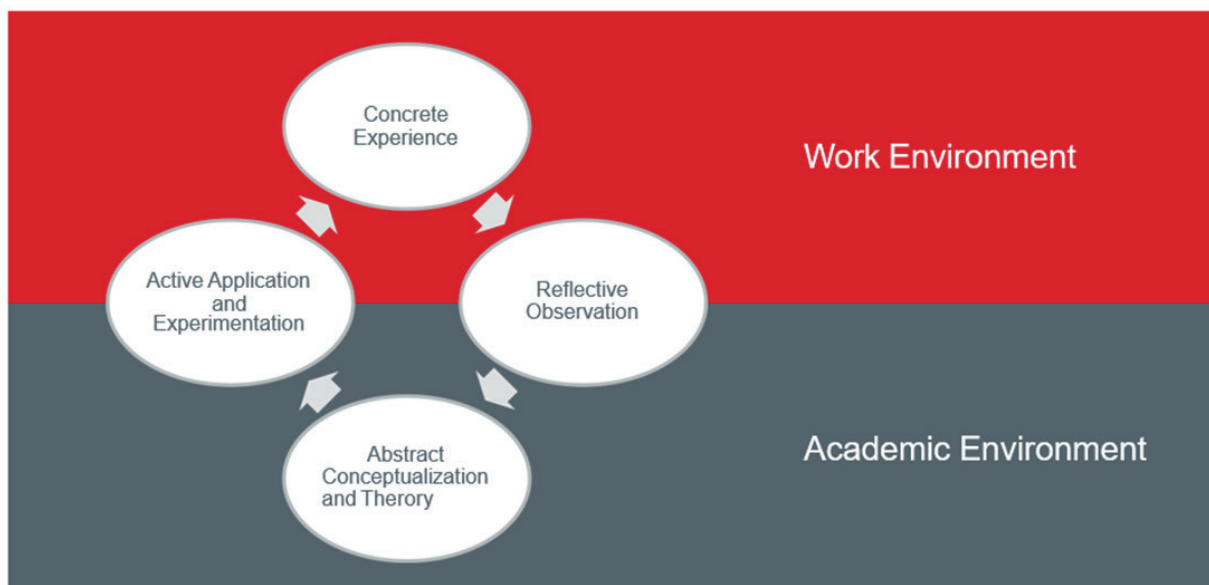
This collaboration guarantees a high academic standard and a focus of the actual needs of the labour market with a curriculum that combines higher education and on-the-job training. Due to the professional expertise acquired during the training phases, the students can carry out challenging field-related tasks directly upon graduation and do not need further training. Given this combination of **academic skills** and **applied knowledge**, the graduates can work in any type of industrial enterprise, in any field of business activity, and at any level of corporate hierarchy.

DHBW cooperates with numerous universities and enterprises worldwide. This gives our students the opportunity to spend part of their studies (either theoretical or practical) abroad. By adding more internationally oriented degree programmes, DHBW has responded to the increasing demand for internationalization. No matter in which sector one works, internationally trained employees are in great demand.

PEDAGOGY AND PROFESSIONAL DEVELOPMENT

Learning at DHBW, no matter on which level of graduation, aims for gaining action competences, personal skills, and competences, as well as social competences. Within the given academic programme settings, competence specifications are outlined for every subject. This process is based on the constitutional co-operation of academic staff and partners from the world of work. The periodic change of learning environments, partly in university, partly in one of more than 9000 enterprises and institutions (Dual Partners), confronts students with challenges beyond common academic study experiences. Synergy of theory and practise provides for a holistic experience. In the end, the applicability of learning achievements in real work situations guarantees relevance and quality of learning subjects, which serves the strong focus of the Dual study system on general employability of graduates over work-lifetime.

DHBW TEACHING AND LEARNING MODEL



* Kolb, D. (1984). Experiential Learning: experience as the source of learning and development. Englewood Cliffs, NJ: Prentice Hall. p. 21

The first step towards a Dual Bachelor study course is the choice of a study programme of one of the schools (business, engineering, social work), offering a broad variety of 27 Bachelor programmes in over 100 disciplines.

DHBW: Three schools with a wide range of study programs

DHBW Business School	DHBW School of Engineering	DHBW School of Social Work
<ul style="list-style-type: none"> • Business Administration • Accounting, Taxation, and Commercial Law • Business Information Systems • Media • International Business Management • 	<ul style="list-style-type: none"> • Electrical Engineering • Computer Science • Mechanical Engineering • Mechatronics • 	<ul style="list-style-type: none"> • Social Management • Social Work in Healthcare • Social Work: Long-Term Care and Rehabilitation •

Please see our [website](#) for the complete list.

During the three years of Bachelor studies, manifold aspects provide for benefits for DHBW students, as there are: small classes, personal care by professors, lecturers, and the Dual partner's mentor in charge, as well as contact with experts of these collaborating companies. A further advantage is the financial independence and excellent prospects for future jobs. 85% of the Dual Bachelor students sign in for a regular employment contract even before having finished their degree. Students receive projects and assignments according to their growing abilities and deepen the combination of academic skills and applied knowledge. Eventually, they graduate with favourable opportunities in any field of industry, business, or institution.

Advantages of the Cooperative Higher Education System at the DHBW

- Interlocking of Theory and Practice

Bachelor's degree Programmes involve about three-monthly study terms that take place on campus and which alternate with internship terms of about the same length. A course of study at the DHBW lasts three years (six semesters). The theoretical content is composed based on the requirements in practice and the entire training programme and is fine-tuned after consultation with Dual Partners. This communication ensures that the students will receive a well-rounded education. Students obtain academic degrees, and, in addition, the theoretical material covered is further supplemented and consolidated via practical experience.

