European Training Foundation

RESEARCH ON CURRICULUM DESIGN AND KEY COMPETENCES FOR NEW LEARNING

Research report

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PREFACE

The research report presents findings of a critical literature analysis. The aim of the research was to analyse characteristics of contemporary curricula trying to understand what new structural and pedagogical approaches are used in different countries responding to economic, social and technological challenges. The report also focusses specifically on the integration of key competences in curricula trying to define what are the most effective ways of integrating key competences in the curricula. The last part of the report presents a description of the methodology (instrument) for the analysis of contemporary curricula characteristics and cases based on specific curricula from several countries linking the main findings of curricula trends and integration of key competences.

CONTENT

DEFINITION OF KEY CONCEPTS

Here we define the main concepts and terms used in the report. The provided definitions are based on our reviewed literature.

Contemporary curricula – in our research report we defined contemporary curricula as opposed to traditional, subject-based curricula and having characteristics which reflect tendencies in 21st century education such as flexibility, adaptability to the labour market, integration of theory and practice, authentic learning environments, and etc. (Voogt & Roblin, 2010; Sturing et al., 2011; Veillard, 2012; Bolstad et al., 2012; Frommberger & Krichewsky, 2012; Mincu, 2013; Cremers et al., 2014; Acedo & Hughes, 2014; McPhail & Rata, 2016; Greany & Waterhouse, 2016; Abadzi, 2016; Zitter et al., 2016; Hodge, 2016; Brassler and Dettmers, 2017; Tsatsaroni, & Sarakinioti, 2018; Nikolov et al., 2018; Zwan, & Afonso, 2019; Caves et al., 2019; Bouw et al., 2019; Crato, 2020; Rintala, Nokelainen, 2020).

Flexible curricula – curricula, which is characterised by adaptability and accessibility to students' needs and capabilities (Jonker et al., 2020).

Modular curricula – curricula when the training is divided into learnable units or elements of competence targeted towards specific skill development (Boahin & Hofman, 2014) and qualification. The researchers refer to competence-based training (CBT) and see its modular structure as one of the key characteristics (Mazrekaj & De Witte, 2020).

Project/problem-oriented curricula – curricula which is designed around real context/authentic contexts and is considered as "a highly effective way for instructors to help students learn disciplinary skills, modes of thinking, and collaborative practices by creating solutions to real-world problems for real users and clients" (Rees Lewis et al., 2019).

Workplace-oriented curricula – is an umbrella concept for various workplace-oriented curricula. Most typically it is apprenticeship-based curricula and it is specifically based on the authentic work settings (for example, on-the-job training periods within school-based learning (Rintala & Nokelainen, 2020). It can be organised as a distinct part of curricula (as a separate module) or as a major part of the whole curricula with intervening elements of school-based learning.

Work-integrated curricula – curricula based on work integrated learning approach, when students come to learn through experiences in school-based and workplace environments and through integration they reconcile those experiences to develop the understandings, procedures and dispositions, including the criticality and reflexivity, required for effective professional practice (Billet, 2011). The key dimensions of this curricula are authenticity, integrated learning supports, alignment of teaching and learning activities and assessments with integrative learning outcomes, supervisor access and induction/preparation processes (Smith, 2012).

Personalised curricula – curricula which are adapted to diverse learners' needs and individual interests, when teachers create diverse learning spaces for all learners (Guðjónsdóttir et al., 2015) and employ open, flexible, innovative and creative teaching methods (Guðjónsdóttir & Óskarsdóttir, 2017), and are built on cooperation and collaborations, group work, and teamwork.

Integrated curricula – curricula which are constructed on the basis of integration of disciplines, themes or concepts. **In**tegration might be based on multidisciplinary, interdisciplinary or transdisciplinary approaches. Curriculum integration includes many forms such as thematic units, project-based learning, problem- based learning and place-based learning and even passion-based learning (Drake & Reid, 2020; Sharma et al., 2017).

Hybrid curricula - curricula that go beyond the school-work distinction. Ideally, well-designed VET curricula should be hybrid in nature. It should combine the advantages of school-based and workplace

learning arrangements by binding these practices together, without losing the strength of either. (Zitter et al., 2016; Bouw et al., 2019).

