DIGITAL SKILLS AND ONLINE LEARNING IN ARMENIA

DIGITAL SKILLS FOR VET STUDENTS

Policies, strategies, initiatives, practices

The Government of Armenia took the first steps towards setting up an e-society back in 2000 and has made significant progress since then in e-governance development, with financial and technical assistance from the European Union and the United States. Nevertheless, according to the online public services development index, Armenia is 87th out of 193 countries, behind Russia, Kazakhstan and Belarus[1].

Outside of the public sector, little significant action has been taken towards digitalisation. Some of the obstacles faced by private companies in the digital economy is the lack of digital and big-data skills, low level of awareness of digitalisation and an unclear data privacy policy, all of which have a negative impact on the atmosphere of trust and collaboration between the public and private sectors. The public sector needs to understand how private companies address their employees' digital skills and competence (DSC), and how the development of these via formal and non-formal education plays a crucial role in this context. It is vital that Armenia's digital transformation agenda anticipates and reflects the potential impacts on different socio-economic groups in the country, the need for education and training, the ability of the country (particularly in the digital economy) to expand export volumes, and the need for long-term policies.

The system of formal vocational education and training (VET) in Armenia is mostly school-based and comprises two levels: preliminary vocational (craftsmanship) education (preliminary VET) and middle vocational education (middle VET). Both preliminary and middle VET can be implemented on the basis of basic general (nine-year) and secondary general (12-year) education[2], and in different forms: classroom-based, distance learning, external and individual professional training (master training).

Dual VET pilots in precision engineering and IT sectors

Since 2017, the Private Sector Development and Technical Vocational Education and Training in South Caucasus (PSD TVET) programme implemented by GIZ has been helping improve conditions for sustainable economic development in selected sectors relevant for employment promotion, such as precision engineering and IT. In close cooperation with the Ukrainian Ministry of Education, Science, Culture and Sport and with the active involvement of private companies, the dual VET approach is piloting 'software of computing equipment and automated systems' in Shirak Regional State College and 'mechatronics' in Lori Regional State College.

The dual VET system fosters local economic development and increases youth employment through recognition of VET quality by the private sector. The results of the pilot courses will enable IT specialists and technicians to be trained based on the requirements of the labour market, thus strengthening cooperation between colleges and employers.

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[1] UN, *E-government survey*, 2018, https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/un/2018-Survey/E-Government%20Survey%202018_FINAL%20for%20web.pdf

[2] ETF, *Policies for human capital development: Armenia – An ETF Torino Process assessment*, 2020.
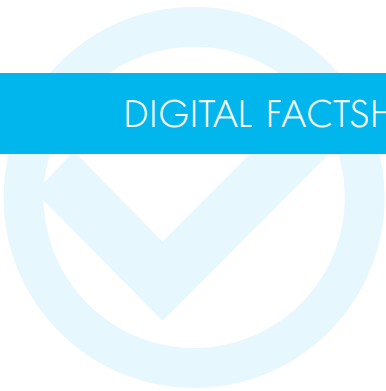
Depending on the list of qualifications for VET, which is interlinked with the state educational programmes, DSC are offered in two sectors: information and communication technologies (ICT) and engineering, industry and construction[3], as provided in Table 1. In total, seven specialties are taught in preliminary VET and 15 in middle VET[4] in 34 VET institutions.

The module on basic digital literacy skills is obligatory as part of the general development of digital skills. It is delivered as part of the key competences section of each curriculum, comprising anywhere between 34 and 72 hours, depending on the qualification. Deeper review of this module reveals that the component of key competences is not properly linked with the potential functions of the graduates, which will be required to perform on the workplace. Therefore, the module needs revision, to encompass relevant software applications used in corresponding industries, such as tourism or agriculture. However, such revision of the content should be accompanied by modernization of the hardware infrastructure of VET colleges to be able to deliver.

Within the national qualification framework (NQF), VET occupies levels 3 to 5. Although preliminary and middle VET are situated at different levels of the NQF, they are actually two parallel systems: normally, on entering VET, applicants choose between the two levels, i.e. they decide what type of employment would be more suitable for them, such as a craftsperson or a middle manager, and, after acquiring the corresponding qualification, their aim is to enter the labour market (either immediately or after a certain period of time) or continue their education at university[5].

Table 1. Qualifications relevant for DSC qualifications

ICT sector	
Preliminary vocational (craftsmanship) education	**Middle vocational education**
Computer operation	Technical maintenance of computer equipment and networks
	Computing machinery, complexes, systems and networks
	Software and automated systems
	Web design

[3] According to the Ministerial Decree on free (no fee) places for the 2020/21 academic year in preliminary VET and middle VET institutions.

[4] Author's own research supported by the VET Department of the MoESCS.

[5] ETF, *Policies for human capital development: Armenia – An ETF Torino Process assessment*, 2020.

Engineering, industry and construction sector

Testing of electrical devices, machines and equipment	Electrical stations, networks and systems
Maintenance and repair of electronic computing machines	Installation and operation of power lines
Maintenance and repair of radio electronic equipment	Power supply (by industry)
Technical operation of electrical equipment	Electrical machinery and devices
Maintenance of power plants and networks	Maintenance and repair of radio electronic equipment (by industry)
Technical operation of machinery and electrical equipment	Communication networks and systems
	Automation, telemechanics and communication in transport (according to transport types)
	Mechatronics
	Installation, maintenance and repair of medical equipment
	Installation, adjustment and operation of electrical equipment in industrial and civic buildings
	Technical operation of drones and aircraft engines

In 2019/20, the involvement of students in preliminary VET in the ICT sector fell by 26% – 59% among women – compared with the 2016/17 academic year. This can be explained by the lesser appeal of the qualifications and skills at this level, as applicants prefer programmes offered at the middle VET level. At the middle VET level, the number of students has increased very slightly, by 2% – 17%, among women – since 2016, due mainly to ICT sector development and increased awareness in society.