- Condensed Learning

DHBW Bachelor Degree Programmes have been awarded the maximum of 210 ECTS Credits due to condensed learning plus synergy effects through dovetailing of theory and practice. Moreover, small classes of about 30 students guarantee close supervision. The period of study is highly concentrated and effective, providing graduates with a very broad experience of professional practice that will enable them to find a footing in working life quickly and easily. Besides attaining specialist knowledge required for their future professions, students have the chance to acquire a high degree of social competence.

- Experienced Teaching Staff

In addition to the permanent faculty of the DHBW, teaching is in the hands of highly qualified lecturers from renowned technical colleges and universities of international standing as well as expert professionals in particular fields in Economy and Engineering. This well-balanced combination of teaching expertise ensures that lectures and seminars are characterized by a high degree of practical relevance and a close focus on the latest academic developments.

- International Orientation

The international focus of the courses offered by DHBW reflects a keen awareness of the increasing pace of the globalization process. In addition to a solid grounding in business management, economics and crucial social skills, students attain a high level of competence in foreign languages and intercultural affairs. To consolidate these aspects, we actively encourage our students to gain experience abroad, either with a theory semester at one of our numerous international partner universities or with a Summer School or International Semester at DHBW.

- Outstanding Career Prospects

After three years of partaking in this programme, the students' prospects are excellent. Roughly 90% of the students sign employment contracts with their training companies after graduation. Numerous DHBW graduates are now to be found in the boardrooms of well-known companies. Independent studies have shown that DHBW graduates can expect their subsequent careers to progress more rapidly than the average graduate. According to a study made by the IBM, graduates of the DHBW aged between 30 and 44 years have not only risen higher on the career ladder than former students of the same age with a degree from a university or technical college, but they also have a higher income.

- Financial Independence

Students possess an employment contract involving monthly salary throughout the entire study period of three years and insurance status of normal employees. Thus, anyone pursuing a course of study at the DHBW is, at the same time, a company trainee. Throughout the duration of his or her studies, the undergraduate will be receiving a monthly income from this company and will therefore be able to concentrate fully on the required course work.

AUTONOMY, INSTITUTIONAL IMPROVEMENT, AND RESOURCES

After all, Professional HE at the DHBW is characterised by the fact that its education and certainly its study programmes are shaped by specific professional goals or needs, in which the contexts of the future professions are clear and the learning outcomes are defined by the professional needs, in terms of integrated competences (HAPHE Consortium, 2013).

DHBW is playing a considerable role as an intermediary education system between HE, VET, and the labour market, classified as an PHE institution, DHBW has its roots in both, the academic and professional higher education area. They are key actors in the process of a better cooperation and understanding between Higher Education and the world of work.

Following the tradition of cooperative study, the dual partner companies and the DHBW programme management are involved in curriculum development and revision as well as in mentoring of the student during practice periods and partly during the final thesis. The DHBW is responsible for the assessment, however, can share this task in some respects with the Dual partner.

The following requirements for German Dual PHE programmes are eligible for the DHBW:

1. Applicants must be generally eligible for HE admission.
2. Involvement of companies in the recruitment process has to be documented and is part of the accreditation.
3. Bachelor programmes last three years and offer 210 ECTS credit points:

at least 120 ECTS credit points for theory and at least 30 ECTS credit points for practice.

4. There is a clear relation between theory and practice. Academic relevance of practice has to be proved. Practise learning should follow the standards set by AppQ, a joint EU project for ensuring sustainable apprenticeship phases:

<https://apprenticeshipq.eu/about-the-project/#/>

5. The programme includes a final thesis with 6 - 12 ECTS credit points
6. The overall annual working time of students (academic workload for work and study, plus any additional work for the company) has to be “reasonable”.

(No mentioning of any limit, but information from some institutions indicates an average of about 2.000 hrs per year, which is clearly more than the typical full-time employment).***

7. Each faculty has to meet criteria for regular Universities of Applied Sciences, e.g., at least 40 % of teaching needs to be provided by employed professors. This is a precondition to guarantee institutional research activities and simultaneously creates options for profound and intensive student mentoring.

8. The existence of a Quality Management System for the cooperation of the two different learning environments has to be proved, as well as a thoroughly described mentoring and counselling system (during practise) for students.

All programmes should follow the Bologna Process Criteria for HE:

https://ec.europa.eu/education/policies/higher-education/bologna-process-and-european-higher-education-area_en

Cooperative Higher Education: Theory and Practice Integrated

THEORETICAL KNOWLEDGE

- At DHBW, academic knowledge is conveyed by more than **700 full-time professors** and **9,000 associate lecturers**.
- This guarantees that the students are provided **applied** and **up-to-date knowledge** from the chosen professional field.



PRACTICAL EXPERIENCE

- Work placement at one of over **9,000 partner companies and social institutions** enables the students to reality-test their careers.
- As a result, co-op students have a clearer **sense of their career objectives** than the students from academic universities.

With this strategy, DHBW provides a route to sought-after academic qualifications while enabling students to gain extensive practical experience. This allows DHBW graduates to take on challenging tasks early in their professional pathways, helping them to launch their successful careers. DHBW welcomes partner companies and social institutions as equal partners to the university. All partners work together to continuously develop and improve the 'dual study concept' and to achieve mutual goals.

COOPERATIVE MASTER STUDIES AT DHBW CENTRE FOR ADVANCED STUDIES

The advanced Dual Study programmes of DHBW Centre of Advanced Studies (CAS) offer academic, research and practical training for graduates who could gain at least one year of relevant work experience in a regular job. One of the crucial requirements is an existing employment contract providing for broadening, expansion and complementing of newly acquired knowledge and skills. The Dual Partner has to make sure that real (research and work) projects as well as personal and professional support of the student is provided for. The other essential requirement is a bachelor's degree in a matching subject area with 210 ECTS credits with a final grading of minimum 2.5 (German level) or at least ECTS classification A or B. It is not relevant which type of HE institution granted the degree, only the credits count. If the obtained bachelor's degree is worth less than 210 ECTS points, certain basic modules have to be completed before embarking on the Cooperative Master study.