INTRODUCTION

Contemporary education meets diverse challenges and thus, its content should be regularly revised. Researchers (Acedo, Hughes, 2014; Priestley & Sinnema, 2014; Drake & Reid, 2020) speak about the main drivers and factors which affect curricula transformations. Besides global tendencies, which traditionally have been associated with increased competition, internationalisation, industry 4.0, digital innovations, more and more voices speak about complex and new problems which current and future generations will have to solve. These include sustainability, pollution, increasing inequalities, homogenising of cultural diversity (Hoskins & Crick, 2010; Acedo, Hughes, 2014; Reinsfield, 2019).

In our research we discuss tendencies in curricula and their transformations which they have passed in the last decade. Big efforts have been allocated to find relative and most appropriate curricula design and pedagogies which would allow integrating the latest knowledge and best practices of educational sciences, psychology, neurosciences and other fields, taking the most of artificial intelligence, integrational approaches, networking. International organisations (OECD, ETF, UNESCO, ILO) and education communities agree that in order to prepare young people for the modern world, education should develop what is called 21st century skills and competences, which include, yet are not limited to creativity, critical thinking, learning to live together and lifelong learning, communication, collaboration, problem solving, citizenship, intercultural competency, global awareness, agility/adaptability, digital competences (Brown Wilson & Slade, 2020). In the European Union, the key competence framework for lifelong learning was adopted in 2006 and revised in 2018. World Economic forum (2015) identified key 16 skills which students require for the 21st century. Key competences were also defined by other international organisations, including UNESCO (2013; 2015), OECD (2015; 2019), Assessment and Teaching of 21st Century Skills (ATCS, 2015).

This research has been performed under the ETF initiative Creating New Learning (CNL) which aims to enable the development, implementation and dissemination of innovative teaching and learning practices for more effective education and training systems. Through the initiative CNL aims to build new networks, a body of knowledge and identify and develop tools that can support the countries in transforming learning. The research will dispute regarding cons and pros of diverse types of curricula and at the same time tracking common and uniting characteristics which also could be potentially integrated into traditional curricula.

The research focuses on identification of the key attributes of innovative VET curricula and how these characteristics emerge over the last decade, focusing on factors, specific drivers and implications. The analysis clarifies the emerging characteristics of contemporary curricula including authenticity of the learning environment, flexibility, learner's autonomy, integration of theory and practice and other.

The research aims to investigate what type of curricula are best suited to facilitate learning, particularly in VET and what are the characteristics of these curricula? And how (and whether) traditional, subject-based curricula may be successfully transformed and /or supported by alternative types of curricula to meet new challenges.
The research is structured around 3 key questions:

1) What are the characteristics of different types of VET curricula that could be considered as alternatives to the traditional, subject-oriented curriculum to support more effective and engaging learning experiences?
2) What are the trends/approaches in integrating key competences in VET curricula and how effectively do the different curricula approaches support learners in acquiring the learning outcomes related to key competences?
3) Which of the findings from research question 1 and 2 are reflected in 'contemporary' curricula developed and implemented in different countries (macro or meso level)?

The research identifies what evidence is that contemporary curricula actually has an added value for the learning process and as a result in achieving the required learning outcomes. Contemporary subject-based curricula in many countries recently have been reformed and updated with clear focus on competence-based learning. The borderline between the so-called contemporary curricula and subject-

oriented curricula might not be so distinct if we look at such elements as: learning goals (learning outcomes), interdisciplinarity, learning in diverse environments and other. We discuss what is the level of integration of learning outcomes: integrated approach or traditional subject/area approach with some level of integration, or a mixed approach when some integrated course(s) is used in parallel with traditional subject-based approach; what is the balance of key competence vs. occupational competences. We analyse the curricula design aspects which allow us first to understand difficulties of integrating key competences; second: supporting/driving factors.

Methodology

The research is based on the literature analysis. The main international data bases were selected including Academic Search Complete (EBSCO), ERIC (EBSCO), SAGE Journals Online, SpringerLink, Taylor & Francis, Wiley Online Library. The analysis was not limited to the geographical regions, specific publishing journals, age groups, a form of learning (traditional, online, blended) or a type (formal, non-formal, informal) and an educational segment: primary, basic, secondary, vocational, higher education, adult learning. At a later stage the segment was narrowed down to vocational education and training.