The positive dynamics in ICT sector development, the possibility of employment, the flexibility of work schedules and career-growth opportunities are all reasons why more women choose to specialise in ICT rather than engineering, which is considered a stereotypically male occupation. According to a 2018 labour-market survey of 750 ICT companies operating in Armenia, the sector comprises 62% male and 38% female technical specialists[6].

[6] EIF, *Report on the state of the industry*, 2018, www.eif.am/eng/researches/report-on-the-state-of-the-industry/

In the context of digital skills training, the role of youth professional orientation and career guidance centres is important. The career information and guidance methodology was developed in accordance with the eight key competences that, according to the Council of the European Union[7], are required by the modern citizen, and includes the mastery of digital skills. The ability to master digital technologies is, therefore, one of the prerequisites for competitiveness in the labour market.

To ensure the IT sector develops in a balanced manner, a personnel development policy needs to be implemented in the regions, which would help prevent youth emigration and reinforce the regions. The establishment of technology centres in the regions, which began in 2005, can be considered an extremely important initiative[8] that has a direct impact on the development of the VET sector at regional level. Technology centres in Gyumri and Lori are active partners in piloting the dual VET approach and have also been engaged in labour-market needs assessment and the development of curricula and modular programmes.

One of the strategic goals of the Ministry of High-Tech Industry is to provide continuing training to meet the needs of the labour market in that sector[9]. The rapid developments and technological changes in the ICT sector require continuing training to be conducted as a flexible tool to equip people with the necessary up-to-date sectoral skills and competences. A distinct section of the Development Strategy of High-Tech Industry and Digitalisation Strategy of Armenia[10] focuses on the education system, and particularly on modernising qualifications and educational programmes (initial and continuous), increasing the number of students and the quality of education.

The following 18 strategic directions are highlighted for development in the strategy: (1) artificial intelligence, (2) data science, (3) cyber security, (4) quantum systems, (5) nanotechnologies, (6) robotics, (7) Internet of Things, (8) modern communication technologies, (9) optical-laser technologies, (10) radio electronics and microelectronics, (11) bioengineering technologies, (12) DNA sequencing, (13) superconductors, (14) alternative energy acquisition technologies, (15) energy storage technologies, (16) high-precision manufacturing technologies, (17) blockchain technologies, and (18) aerospace technologies.

Students in the VET system, who can potentially be considered as a middle-level workforce, are still not ready for full employment in the labour market and thus cannot yet serve as the basis for economic

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[7] EU, Council Recommendations on key competences for lifelong learning, 2018, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.C_.2018.189.01.0001.01.ENG&toc=OJ%3AC%3A2018%3A189%3ATOC

[8] Gyumri Technologies Centre, www.eif.am/eng/projects/gyumri-information-technologies-center/

[9] Ministry of High-Tech Industry, Workforce Development through Cooperation between Higher Education and the Private Sector, From Idea to Business grant scheme, and Markets Development and International Cooperation annual programme 2020, https://hti.am/edfiles/files/179-A.pdf

[10] Ministry of High-Tech Industry, 'Development Strategy of the High-Tech Industry Digitalisation Strategy of Armenia', 2020 (under discussion and awaiting approval at the time of writing), www.e-draft.am/projects/2173/about
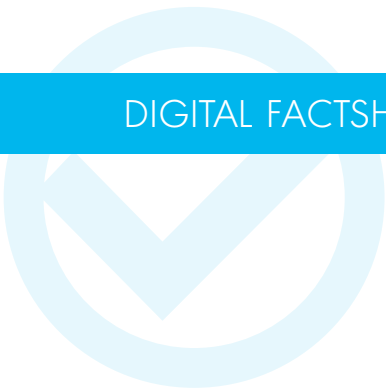
development of the high-tech sector. Consequently, in most cases, strategic and development programmes consider students in the higher educational system to be the major target group.

Considering the VET qualifications delivered by preliminary and middle vocational education institutions in light of these 18 strategic directions demonstrates that the qualifications need to be revised and modernised to meet labour-market needs and match job descriptions. Several new directions are being embraced by the VET system, including aerospace, optical lasers and bioengineering technologies, among others.

The involvement of EU organisations and international donors in VET reform is crucial. Several programmes in IT were revised with the support of the EU4Youth programme, for example, and new skills, in such fields as robotics and maintenance of solar energy systems, were developed within the aforementioned PSD TVET programme implemented by GIZ. The latter initiative was piloted as a short-term programme for five months. The results are still being analysed with a view to developing it as a long-term programme.

Facts and trends

The analysis carried out during development of the Workforce Development through Cooperation between Higher Education and the Private Sector programme for 2020[11] considered the views of 100 companies participating in the effort to develop technologies and international experience, as well as current market demand for the qualifications. The results are presented below.