Non-native speakers benefit from a very good level of German language to follow the Dual Master course content and to participate in both classes and work communications, in a qualified manner. Only some Cooperative Master Modules are implemented in English so far.

The next step is to choose a suitable study programme from the currently 22 Dual Master courses offered by CAS in three schools (business, engineering, social work/healthcare), which relates to the current occupation. Besides the basic subjects, the Master student then chooses from a large variety of modules, including soft skill units, for configuration of a tailored programme. A compulsory consulting session with an expert from CAS ensures the suitability of choices. Dual Master programmes at DHBW charge tuition fees, depending on the course (in between 3,000 and 9,000 € per year). Students can either start on 1st of April or 1st of October (CAS 2019).

The alignment of a Dual Master course with the needs of the student, is guaranteed by some features differing from Cooperative Bachelor programmes (DHBW 2019):

- continuous real-life occupation in the Dual Partner company or institution, interrupted by three-day academic units once a month (<-> three months blocks)
- individual choice of modules in addition to core subjects (<->rigid structure),
- full employee status (<-> trainee status),
- extendable standard period of study, 2 years or more (<-> 3 years fixed),

- flexible groups depending on learning modules (<-> fixed groups),
- study fees for all Master students (<-> study fees for Non-EU citizens only),
- large diversity in pre-Master experiences of students (<-> rather homogenous prerequisites),
- different venues for teaching (<-> in one place).

The benefits for Dual Master students at CAS are obvious from this enumeration. Personal exchange and knowledge sharing in small learning groups (peer to peer learning) build the essence of study times within the career integrated extra-occupational Dual Master studies. Cooperative research provides for skills and knowledge related to complex cause-effect correlations as they occur in work-related issues. However, for (international) Dual Master students, it might be challenging to manage the workload of combined work and study as well as the variety of learning groups in different places (only 50% of courses are at CAS, Bildungscampus Heilbronn). Yet, the diversity within the Dual Master student community coupled with different locations offers excellent learning opportunities.

After having acquired a Cooperative Master's degree from CAS, students are able to assume more responsibility and often are designated to take on higher or specialist positions in their respective companies. Some employers account for the study fees, knowing that investment in qualification of employees is a crucial factor to keep them on board. On the long term, this contributes massively to maintain and increase competitiveness.

INDUSTRY 4.0, AND DIGITALISATION AT THE DHBW AND ITS PARTNERS

Industry 4.0 is the convergence of the real and digital world, in which people, machines and industrial processes are intelligently networked. This DIGITALISATION of industry is dramatically changing how we produce, manage and work: Intelligent machines coordinate production processes independently, service robots cooperate intelligently with people during assembly, and intelligent (driverless) transport vehicles handle logistics orders independently.

Students at the School -Business Administration Industry and Engineering at the DHBW are involved in this exciting process, which will be a success factor for German industry. In addition to the IT challenges, students will learn about the diverse business requirements associated with the goal of a so-called smart factory: business and value-added processes are being redesigned and made more flexible, customers and business partners have to be integrated into operational processes, and products and services are new developed, human resource management will change.

Focus of the DHBW School: Business Administration courses

- Materials and production management,
- Logistics
- Finance and accounting
- Marketing as well
- Human Resource.

The imparting of specialist knowledge is supplemented by the targeted development of overarching key qualifications such as general business administration, law, mathematics, and statistics as well as business English.

Special features of Industry 4.0

In the first four semesters, the IT basics required to understand Industry 4.0 are first developed. Building on this, business administration and IT skills are brought together in the main course and specific topics related to digital value creation are taught as part of a compulsory elective module “Industry 4.0”.

If the electronic business / information management major is also chosen as the second elective module, the students can acquire further knowledge related to Industry 4.0. Alternatively, one of the four classic business functions can be used (see above).

The development of methodological and social skills is also very important. These include events on project management, rhetoric, presentation, moderation as well as negotiation and acquisition methodology. The curriculum is rounded off by the application of management simulations and the integration of smaller empirical research projects.

GOING GREEN, SUPPORTING SUSTAINABLE GOALS

So far, we have not coupled this topic of going green with the activities for Industry 4.0. There are several lectures that deal with the topic. In the lectures on automation or robotics it is a marginal topic. We deal with e-mobility and the associated infrastructure. There is still a lack of networking, and too much interlocking is also counterproductive. For the further development of our laboratories, we will include the topic of energy management. In our learning factory, we will install modules for energy management and sustainability in accordance with VDI5600.

In addition to sustainability, the focus is also on reliability, resilience, and safety as well as security.