Using the key words (*contemporary curricula, innovative curricula, vocational education and training, modular curricula, integrated curricula, work-oriented curricula, phenomenon-based curricula, project-oriented, problem-based curricula, key competences, 21st century competences, curriculum transformation*) the selection of articles and studies, including full articles and abstracts was performed. It should be noted that additionally adding such key-words as “project-oriented” curriculum/a, problem-based, work-oriented curriculum/a” allowed finding rather limited number of new articles /studies. Majority of the scientific literature pieces are identified with the key word “curriculum/a” and later specifying the educational context like “vocational education and training”, “non-formal and informal learning”, “adult education”. Reviewing the results, it was clear that high number of articles containing the key words “work-oriented”, adult learning, non-formal and informal learning are not relevant for this research. Thus, in most cases, the search was done in an iterative manner – using key words in different combinations.

In order to select articles/studies in the Russian language, the appropriate key words were used (*инновационная учебная программа, учебный план, ключевые компетенции, гибкий учебный план*). While searching for scientific literature among databases where articles and studies in the Russian languages are available (ERIC, Ebsco), other key words like “curriculum”, “vocational education and training - *профессионально-техническое образование*” were also used. However, the results with the key word “*curriculum*” were rather few. The results of the literature research are presented in Table 1.

Table 1. Identified number of articles for literature review

Database	Period	Key words	Found total
Ebsco	2010-2020	innovative curriculum, modular curriculum and vocational education and training	978
Academic Search Complete (EBSCO)	2010-2020	innovative curriculum, modular curriculum and vocational education and training	158

ERIC	2010-2020	innovative curriculum, modular curriculum and vocational education and training	166
ERIC	2010-2020	Contemporary curriculum, vocational education and training, non-formal and informal learning, adult learning	121 635 (full articles)
Acdemic Search Ultimate	2010-2020	innovative curriculum, modular curriculum, and vocational education and training	158
Taylor Francis Online	2010-2020	innovative curriculum, project-based curriculum, phenomenon-based curriculum, modular curriculum	198
Web of science	2010-2020	innovative curriculum	34
Oxford Journals Collection	2010-2020	innovative curriculum	160
Sage journals	2010-2020	Curriculum, contemporary curriculum	59
Sage journals	2010-2020	project-oriented curriculum in vocational education and training	62
Sage journals	2010-2020	21st century competences in curriculum implementation	87
Sage journals	2010-2020	Interdisciplinary curriculum, non-formal and informal learning, adult education	585
Sage journals	2010-2020	Work-oriented curriculum, adult education, non-formal and informal learning, vocational education and training	39 285
Sage journals	2010-2020	Modular curriculum, adult education, non-formal and informal learning, vocational education and training	621
Ebsco Academic Search Academic Search Ultimate Complete Education Source	Available from 2014	преобразование учебного плана	15

Ebsco Academic Search Academic Search Ultimate Complete Education Source	Available from 2015	ключевые компетенции	70
Ebsco Academic Search Academic Search Ultimate Complete Education Source	2010-2020	гибкий учебный план профессионально-техническое образование	6
SpringerLink	2010-2020	Innovative curriculum, key competences	185
SpringerLink	2010-2020	Integrated curriculum, phenomenon-based curriculum vocational education and training	89
Wiley Online Library	2010-2020	innovative curriculum, key competences, vocational education and training	1292 (32 with open access content)

In order to select the most relevant papers we used inclusion/exclusion criteria (Table 2).

Table 2. Inclusion and exclusion criteria used for the final selection of research literature

Criteria	Inclusion criteria	Exclusion criteria
Sources of information	Include articles based on empirical findings or theoretical analysis. Articles published in the peer-reviewed, open access journals, full-text articles. Articles must be published in a period from 2010 to 2020.	Exclude sources published without peer-review, with no full-text available. Exclude articles published till 2010.
Content	Include studies where innovative curricular and key competences are regarded as a core subject. Include studies where innovative curriculum is being practiced at different types of schools (general, VET) of different forms of property (private, public schools).	Exclude studies where innovative curriculum and key competence are regarded as a secondary concept. Exclude studies where curriculum is being practiced within business organizations, in relation to consumer behaviours.