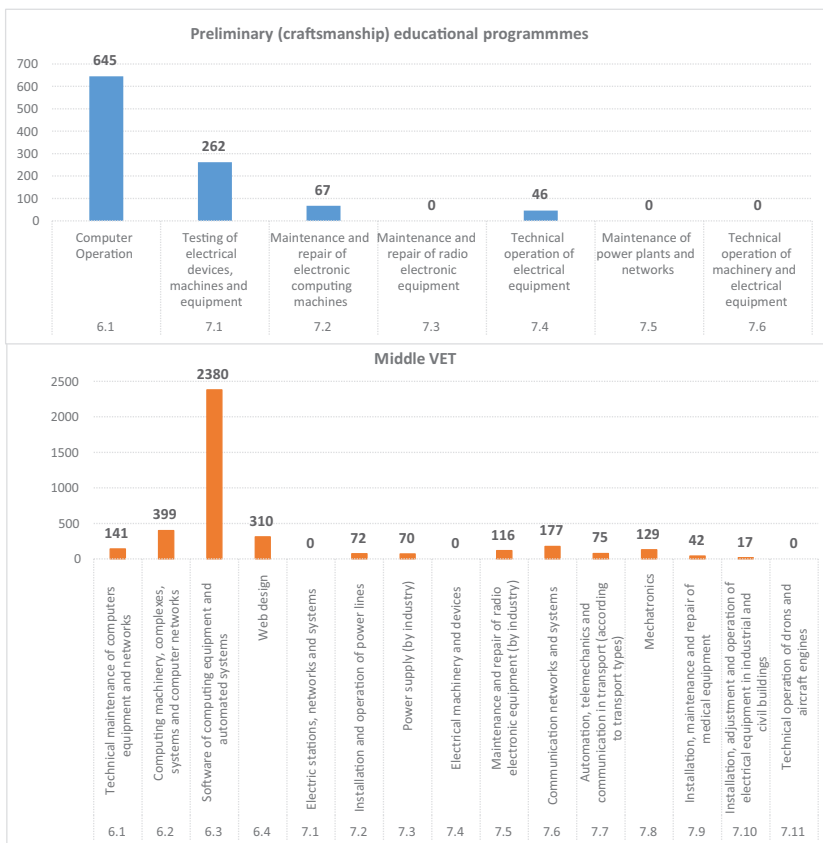**Figure 1. IT market demand for skills in 2020**
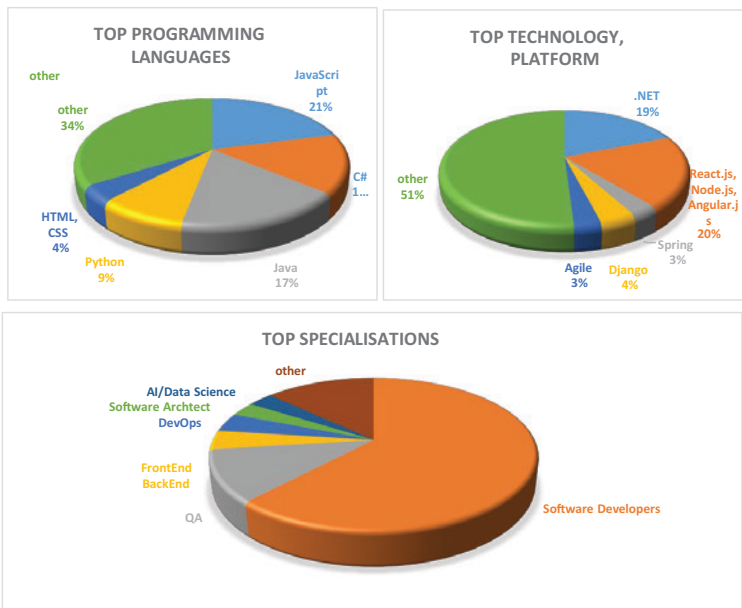
Detailed examination of VET educational programmes and modules, especially in the ICT sector, shows that the above-mentioned top programming languages, such as Java Script, HTML and others, are either taught as a stand-alone course or as a part of a bigger module.

In the period 2016–20, a total of 1 020[12] students participated in ICT-related preliminary VET programmes, 254 of them women, and 3 928 participated in middle VET programmes, 888 of them women. Zero values in Figure 2 indicate either a lack of awareness or professional orientation on the part of the applicants regarding these specialities or that the content of these educational programmes requires a radical review.

According to a 2019 survey of 86 companies in various sectors in Armenia[13], the areas that will continue to trend up to 2024 are technology design and programming; emotional intelligence; and systems analysis and evaluation. On the other hand, demand for skills in technology installation and maintenance, and technology use, monitoring and control will gradually decline.

**Figure 2. Students' overall participation, by qualification, 2016–20**

Preliminary (craftsmanship) educational programmmes

Computer Operation	Testing of electrical devices, machines and equipment	Maintenance and repair of electronic computing machines	Maintenance and repair of radio electronic equipment	Technical operation of electrical equipment	Maintenance of power plants and networks	Technical operation of machinery and electrical equipment
645	262	67	0	46	0	0
6.1	7.1	7.2	7.3	7.4	7.5	7.6

Middle VET

Technical maintenance of computers equipment and networks	Computing machinery, complexes, systems and computer networks	Software of computing equipment and automated systems	Web design	Electric stations, networks and systems	Installation and operation of power lines	Power supply (by industry)	Electrical machinery and devices	Maintenance and repair of radio electronic equipment (by industry)	Communication networks and systems	Automation, telemechanics and communication in transport (according to transport types)	Mechatronics	Installation, maintenance and repair of medical equipment	Installation, adjustment and operation of electrical equipment in industrial and civil buildings	Technical operation of drons and aircraft engines
141	399	2380	310	0	72	70	0	116	177	75	129	42	17	0
6.1	6.2	6.3	6.4	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	7.10	7.11

[12] Author's own research supported by the VET Department of the MoESCS.