STUDY PROGRAMME CHARACTERISTICS

DHBW Business Administration

NAME OF STUDY PROGRAMME 1:	BUSINESS ADMINISTRATION
Website link:	https://www.dhbw.de/english/programmes-listing.html#course-0
Name of implementing university:	Baden Wuerttemberg Cooperative State University Heilbronn (DHBW)
How is DHE defined/understood at this university?	Students study alternately for three months at DHBW and at their Dual Partner (employer) and thus receive integrated theoretical and practical content.
Implementing faculty/department:	Faculty of Business
	22 Business Administration study programmes in 10 locations in Baden-Wuerttemberg (one of 16 Federal States of Germany)
Joint or double degree? Yes/no – if yes, please indicate.	No
Please indicate the occupation of graduates from this programme (e.g., IT engineer, physiotherapist etc).	Management positions
Please indicate economic sector where graduates are typically employed (e.g., banking, insurance, construction, health etc.).	All business sectors: industry, trade, banking, insurance, IT, service companies, consulting, etc.
Degree upon completion:	Bachelor of Arts (B.A.)
Education programme (EQF level):	6
Type of programme (HJET, PHE, HE):	PHE
Obligatory external accreditation of the programme: Yes/no	Yes
	In 2006, the German Central Agency for Evaluation and Accreditation (ZEvA) accredited all study programmes of the Baden-Wuerttemberg Cooperative State University (DHBW). In July 2008, ZEvA validated the programmes as intensive degree programmes with 210 ECTS points. In 2011, DHBW was the first university in Baden-Wuerttemberg that obtained the system accreditation by the Central Evaluation and Accreditation Agency (ZEvA).

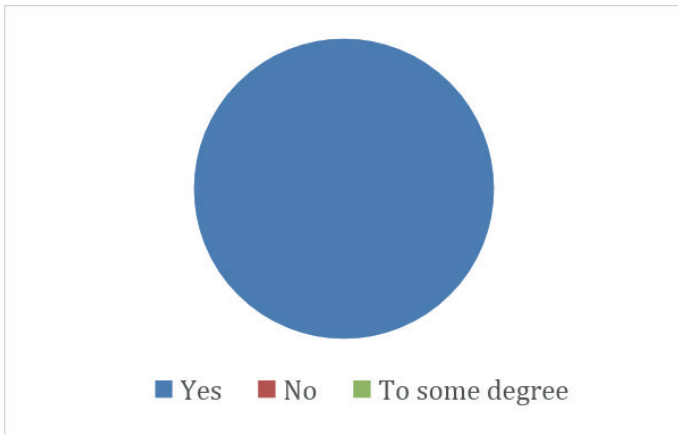
Responsible body for accreditation:	Internal system accreditation by the Central Evaluation and Accreditation Agency (ZEvA)
Length and overall structure of the programme:	Three years
	The integration model combines training with the dual partner and studies at the DHBW. The curriculum is designed in a way that training and studies alternate but also can overlap.
	After graduation, about 70 percent of the students remain employed by the training company, the Dual Partner.
Entrance exam: yes/no	Depends on school-leaving certificate. If the student has a university entrance diploma, no exam is required.
Fee: yes/no	no
Teaching staff from HEIs in %	About 40
Teaching staff from industry in %	About 60
Specific requirements for teaching staff (e.g., practical experiences/managerial position in industry etc.).	Practical experience (min 3 years in industry)
Balance between education in institution & company (in % and number of days/months)	1. - 6. Semester: Interlinking training / theoretical phase and practical phase – each semester 12 weeks theory at the university and 12 weeks practical training at the dual partner company.
e.g., 6 months in company or 1 day at institution and 4 days a week in company etc.).	
Dual approach:	Curriculum-integrated; work-integrated
Curriculum-integrated, work-related, work-based, work-integrated. Please select appropriate answer.	
Formal contracts with company (yes/no). If yes – please indicate type of contract	Yes – Training / study contract between the company and the student.
	The company has a contract with the university, which grants the right to fill a certain number of places with dual students. The company advertises those dual study positions on job portals and selects the students. The university accepts the students that the company selected. So, it is in fact the company (and not the university) that does the selection for admission.
Payment of students by industry partners (yes/no, partly.)	Yes
Support provided by the programme (i.e., service matching and career guidance)	Not relevant
Please indicate how/at what stages industry partners are involved in curriculum design and review (e.g., definition of functions, competences, LOs and syllabi).	Close cooperation with dual partner in the preparation and review of the curriculum.

Assessment:	
Student assessment by HEIs (in %)	Exams at HEI 100%
Student assessment by industry partners (in %)	
Modalities of assessment during apprenticeship periods:	Theoretical and oral exams.
Final thesis: ratio of mentors from HEIs and industry	One mentor on each side, but evaluation is exclusively on the HEI side
Drop-out rates in the last 5 years (if applicable):	5 to 10 percent over the study period of 3 years
Upon completion, is there a right to continue education at universities (yes/no, MA/PhD level)?	Yes, by completing the study programme 210 ECTS points are awarded. These can be recognised when applying for an MA/PhD level.
Are data available regarding the employment rates of graduates? If so, please indicate.	Depending on study programme and year group 80 to 90 percent
Key resource documents:	
Additional comments/observations:	

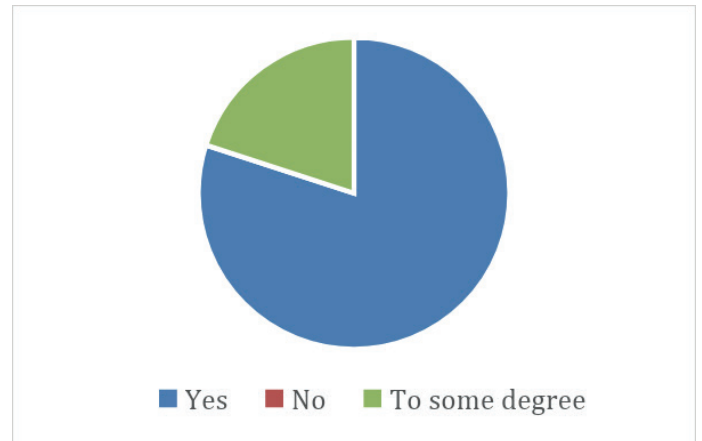
OVERVIEW OF THE EXAM 4.0 PARTNERS INSTITUTIONS

In this section differences and similarities among the consortium partner institutions are presented.