Type of study	English, Russian, and the main European languages quantitative, and qualitative studies, reviews. Foresight studies (in order to capture possible future tendencies in the analysed field).	Conference abstracts, reports and editorials, commentaries.
Outcomes	Relevant international studies from OECD, UNESCO, etc. Specific cases of different type of curricular reflecting different characteristics as defined in RQ1 and RQ2.	Conference abstracts, reports and editorials, commentaries
Availability	Full-text (in English) and abstracts (in the main European languages) accessible to the authors	Full-texts non accessible to the authors.

Using the inclusion/exclusion criteria, total of 204 articles were selected for more detailed investigation, yet, some were excluded in the process as they were not directly linked to the research questions. It should be mentioned that in order to ensure data saturation, we searched for additional literature in order to provide sufficient evidences and examples. The final research is based on 184 references which include scientific articles, studies as well as policy documents and country reports.

For the development of Part 3 of this report we designed an original curricula analysis instrument, which was used to analyse specific cases of different curricula, how characteristics of contemporary curricula and key competences integration approaches are reflected in them.

TRENDS IN CURRICULA

2.1 Developments influencing curriculum design

We start our discussion from the latest trends in curricula development, analysing the main factors which influence these developments and also identifying recurring characteristics of contemporary curricula. There are multiple drivers encouraging to reconsider curricula in the 21st century (Drake & Reid, 2020). In this section we present an overview of general tendencies affecting curricula transformations and also focusing specifically to the contexts and rationale for changes in vocational education and training (VET). As referred in the introductory part, we define the characteristics of contemporary VET curricula and in the next section analyse how they are reflected in different types of contemporary curricula: through design, structure, instructional approach or other ways.

The investigation of the rationale behind each type of contemporary curricula is related to:

- Developments in labour market and economy (Albashiry et al., 2015; Pilz et al., 2018)
- Focus to learning outcomes and qualification frameworks (Tūtlys, Spūdyte, 2011; Ure, 2019);
- Latest knowledge on how people learn, new pedagogies (Frommberger & Krichewsky, 2012; Ure, 2019);
- Stakeholders' influence (Drake & Savage, 2016; Drake & Reid, 2020).

There are macro, meso and micro factors which make national governments, educational institutions, practitioners to search for new types of curricula. Macro factors and drivers are related to global tendencies such as growth of digital technologies and their penetration to our everyday life (Jenson & Droumeva, 2017; Butler et al., 2018; Brown et al., 2019;), increasing pressures from diverse stakeholders (employers, politicians, parents, etc.), international collaboration and competition, European policies which affect member states and candidates including regions which are affiliated or supported by numerous EU programmes, international education benchmarking practices and similar (Brown Wilson, Slade, 2019; Caves et al., 2019). Meso factors are linked to national policies, VET system characteristics, regional practices and etc. (Andrian et al., 2018; Westerhuis & van der Meer, 2017). Micro factors most typically are associated with institutional practices, organisational culture, teachers' professionalism, curricula implementation practices.

2.1.1 Developments in labour market and economy

Countries have taken various measures while revising their national curricula to respond to the demands of the labour market: increasing flexibility for learners (Stewart, 2017; Tsatsaroni & Sarakinioti, 2018), less regulated learning time (it can be shorter or longer depending on individual situations), valuing learning in different learning environments (Nikolov et al., 2018). According to Pilz et al. (2018), flexibility aspect is also important while targeting diverse needs of learners. Diverse curricula strategies were accepted to increase accessibility of VET, increasing the rate of participants in the VET system and to ensure faster and more diversified careers and expand systems towards more personalised modes of learning (Telling & Serapioni, 2019). For example, Stenström, & Virolainen (2014) observe that in order to enhance flexibility and employability perspectives in the labour market, some VET programmes were diversified by offering modules from other vocational qualifications.

Research (Mulyadi, 2019; Kuper, 2020) also indicates that digital skills combined with complex information processing skills will be in high demand. Industry 4.0 also imposes curricula changes and requires interdisciplinary cooperation. A full potential of Industry 4.0 can only develop if integrative technical challenges and business perspectives are taken into account for training of future specialists. For example, Atwell et al. (2020) indicate that contemporary curricula today should be designed and developed taking into consideration what new realities and demands Artificial Intelligence creates nowadays. Researchers (Attwell et al., 2020) observe that "demand for physical and manual skills and for basic data input and processing will decline", and an increased demand in interpersonal skills, creativity, and empathy is evident. In Japan, curricula transformations are already discussed not only in the light of Industry 4.0 but Society 5.0, focusing on robotics, AI, digital technologies, STE(A)M education (Mulyadi, 2019).