[13] EV Consulting, 'What kind of skills will be required for the future of jobs in Armenia', 2019, https://evconsulting.com/wp-content/uploads/2019/10/Sara-skills-for-the-future-jobs.pdf
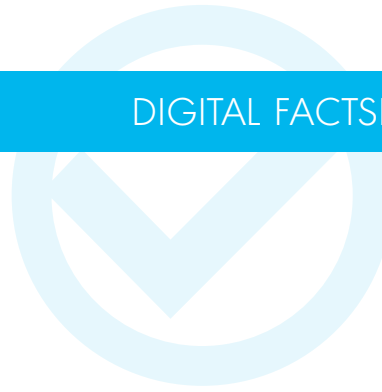
It is vital that the implementation of the high-tech development and digitalisation in Armenia strategies anticipate and reflect the potential impacts on different socio-economic groups in the country, the need for education and training, the ability of the country (particularly in the digital economy) to expand export volumes, and the need for long-term policies.

In 2016, private-sector companies initiated and funded the establishment of the 'real school' educational and cultural foundation, which is currently operating as a pilot project in four Armenian cities. The main goal of the foundation is to provide graduates, via the four-year 'theory of systems' vocational programme for the 15–21 age group, with the necessary knowledge and technical skills to pursue various opportunities in the innovative high-tech industry.
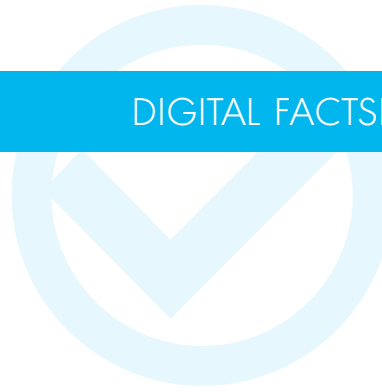
DIGITAL SKILLS FOR VET TEACHERS AND TRAINERS

Policies, strategies, initiatives, practices

There are no formal DSC-specific requirements for becoming a VET teacher at the national level. Those with a bachelor's degree can become lecturers, while the educational requirements for becoming a master teacher of practical training are lower. This is particularly true for the regions where even VET graduates may be recruited as a master teacher due to lack of qualified candidates for teaching positions. The process of recruiting teachers is organised by VET directors and based on a competitive process, via which the best applicants are selected for the vacant positions.

In June 2019, however, a decision was made not to implement the 2019–23 Strategy for Preliminary (craftsmanship) and Middle Vocational Education as a stand-alone paper, but rather to merge it with the 2020–30 Education Development Strategy. To that end, an agreement was reached to incorporate the goals, objectives and main content of the Strategy for Preliminary and Middle Vocational Education in the Education Development Strategy, which is currently in the development process.

Three primary goals for VET development were identified as part of the Education Development Strategy and presented to the development partners in August 2020. For the purpose of this paper, primary goal 1 is relevant as it is designed to 'create a universally accessible, learner-oriented educational environment in VET'. This primary goal is planned to be achieved through implementation of one activity with four indicators:

- development of an online platform,
- e-courses,
- electronic resources, and
- DOL methodologies and models.

Primary goal 1 also envisages the design of the continuing professional development (CPD) system for VET teachers and

Human capacity development in terms of DSC/DOL

In 2017, training in 'strategic planning and management of e-learning' for 22 VET managers and in 'content development, testing technologies and communication tools for e-learning' for 23 VET teachers was organised by the National Centre for VET Development, with expert support from the NGO the National Network of Distance Education (NNDE). The network was founded in 2015 as a joint initiative by eight Armenian educational organisations. It currently consists of 23 member organisations (public and private training and educational institutions). The establishment of the network was inspired by the Institutional Building and Human Resource Development in e-Learning South Caucasus programme implemented by GIZ. The network promotes e-learning in the educational landscape, while supporting member organisations in developing and implementing e-learning activities.

Continuing professional development in DSC/DOL

The TVET Master Teacher programme was introduced in and designed by the Faculty of Pedagogy of Brusov State University. This initiative was supported by the PSD TVET programme implemented by GIZ as the first step towards establishing a CPD system in Armenia. The programme is based on a UNESCO-UNEVOC blueprint curriculum and includes 'web technologies in VET' as a subject (three credits). In the future, the plan is to set up a joint degree
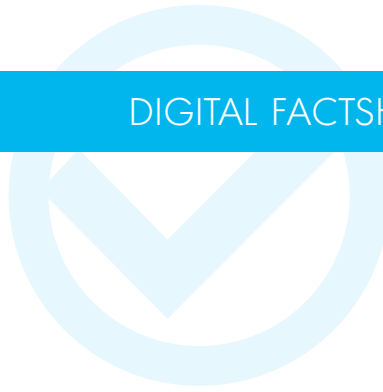
contributing to the sustainable development of digital skills and competences among VET teachers.

Currently, there is no CPD system for VET teachers in the country. The main body responsible for VET teacher CPD is the National Centre for VET Development, which provides annual basic training for VET teachers, mainly in relation to the application of educational standards and modular programmes. Unlike in the general education system, where there are four categories (ranks) of teachers, there are no categories in VET.

As developing the digital skills of VET teachers is not mandatory, this process is driven by the initiative of or requests from individual VET institutions. The training itself is mostly covered by international organisations and donors, but sessions aren't structured or joined up. Consequently, the VET teacher-training system requires fundamental change, in terms of both content and structure. Undoubtedly, the development of teachers' digital skills can have its own place in the training curriculum.

Training, or re-training, is required to improve and implement current processes, and introduce modern educational technologies, e.g. e-learning. To this end, professional and pedagogical training programmes with appropriate certification and recognition for VET teachers can be developed and implemented based on practice and in cooperation with employers, leading universities and communities. This is covered in the VET Action Plan 2017–23[14] in the form of an activity to revise the training system mechanisms for VET teachers in 2021. It will contribute to the continuing professional development of VET teachers, encourage them and serve as a precondition for the establishment of a benefits system, including financial incentives, access to healthcare and other social benefit schemes.