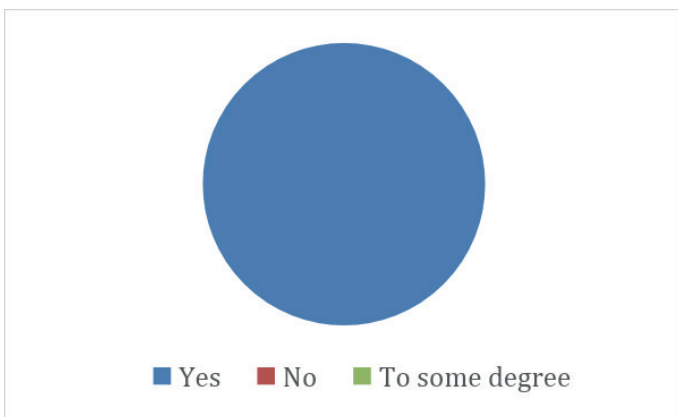
Pie charts are used to visually present some aspects of each section of the consortium partners' answers regarding their institutional model. The pictures show a general comparison between the partners' institutions. Each partner's answers are not available in the pie charts, but in the description model earlier in the document. The pie charts are used to indicate the proportion of the "yes, no and to some degree" answered by the partners' regarding their institutional model.



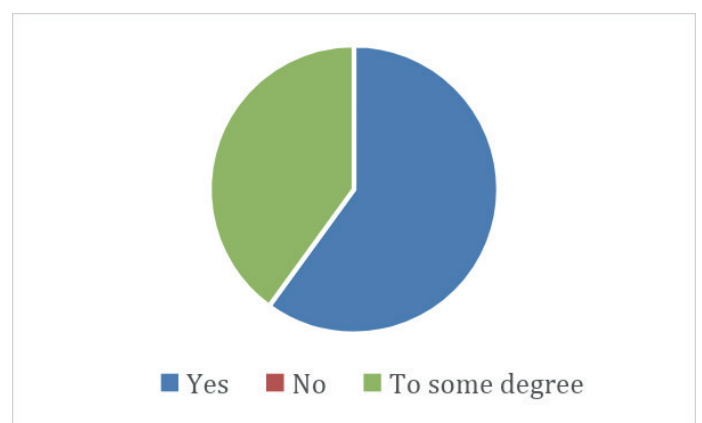
Does the institution have training in a real workplace?



Enterprises contribute with funding/equipment, worth at least €5000, over the last two years.

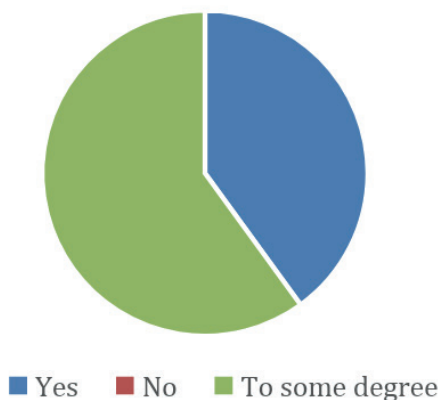


The VET/HVET centre forms partnership with specialist organizations at national and regional level.

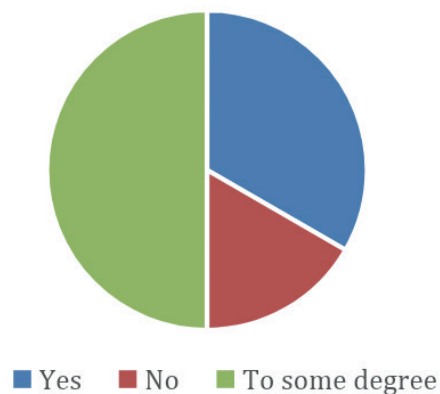


Studies show that at least 30% of graduates continue in the sector related to their programme.

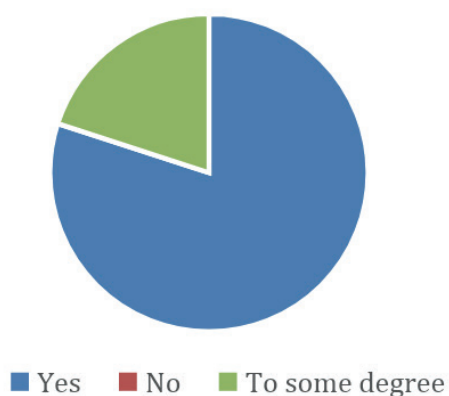
Pedagogy and professional development



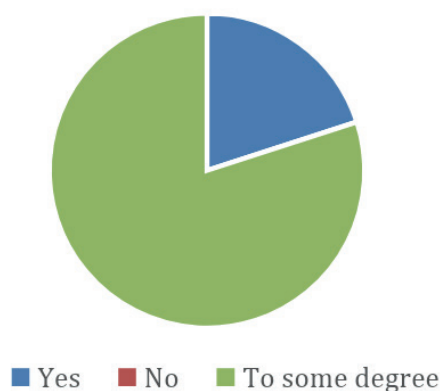
75% or more of the teachers attended at least one event or in-service training in the last 12 months.



All teachers and trainers have relevant industrial professional work experience from relevant enterprises.

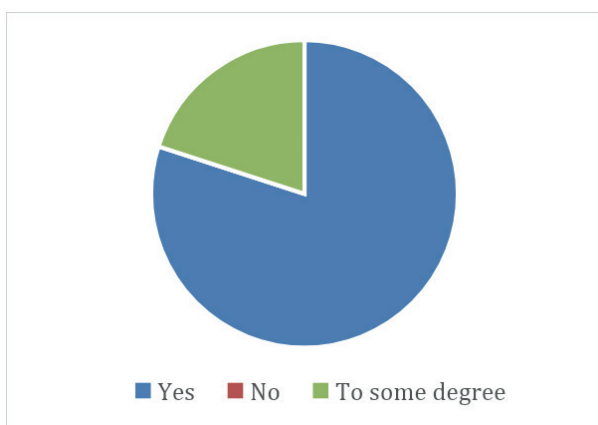


Teachers regularly create learning tasks that resemble real, up-to-date tasks in the world.