2.1.2 Focus on qualification frameworks and learning outcomes

Focus on qualification frameworks and learning outcomes signifies a move from input to outcome-based approach in education. EU policies have played an important role in curricula modernisation processes including the adoption of credits transferability and recognition of non-formal and informal learning, learning outcomes orientation, qualification frameworks, competence development in initial and continuous VET (Copenhagen Declaration, 2002; Maastricht Communiqué 2004; Helsinki Communiqué 2006; Bordeaux Communiqué 2008; Bruges Communiqué 2010; Riga Conclusions, 2015). Particularly Helsinki Communiqué 2006 stressed the need to reconsider VET in relation to the European qualification framework and national qualifications frameworks and Riga Conclusions 2015 focused on increasing flexibility in gaining qualifications, a need for key competences development in VET curricula. The development of EQF and NQF helped to link learning outcomes with qualifications frameworks levels, which increased the transparency of the qualifications of the various national systems; and comparability (Tūtlys, Spūdyte, 2011). From the perspective of contemporary pedagogies, learning outcomes are closely associated with learner centred approach.

Learning outcomes are also emphasized in the UNESCO Education 2030 program, as they are linked to the main aim of the agenda to ensure and promote quality inclusive and equitable education, lifelong learning opportunities for all (UNESCO, 2015). Introduction of learning outcomes was a response to the

need to create more flexible learning and study paths for people of all ages and backgrounds, ensuring transnational mobility, lifelong learning, creating mechanisms for the recognition and validation of learning in the terms of learning outcomes (Telling & Serapioni, 2019).

For curricula these changes meant the implementation of competence-based approach, which enhances flexibility, authenticity of learning (recognising and linking diverse learning environments), knowledge transferability, effectiveness of learning and other aspects (Child, Shaw, 2019). The research shows that curricula have been successfully transformed in many countries focusing to competence-based learning (Boahin et al., 2014; Telling & Serapioni, 2019). National general education and VET curricula reforms in UK, Australia, New Zealand (Bolstad et al., 2012), most of the EU member countries have incorporated competences and outputs-based approach (Telling & Serapioni, 2019). However, strategies slightly differ. In general education subject-based curricula in some countries moved from loosely interconnected subjects to more integrated learning units and themes (Drake & Reid, 2020); key competences have been integrated into curricula (Mockler, 2018) and descriptors of competence levels established (Keevy & Chakroun, 2015). More freedom and flexibility appeared allowing schools to integrate content more relevant to their local or regional contexts to respond to cultural diversity (Andrian et al., 2018) or regional economy demands (Westerhuis & van der Meer, 2017).

Priestley, Sinnema (2014) consider that a move from the explicit specification of content towards a more generic, skill-based approach created a greater emphasis on the centrality of the learner and greater autonomy for teachers in developing the curriculum in school. Competence-based education thus, was perceived as the one having more added value to economy development, better responding to individual needs and accountability to society Competence-based approach also gave stimulus to the development of new pedagogies (Brassler and Dettmers, 2017). They are discussed in the next section.

2.1.3 Developments in pedagogy

Another macro driver for curricula transformations is related to broader theoretical and scientific movements. Curricula have been mainly influenced by three key theories: behaviourism, cognitivism and constructionism. Behaviourism even though put the teacher as the leading and central figure in curricula implementation, was, nonetheless, important for defining the role of the repetition in the learning process, practical application of knowledge in work environment and finalising learning with measurable outcomes. Cognitivism shared many similar views and approaches with behaviourism, however, it significantly contributed to the structure and design of curricula which became more learner-centred, recognising learners as active constructors of knowledge (Frommberger & Krichewsky, 2012; Abadzi, 2016). However, both theories have not affected the way of instruction and most of curricula implementation was based on the transfer of knowledge. Constructivism affected curricula transformations in relation to the learner's engagement (Baroutsis et al., 2016) and role in constructing knowledge individually and collaboratively. Knowledge is socially constructed - this was the key message of constructivism theory. This highly influenced pedagogical approaches in curricula, which moved to learner-centred and active learning (Ure, 2019). The researcher observes that while behaviourism and cognitivism were governed by an objectivist view of knowledge, constructivism promotes the idea that learning outcomes cannot be easily measured as they vary among learners. Accordingly, learning outcomes "should follow a holistic, generalising concept of competence" (Ure, 2019, p. 175). Constructivism theory also implied that curricula should provide learning in solving or acting in complex situations, a shifted role of teachers and growing importance of self-directed learning (Bolstad et al., 2012). These theories affected the models and types of curricula and stimulated search for new and alternative approaches.