The long-term aim of developing DSC and DOL for VET teachers is to strengthen cooperation between public authorities and the private sector, academia, unions and associations, international organisations and NGOs. Multi-stakeholder partnerships can be promoted by linking teachers' professional development system and ICT communities.

Facts and trends

A total of 356 VET teachers[15] are involved in teaching digital skills and competences[16], 73% of them women. Only 21 teachers (6 of them women) have scientific degrees, demonstrating that the teacher has passed the mandatory basic exam in IT.

programme with Magdeburg Technical University. The programme pilot was conducted as short-term training for VET teachers in tourism in 2019.

As a next step, this programme will be delivered online via the existing Moodle platform, depending on Brusov State University's capacities and resources, thus ensuring that VET teachers from the regions also have access to it and can participate on a flexible basis.
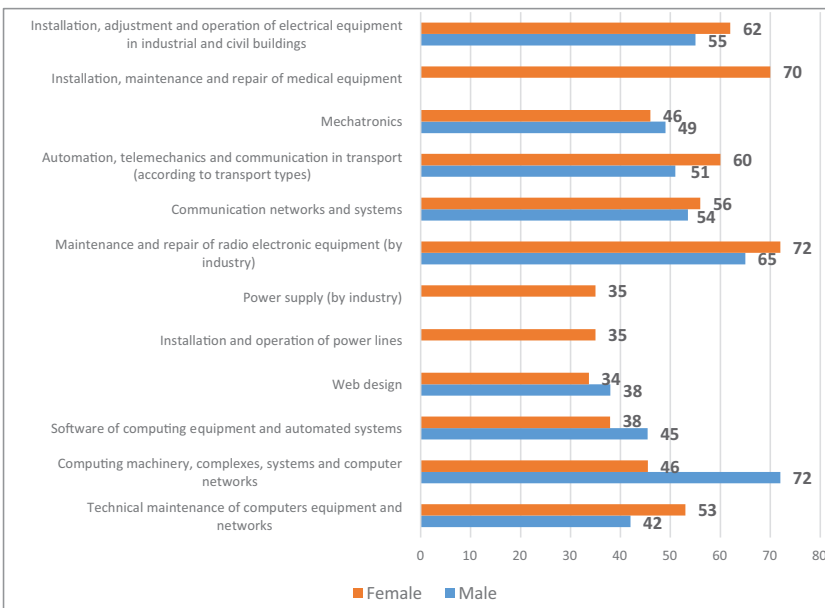
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[14] Approved by MoESCS Order of 26 August 2019.
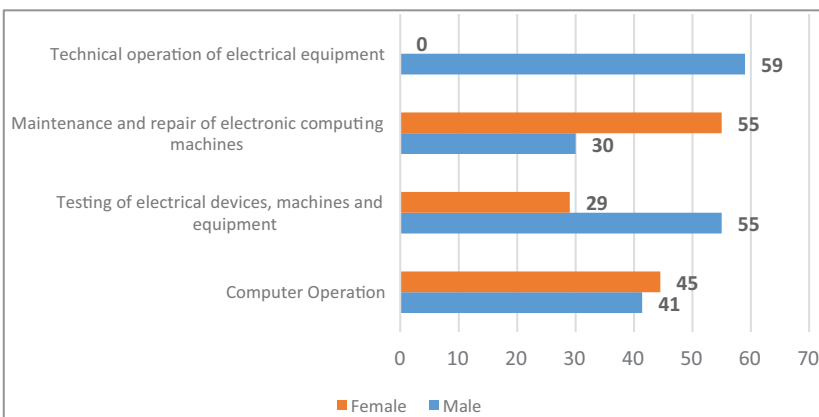[15] Author's own research supported by the VET Department of the MoESCS.
[16] See Table 1.

Figure 3. Teachers' involvement in middle vocational education by average age and qualification

Qualification	Female	Male
Installation, adjustment and operation of electrical equipment in industrial and civil buildings	62	55
Installation, maintenance and repair of medical equipment	70	
Mechatronics	46	49
Automation, telemechanics and communication in transport (according to transport types)	60	51
Communication networks and systems	56	54
Maintenance and repair of radio electronic equipment (by industry)	72	65
Power supply (by industry)	35	
Installation and operation of power lines	35	
Web design	34	38
Software of computing equipment and automated systems	38	45
Computing machinery, complexes, systems and computer networks	46	72
Technical maintenance of computers equipment and networks	53	42

The job of VET teacher is not attractive, owing to low salaries and the lack of social benefits. Staff turnover, especially in the IT sector, is high, because of competitive offers from private companies.

Figure 4. Teachers' involvement in preliminary (craftsmanship) vocational education by average age and qualification

Qualification	Female	Male
Technical operation of electrical equipment	0	59
Maintenance and repair of electronic computing machines	55	30
Testing of electrical devices, machines and equipment	29	55
Computer Operation	45	41

Between 2008 and 2015, the PSD TVET programme run by GIZ conducted several activities and training courses for VET teachers in instructional design, content development and tutoring in e-learning, based on open-source programmes. Some of the training focused on institution building and human resource development in e-learning.

It was conducted over the course of six to nine months and based on a blended learning approach. The project-oriented approach of the training meant participants were able to develop e-courses ready for implementation.

In September 2020, the Armenian and Russian national WorldSkills teams, and the Young Professionals Union (WorldSkills Russia), participated in a joint training conducted for the national experts, trainers and industrial training masters on implementing digital and online solutions for professional skills championships (skills camp).