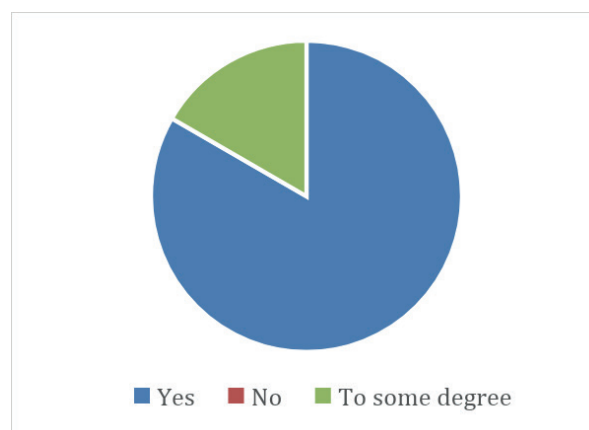


The VET/HVET centre works in partnership with industry, universities, etc to design and organise in-service training for trainers.

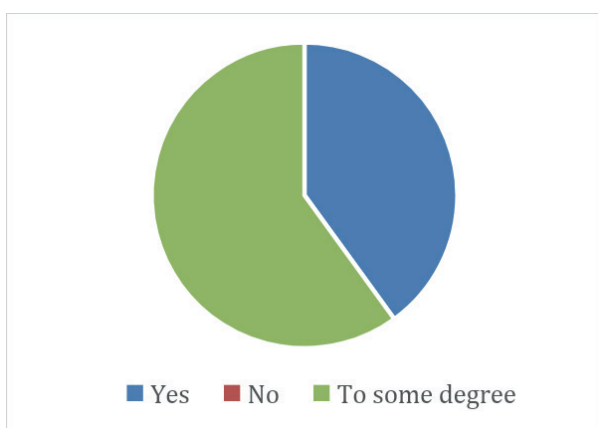
Autonomy, institutional improvement, and resources



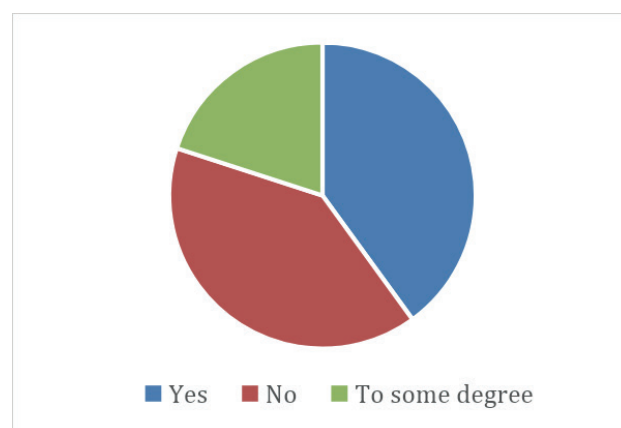
The VET/HVET centre has the authority to deciding independently how to use the resources.



The VET/HVET centre plans and monitors its own budget, enter contracts with other organisations (for business purposes).

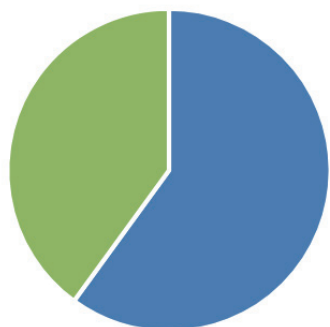


The VET/HVET centre has the authority to decide loans, for example, to fund investment.

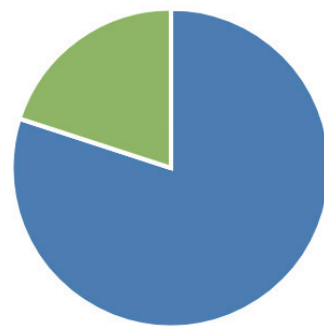


The school or centre has the authority to take learning programmes and to close current programmes.

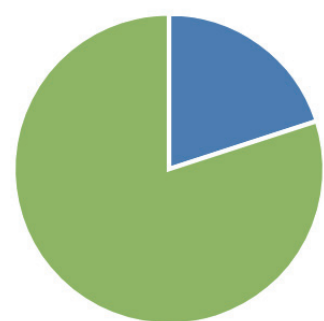
Lifelong learning in VET



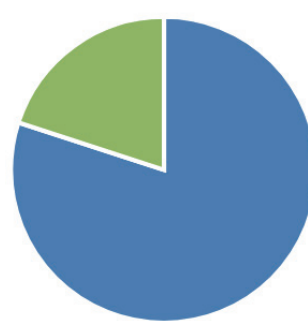
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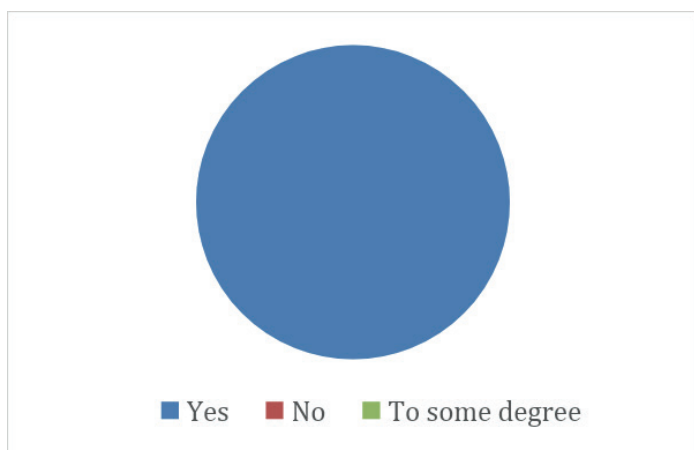
All teachers and trainers have relevant industrial professional work experience from relevant enterprises.