2.1.4 Influence of stakeholders

Curriculum design and development is intended to be a democratic process (Brown Wilson & Slade, 2020) and should be aligned with internal and external stakeholders. Contemporary curricula should respond to diverse needs and expectations coming from different stakeholders (employers, professional associations, parents, ministries and etc.) regarding the accountability of education, better match with

labour market demands, faster adaptation to the real work contexts (Convery, 2017; Caves, Baumann & Renold, 2019; Brown Wilson, Slade, 2020; Horden, 2020). Learners' voice should be also heard (Baroutsis et al., 2016) and accessibility, individualised approaches, flexible and alternative learning paths are loudly articulated in contemporary contexts (Stewart, 2017). All these aspects make a complex group of driving factors for curricula modernisation.

Responses of national authorities and schools vary. In some countries we can observe decisions to move to VET modularisation (as in the case of Germany, Poland, France) or towards more integrative curricula approach (Drake & Reid, 2020), for example, integrated curricula in Finnish general education system, also elements of integrated curricula in New Zealand curricula (Reinsfield, 2020). In some cases, we see both approaches, developed in parallel, like in Finland (flexible modular programmes in VET and phenomenon-based learning in general education), the Netherlands (many different type of curricula emerge including hybrid curricula, problem-based, project-based and etc.), VET curricula are implemented in at least two models: school based and apprenticeship-based (Finland, Denmark, Lithuania, Latvia, Estonia, Slovenia and more[1]). Scientific literature also evidences that for successful implementation of VET curricula inclusive stakeholders' engagement is crucial (Viennet and Pont, 2017; Caves et al., 2019). This is also supported by EU policy documents, Riga Conclusions (2015), where the need to promote work-based learning in all its forms is stressed and which cannot be implemented without substantial support and involvement of stakeholders.

The above described drivers and challenges allowed us to define the most recurring characteristics of contemporary curricula which resulted as a response to these complex factors. They are further discussed in the next section.

2.1.5 Characteristics of contemporary curricula

In order to define key trends in contemporary curricula we analysed articles and studies focused to discuss and analyse key characteristics of 21st century education (Voogt & Roblin, 2010; Sturing et al., 2011; Veillard, 2012; Bolstad et al., 2012; Frommberger & Krichewsky, 2012; Mincu, 2013; Cremers et al., 2014; Acedo & Hughes, 2014; McPhail & Rata, 2016; Greany & Waterhouse, 2016; Abadzi, 2016; Zitter et al., 2016; Hodge, 2016; Brassler and Dettmers, 2017; Tsatsaroni, & Sarakinioti, 2018; Nikolov et al., 2018; Zwan, & Afonso, 2019; Caves et al., 2019; Bouw et al., 2019; Crato, 2020; Rintala, Nokelainen, 2020.

Bolstad et al. (2012) defined the following key trends and principles for the 21st century education:

- Personalising learning;
- New views of equity, diversity and inclusivity;
- A curriculum that uses knowledge to develop learning capacity;
- "Changing the script": Rethinking learners' and teachers' roles;
- A culture of continuous learning for teachers and educational leaders;
- New kinds of partnerships and relationships: schools no longer siloed from the community.

Voogt and Roblin (2010) referred to a shift in pedagogies in industrial and information societies, which are reflected in the 21st education. New pedagogies are defined through 5 aspects: active, collaborative, creative, integrative and evaluative. This allows to distinguish trends in pedagogical approaches in contemporary curricula, which are linked to learner's choice, variety of activities, collaborative learning, support and scaffolding, integration of theory and practice, integrated learning, co-creation.

Acedo and Hughes (2014, p. 514) named guiding principles for 21st century learning. These include fundamental areas of knowledge (STEM learning, information literacy, concepts-focussed learning), competences (creativity and critical thinking) and attitudes (academic honesty, health and mindfulness, service learning) that should feature in a model of cognition that responds to the challenges of rapidly transforming societies, workplaces and environments.