Owing to the nationwide lockdown imposed in 2020 as a result of the Covid-19 pandemic, all processes in public life have moved online, and the VET learning process is no exception. On account of this situation, an online introduction to e-learning course, which was developed by the National Network of Distance Education with the support of the PSD TVET programme back in 2018, was conducted for about 150 VET teachers and managers from 44 colleges from the capital city, Yerevan, and the regions. The course equipped the participants with the relevant skills in how to organise e-learning and familiarise themselves with its main components.

Online solutions in education will be crucial in the post-Covid world, particularly for certain groups of students. There is a need to ensure inclusiveness, equal opportunities and access for everyone, e.g. making sure students in remote regions have the devices and connectivity they need. VET teachers and private-sector instructors will be trained further in how to develop and implement e-learning content, with a focus on dual technical VET. This, in turn, requires improving digital skills among VET teachers and managers.

DIGITAL AND ONLINE LEARNING IN INITIAL VET

Policies, strategies, initiatives, practices

In the law on preliminary vocational (craftsmanship) and middle vocational education adopted in 2005, distance learning is defined as a systematic learning format, when the process of direct and indirect learning between the student and the lecturer is carried out mainly by means of information technologies and telecommunications.

Organisation of distance learning is regulated by the Government Decision No 1028-N, 06.09.2007, which specifies how the implementation processes of the educational programmes should be organised, as well as the legal relations among the VET teachers and students. The Decision is now outdated, in that it doesn't reflect the requirements for and opportunities offered by modern DOL, its models, types and organisational processes, and hinders the transition from face-to-face to online learning.

The rapidly changing conditions and professional requirements of the technological sector require the creation of a flexible VET system, within which content can be delivered quickly and participants can engage in the learning process wherever they are and at any time.

Contemporary challenges demand that educational procedures and training process organisation be optimised, using fewer financial resources to achieve VET development goals efficiently. Optimisation will be possible with the integration of distance education into VET, promotion of new teaching methods and assessment mechanisms, development of teachers' and students' skills, as well as expansion of educational services and formation of an open educational space, both of which are planned for 2020–23.

Web-based educational technologies have been grouped together in the VET action plan[17] and action in this regard will start with a conceptualisation process, which will define how VET information system and e-resources are to be developed.

The key player in the system is the National Centre for Educational Technologies, which is responsible for creating the educational information and communication environment, and for the gradual inclusion of secondary schools, VET and higher education institutions

Response to Covid-19

The early days of the 'new educational reality' required a rapid restructuring of the educational process for all involved participants, which brought online communication and interaction technologies to the forefront. VET colleges had to determine the sequence of actions for the transition to DOL. At the organisational level, the results of the actions were aimed to adopt new internal regulations for the organisation of DOL, identify modules that can be implemented remotely, mapping of the available online educational resources, including YouTube films and MOOCs, provide access to teachers and students, and also make changes in the timetable and training programmes. It was necessary to develop a monitoring system for the actual interaction of teachers and students, knowledge assessment methods, as well as to explain to parents the specifics of the educational process in the new conditions.

For example, for the practical element of cookery courses, teachers filmed the detailed preparation of the different dishes, then sent the video to the students as learning material. The students submitted their tasks for assessment in video form as well.

Developing practical skills, organising final exams and determining qualifications are the most important components of VET and, as essentially offline tasks, they caused the greatest difficulties for VET colleges during the lockdown periods, particularly as practical education was stopped by order of the MoESCS.

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[17] The VET action plan was approved by the MoESCS in August 2019.

into the network. The scope of its activities is wide and includes coordination of processes in the field, development of e-resources and teacher training. To help teachers arrange online communication with students, the centre has developed various guidelines – for example, on how to install and use the online meeting platform Zoom. Currently, the centre is focusing mainly on secondary schools, owing to the extremely high workload caused by the Covid-19 pandemic.

A major bone of contention among teachers and VET managers is colleges' technical tools and resources. The existing technical base is outdated, does not meet the requirements of modern professional training and cannot support the level of need in terms of organising and implementing DOL. The process to provide colleges with suitable equipment should be based on the revised requirements of state educational standards and involve additional funding by the state and other sources.

The portal http://vetarmenia.am/ was designed as a resource to support the implementation of DOL in IVET. The EU, GIZ and the United Nations Development Plan have all been involved at different stages of its development. Currently, the portal is mainly informative in nature, but it may be possible to use it in the future as a platform to conduct DOL for VET students.

Facts and trends

In the context of introducing and developing DOL in VET, several human capacity development measures have been implemented by international organisations and the National Centre for VET Development. For example, in 2018 the centre's annual training scheme, conducted by the National Network of Distance Education, offered the following courses:

- 'strategic planning and management of e-learning' for VET directors and deputy directors, which addressed the strategic approaches that VET managers can take to implement an e-learning approach in their colleges; and

- 'content development for e-learning courses' for VET teaching staff, based on open-source authoring tools.

These courses revealed a high level of motivation among VET teachers regarding the introduction of educational web technologies and distance learning. As already noted, however, a key constraint is the outdated technology and software in colleges, as well as the lack of a unified approach and limited knowledge of the use of educational web technologies for the development of DOL in IVET.

Introduction of DOL in IVET

From 2014 to 2018, several activities relating to the introduction of DOL were conducted as part of the 'Private Sector Development in South Caucasus' programme run by GIZ, particularly:

- Enhancing the role of social partnership in modernising VET programmes in the wine, tourism and precision-engineering sectors through a blended learning approach. The process was designed based on an assessment of the needs of private companies, VET colleges and students. In all, 19 VET institutions were involved, with a total of 91 participants, 71 of them women. As a result, 19 blended-learning courses were created and piloted among different target groups.

- Supporting the development of an 'Introduction to e-learning' course aimed at developing the capacity of VET managers and teachers in DOL. The online course was conducted for 26 VET teachers (18 of them women) and handed over to the National Centre for VET Development.