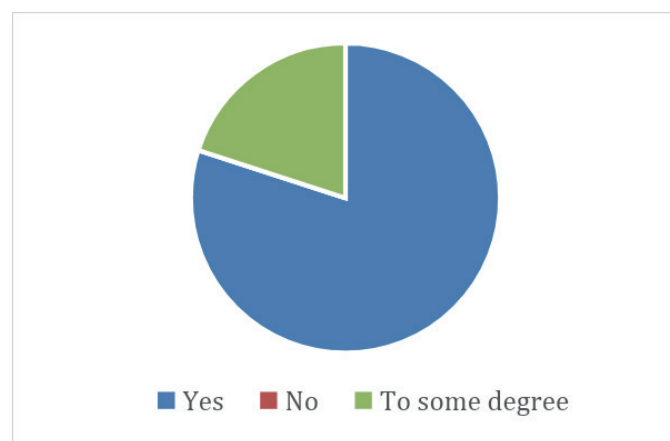
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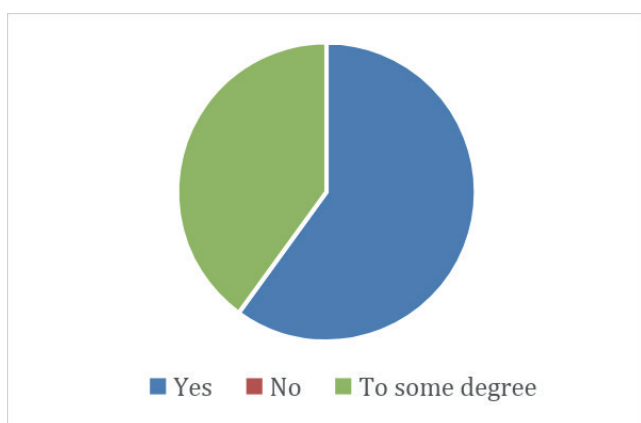
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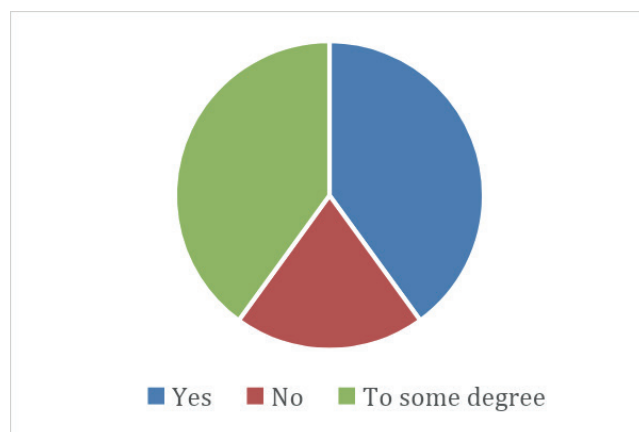
The VET/HVET provides training or other services targeting Small and Medium Enterprises (SMEs).



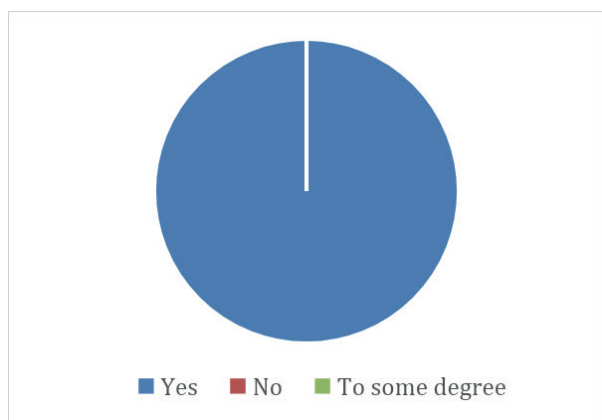
The VET/HVET centre contributes to regional research strategy, for example, by helping to transfer and apply new technologies.



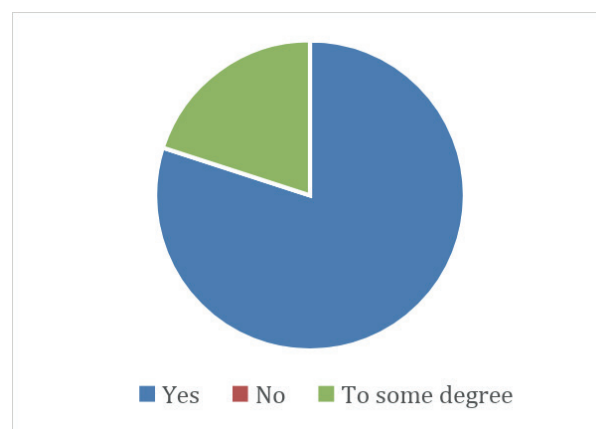
The VET/HVET centre identifies skills or technologies at regional or national level.



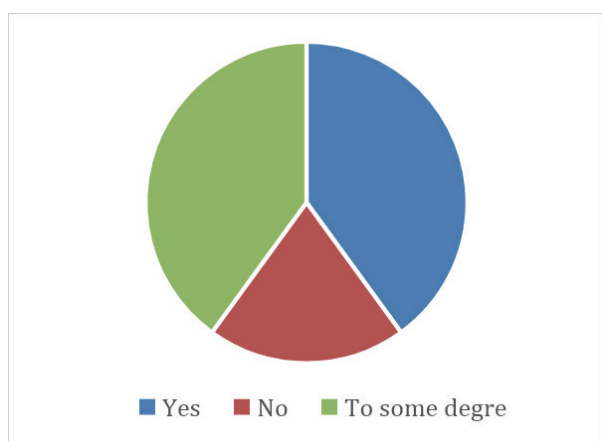
The VET/HVET centre is formally recognised to develop lead or coordinate partnerships, beneficial for the region, by hosting meetings for instance.