[1] https://www.cedefop.europa.eu/en/publications-and-resources/country-reports/vet-in-europe-country-reports

Flexibility, connectivity and authentic learning environment, adaptability to labour market demands are the most typical and most frequently discussed characteristics of contemporary curricula (Tsatsaroni, & Sarakinioti, 2018; Zwan, & Afonso, 2019; Crato, 2020). Ryan and Tilbury (2013) defined flexible learning in three dimensions: the Pace, the Place and the Mode. The Pace dimension speaks about flexible learning path, which is related to learning speed, length of curricula, part-time learning, recognition of prior learning. The Place dimension includes diverse and authentic learning environments such as work-based learning, collaborative engagement of employers and employees, exchange of practice. The Mode dimension encompasses the media aspects such as the use of technology to support learning. Flexibility of learning pathways, combining school-based and work-based learning pathways, is stressed by Rintala and Nokelainen (2020), as it helps to promote individual competence needs. Personalised learning is also much linked to flexible curricula as it allows students' voice be heard (Steward, 2017), and moreover, it involves collaborative learning, communities, use of ICT. Rao and Meo (2016) note that flexible curricula are focused on choices and options and adaptation to individual student's needs

Nikolov et al. (2018) defined contemporary curricula in terms of its flexibility and openness, which is regarded as a means to respond to learners' needs, offering differentiated instruction, diversified grouping, learning space and environment. Nikolov et al. (2018) clearly defined flexibility of curricula in relation to Aims and objectives (what), Teaching and learning strategies (how), Environment (where) and Time (when). Applying curricula spiderweb approach (van den Akker, 2009), Nikolov et al. (2018) explain how flexibility is realised through the following curricula elements as learning aims and objectives, content and assessment. The second dimension (how) is realised in such elements as learning activities, materials and grouping. The third dimension (where) speaks about learning environments and the last – learning time.

Table 3. Flexibility of curricula reflected in different elements of curricula (based on Nikolov et al. (2018)

Aims & Objectives	Levels: Multi or one for all Uniform or personalized learning paths
Content	Learning content is flexible and reflects choice, interests, levels. Differentiated instruction, shorter/longer instruction, smaller/bigger steps, content broken down into different sized pieces, more/less structured. The content form reflects approach, ways in which the content is presented, various options for perception/comprehension. Presence or lack of guiding questions, depth of guiding questions
Assessment	Assessment based on personalized rubrics or same standards. Demonstrating and assessing level of outcomes/products. Ways to demonstrate goal achievement: Choices in forms for the end product, alternative options to show what is learnt.
Learning activities	Active learning methods, personalised approaches, based on learning styles, skills. Regular guidance for learners. Assignments based on product and task options, homework Learning activities support ways to acquire knowledge, options for processing/expression/engagement.
Teacher role	Make adaptations, create individual learning paths. Solo/co-teaching/engagement (external) others. Guide toward autonomous learning. Scaffold support.
Materials & Resources	Learning materials should be various, providing possibility for learners' choices. High and low (or no!) tech Texts at varied reading levels
Grouping	Grouping configurations are various (individual/small groups/whole class) and collaborative and individual learning is equally important. Seating arrangements and student groupings: Fixed or flexible

Location	Learning environment is not rigidly fixed. Learning can take inside/outside classroom/school, using building/rooms. It can be organised in a traditional/blended/digital way.
Time	Diverse learning time options/alternatives based on learning pace, duration, time span, moment, sequence. Learning time can be organised exploring possibilities of synchronous/asynchronous communication Deadlines: Fixed or loose

The analysis of the flexibility of curricula reveals that this characteristic of contemporary curricula is extremely broad and includes many aspects such as personalised learning, valuing prior learning, collaborative and co-creative learning, authentic learning.