From 2017 to 2020, the PSD TVET GIZ programme created an entrepreneurial skills development module for VET teachers and students, which was approved by the MoESCS as an obligatory tool for all VET qualifications. In 2020, this module was turned into an online course to support the development of DOL in the VET system and was ready to implement in September 2020.

That being said, the quality and availability of internet connection and services are improving all the time. Fixed broadband services, rather than fibre-optic, are most popular, for quality and accessibility reasons. In 2019, the number of subscribers increased by 19%[18]. Almost all VET colleges have an internet connection and at least one equipped computer room. However, it is impossible to know exactly how well-equipped VET colleges are because of the lack of monitoring data by the Ministry of Education, Science, Culture and Sport (MoESCS).

Although DOL has many benefits, developing e-learning is more expensive than preparing classroom materials and training trainers, especially if multimedia or highly interactive methods are used. This will have implications for VET budgets and thus require careful consideration.

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[18] Public Services Regulatory Commission of the RA, www.psrc.am/uploads/topics/15876281035176.pdf

DIGITAL AND ONLINE LEARNING IN CONTINUING VET

Policies, strategies, initiatives, practices

Lifelong learning in Armenia is defined by the Education Law as 'learning outcomes achieved through participation in formal education, and non-formal or informal learning throughout the entire life, by which the individual forms or improves his/her knowledge, skills, competences and system of values'.

In 2009, a Concept of Lifelong Learning in Armenia was endorsed by the government. It analysed the situation regarding lifelong learning in the country, identified the problems and challenges, and proposed several solutions. In the context of lifelong learning, the Armenian educational system is based on two pillars: the formal education system and supplementary and continuing education, which is carried out through non-formal or informal learning. In 2012, another policy document, the Strategy of Supplementary and Continuing Education in Armenia, was adopted by the MoESCS.

The framework for lifelong learning is provided by the Government Decision on Supplementary and Continuing Education 2014–17[19]. In addition, in 2015, following an amendment to the Education Law, the government addressed the key adult education and learning issues, including procedures for organising and implementing supplementary educational programmes, as well as for assessing and recognising non-formal and informal learning outcomes. Relevant regulations relate to the policy principles, organisational and legal bases, and the relationship of individuals and legal entities participating in the education process. In 2016, the government revised and updated the national qualifications framework in line with the European Qualifications Framework, so that it now comprises eight levels based on knowledge, skills and competences.

The MoESCS has developed a procedure to keep track of training opportunities via a national electronic register. The National Training Fund (NTF) establishes and implements adult learning and education policy, including coordination, operation, organisation and support for non-formal and informal education. According to its mandate, the NTF is positioned to oversee the validation of non-formal and informal learning outcomes, drawing on the international expertise. As of June 2020, 198 short-term programmes had been approved by the NTF, five of which – in the fields of robotics, solar energy, IT and accounting – involve a DSC element. Another course – for tour guides, delivered by the Swiss humanitarian foundation KASA – is a blended course[20]. Currently, it is not mandatory to have short-term programmes approved by the NTF.

In 2020, the government adopted a decision on implementation of three annual programmes: Workforce Development through Cooperation between Higher Education and Private Sector, From Idea to Business

Tumo Centre for Creative Technologies

The Tumo Centre for Creative Technologies opened in 2011. It provides free training for children and adults aged 12 to 18 in the IT and helps 19 to 26-year-olds specialise in particular areas by providing targeted web-based training, also free of charge. Training is provided in animation, website and games development, movie creation and more.

Most innovative learning applications support the participants to build their own learning path, which is always adapting to fit their pace and evolving preferences. Participants online portfolio grows with every activity and workshop they complete – a kind of living diploma, reflecting on hard work and growing abilities, that can be shown to parents, future employers or universities. Students are also familiarised with skills in such areas as 3D modelling, robotics, photography and graphic design. There are currently four TUMO centres – one in Yerevan and three in the regions.

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[19] Government Decision of 10.09.2015 N 1062-N, www.arlis.am/DocumentView.aspx?DocID=100589
[20] https://elearning.kasa.am/login/index.php

grant, and Markets Development and International Cooperation programme 2020[21]. These programmes include actions to develop a communication platform facilitating the public-private dialogue on assessment of sector-specific skill needs, and to design and deliver short-term training courses, both of which are currently underway. Moreover, these short-term training courses are financed from the State Budget for 6 000 participants, aged 14 or over, both from Yerevan and the regions.

A wide range of training, retraining, resource and infrastructure development programmes is offered by leading international and national companies and organisations. A number of specialist centres (see below) are also operating in the field, with a special emphasis on DSC and professional skills development for different target groups.

The Enterprise Incubator Foundation (EIF) is one of the largest technology business incubators and IT development agencies in the region and operates out of Yerevan. The development of a managerial and professional workforce and fostering productivity improvement in Armenian IT companies are major components of the EIF's mission. Its partners in this regard include world-class companies such as Microsoft Corporation, Hewlett-Packard, Intel Corporation, Sun Microsystems and Cisco Systems. Its network of training centres includes the Armenia-India Centre for Excellence in ICT and the Microsoft Innovation Centre. Provision of technical training in ICT for professionals and students at all levels and in all age groups is one of the key aspects of the EIF's work[22].

The Gyumri Information Technologies Centre is a non-profit scientific and educational foundation providing ICT workforce training in the Shirak region. The centre was founded in August 2005 by the EIF, Fund of Armenian relief (FAR) and Shirak Technologies LLC. It offers courses in JAVA, IOS and web programming (front-end and back-end). Since 2015 a total of 500 students participated in courses, 495 of which are now employed[23].