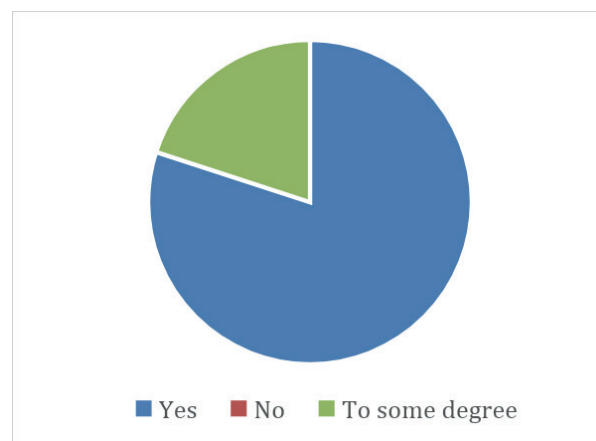
The VET/HVET centre can provide 80% of its students with digital tools for distance learning.



Digital learning technologies are used to provide learning for all learners at any place.

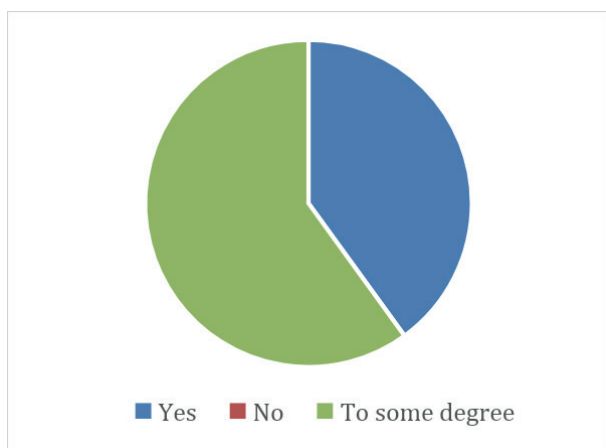


At least 80% of learners learn computational thinking.

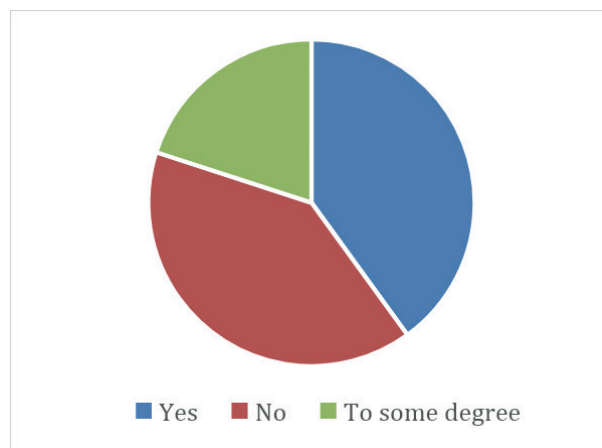


The VET/HVET centre provides at least two specialised profiles that explicitly address digital competencies relevant to I4.0

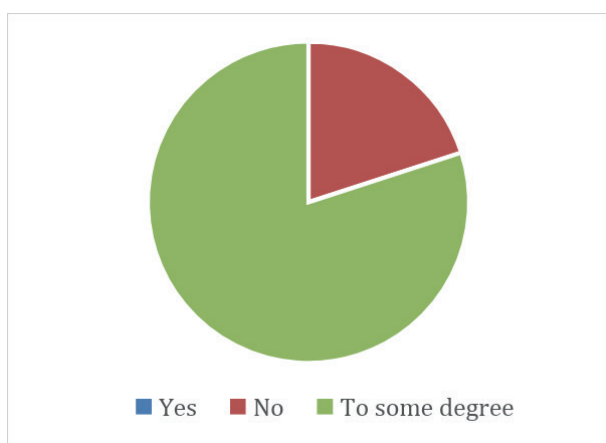
Going green and supporting sustainable goals



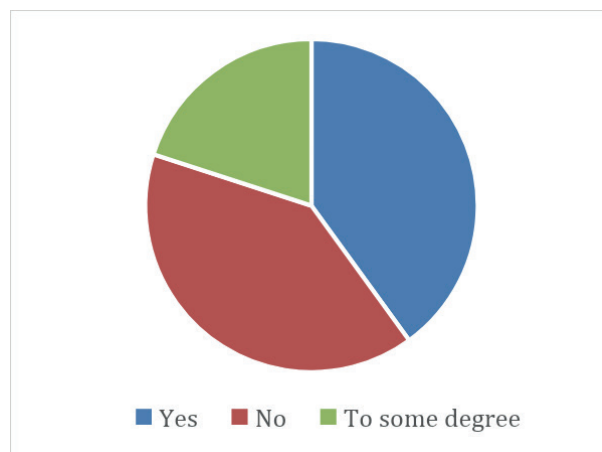
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EVALUATION OF THE EXAM 4.0 MODEL FOR INSTITUTIONS

This model ensures that relevant aspects of a VET/HVET centre's institutions are covered in a non-time-consuming description. The model describes a VET/HVET centre's institution efficiently but is used as a summary of a broader description. Apart from the no-time-consuming tables, standardized questions and sections, the model includes a broader description with seven sections, for further details regarding the seven tables.