A digital-skills development initiative was piloted in the Lori region, comprising a dual short-term programme on mechatronics. It was conducted by the Vanadzor Technological Centre and Lori Regional State College within the context of the 2019 PSD TVET run by GIZ. Participants who successfully completed the course received a certificate. The results of the first pilot have been analysed and will be used to inform the further development of a formal VET programme on mechatronics. The Vanadzor Technological Centre was established by the EIF with support of the Armenian government and the World Bank. In 2019, it conducted 33 training sessions for 496 adults, including 56 teachers, in KODU, Scratch, HTML/CSS and Python. It also ran sessions for 965 teenagers aged 14 or over. Since 2015, some 5 500 students have participated in DCS training provided by the centre[24].

The Armenian National Engineering Laboratory (ANEL) was established on 2 September 2013. It is a centre of excellence and hosts 30 state-of-the-art education and research laboratories. The main goal is to meet the demand of the engineering industry for quality specialists and graduates,

[21] Decree of the Ministry of High-Tech Industry of 11.03.2020, https://hti.am/edfiles/files/179-A.pdf

[22] www.eif.am/eng/services/workforce-development/technical-trainings/

[23] www.gitc.am/training

[24] http://vtc.am/en/dhdgfhgfhdfh/

and to increase the added value and innovativeness of Armenian high-tech businesses, thus enhancing their international competitiveness. The centre is responsible for international certification of LabVIEW associate developers (CLAD), LabVIEW developers (CLD) and LabVIEW architects (CLA).

The Armath Engineering Laboratories programme introduces children aged from 10 to 18 to science, technology, engineering and maths (STEM). The programme was established in 2011 by the Union of Advanced Technology Enterprises (UATE), which is currently working towards exporting the Armath Lab model all over the world. Students at the laboratories participate via after-school classes, exciting competitions, innovative camps and more. The labs offer them practical opportunities to design, build, test and fine-tune their creations in a safe and fun environment, with the ultimate possibility of creating a start-up. With financial support from the Anushavan Abrahamyan Foundation, nine Armath laboratories have been established in VET colleges.

In 2016, the UATE received the Sustainable Growth award in the WITSA Global Excellence awards at the World Congress on IT in Brazil, as well as the Best IT Education Provider award at the regional IT event GITI-2016, held in Tbilisi. According to a 2017 assessment by Grant Thornton Consulting CJSC, 39% of Armath students were working and studying; of those who were employed, 45% were involved in programming, 29% in other areas of IT, 14% in engineering and technical jobs, and 12% had founded start-ups. Employed students and start-up founders were earning between AMD 50 000 and AMD 300 000, the average salary being AMD 132 561[25].

Since the start of the lockdown imposed because of the Covid-19 pandemic, most of the Armath labs have moved their education processes online, to ensure continuity of learning and the safety of students and teaching staff. It is, as yet, too early to say how well this move online has gone, but the lack of statistical data, guidelines, standards, self-assessment tools, accreditation and evaluation criteria is undoubtedly a challenge for the sector.

Facts and trends

On 28 September 2017, the ministries of Economic Development and Investments, Transport, Communication and IT, Education and Science, and Labour and Social Affairs, together with the Union of ICT Employers of Armenia, the UATE and the EIF, signed a Memorandum of Understanding on the establishment of a Digital Skills National Coalition in the Republic of Armenia. The partners agreed to support digital skills development in four main domains: digital skills for the workforce, digital skills for ICT specialists, digital skills in education and for students, and digital skills for all. During 2018, about 800 ICT companies were active in Armenia and the number of jobs in the sector increased by about 4 200. However, in terms of digital-skills maturity, measured in terms of indicators based on benchmarks developed by EU4Digital, Armenia measures less than 30% of the benchmarked indicators (15 out of 56)[26]. There are currently no country-specific policies for measuring the digital skills of citizens and enterprises.

[25] See full report on the assessment at: https://publicadministration.un.org/unpsa/Portals/0/UNPSA_Submitted_Docs/2019/A9DFA9F9-9548-45B0-86B2-9C4B152D01FF/Grand%20Thornton_ARMATH_Audit%20Report.pdf?ver=2018-11-28-011922-037

[26] EU4Digital, *Methodology for measuring and forecasting digital skills gaps*, July 2020, https://eufordigital.eu/wp-content/uploads/2020/11/EU4Digital-Methodology-for-measuring-and-forecasting-skills-gaps.pdf

In March 2019, TUMO and the European Union launched a partnership to build and operate the EU TUMO Convergence Centre for Engineering and Applied Science, a state-of-the-art science, technology, engineering, and mathematics (STEM) ecosystem in Yerevan. The EUR 12.5 million grant provided by the European Union was co-financed by the Armenian government. The campus houses infrastructure for educational programming, a STEM research laboratory, a conference centre and revenue-generating commercial space to ensure the centre's long-term financial sustainability. Additionally, the campus will host the Faculty for Informatics and Applied Mathematics of the French University in Armenia.

The EU4INNOVATION project, launched in early 2019 and administered by the World Bank, is designed to improve the quality of STEM education in Armenia. With the use of contemporary methods and technologies, the project supports the MoESCS in redeveloping the curricula for grades 1 to 12, associated pedagogical materials, textbooks, teachers' guides, and selected exams or examination blueprints for STEM subjects in grades 5 to 12.

In December 2020, the Engineering City project will be completed in Yerevan. The project plan is to provide training and retraining for 1 500 high-quality specialists, create 200 new jobs and establish at least 20 start-up companies. The cost of the project is estimated at USD 21.2 million, of which USD 10.5 million is being provided by the Armenian government from the World Bank's credit funds, and a further 50% by the National Instruments consortium.