Other broad characteristics of curricula are linked to adaptability to the labour market, integration of theory and practice. These characteristics gain importance in curricula due to previously discussed developments in the labour market, global tendencies, technological innovations. We also see that employers make pressure on education systems "to produce" employees who can switch into the workplace immediately (Abadzi, 2016). This high demand coming from stakeholders has affected curricula transformations in most of the countries. However, approaches differ and the voices of scholars' community and from cognitive psychologists in particular, try to explain that swift "plug-ins" into the work place are hardly possible due to the specifics of the learning process (Abadzi, 2016). Knowledge and learning are often context dependent, therefore, all new specialist need a particular span of time to get adapted. For this reason, contemporary curricula pay so much attention to connectivity and knowledge transferability (Veillard, 2012; Zitter et al., 2016). The tools and measures which could help to ensure a smooth path from learning to work environment are related to validation of prior learning, strengthening cooperative and collaborative learning in school and work environments, providing systemic guidance and scaffolding to learners.

Adaptability to labour market demands is linked to higher employability perspectives (Rocha, 2015), faster adaptation to different work situations and contexts, changing environment (Convery, 2017; Caves, Baumann & Renold, 2019; Brown Wilson, Slade, 2020; Horden, 202). Adaptability is closely connected to authentic learning environment (Lewis et al., 2019), active and collaborative pedagogies (problem-based, project-based learning), developing competences to solve interdisciplinary, multidisciplinary or transdisciplinary problems (Yadav et al., 2011; Kang et al., 2012; Chung et al., 2016; Brassler and Dettmers, 2017).

As a result of the analysis of the 21st century education trends and characteristics of contemporary curricula helped us to develop a list of most recurring characteristics relevant for contemporary curricula**:**

1. **flexibility** for learners (Tsatsaroni, & Sarakinioti, 2018; Nikolov et al., 2018; Zwan, & Afonso, 2019; Crato, 2020;) including optimising consolidation timeframes (valuing prior learning) (Abadzi, 2016), personalisation Mincu, 2013) and learner's autonomy (Greany & Waterhouse, 2016; Hodge, 2016, 2016a, 2018; Жанкина et al., 2019; Crato, 2020);
2. **adaptability to labour market demands** (Caves et al., 2019) including knowledge transferability and connectivity (Veillard, 2012; Cremers et al., 2014; Zitter et al., 2016; Bouw et al., 2019)
3. **authenticity of the learning environment** (Sturing et al., 2011)
4. **integration of theory and practice** (Rintala, Nokelainen, 2020) including concepts-focused learning (Ascedo, Hughes, 2014);
5. **collaborative and co-creative learning** (Brassler and Dettmers, 2017) including engaging with /for community (Fang, 2018)

These big clusters of characteristics of contemporary curricula will be used throughout the whole research as they help us to analyse how these characteristics are reflected in different curricula and which of them are most or least evident in the structure and pedagogical approaches.

2.2 Types of contemporary curricula (the rationale behind them and unique characteristics)

This section presents unique characteristics of different type of curricula. We will present different curricula as defined in the typology, using the spiderweb approach proposed by van den Akker (2009) in order to present the main structural and instructional parameters of curricula. When discussing successful experience in curriculum design, development and implementation, van den Akker (2009) emphasizes maintaining a balance between the main components of the curriculum. Thus, when analysing different types of curricula, we tried to describe them according to the following curricula components (van den Akker, 2009, p. 39):

1. The rationale or vision (Why are they (students) learning?)
2. Objectives and Objectives (Towards which goals are they learning?)
3. Content (What are they learning?)
4. Learning activities (How are they learning?)
5. The role of the teacher (How is the teacher facilitating learning?)
6. Materials and resources (With what are they learning?)
7. Grouping (With whom are they learning?)
8. Location (Where are they learning?)
9. Time (When are they learning?)
10. Assessment (How to measure how far learning has progressed?)

This spiderweb approach is chosen in our study in order to define what are leading and dominating features of different curricula, which at the end of the section helped us to summarise the emerging curricula by explaining which characteristic(s) of contemporary curricula they emphasise most.

2.2.1 Workplace oriented curricula

Workplace-oriented curricula

The rationale of workplace-oriented curricula is to develop competence and qualification in authentic learning environment (Smith, 2012). In VET work-oriented curricula is typically associated with apprenticeship, however, other models of work-oriented curricula are also observed. Work-oriented curricula might be realised as an internship, cooperative education, experimental learning, field experience, industrial placement, placement learning, *practica*, sandwich courses, service learning, and workplace learning (Wan et al., 2013).

A study carried out by Wan et al. (2013) showed that collaborative experiences during internship placements are an essential part of vocational higher education curricula. The effectiveness of placements has become one of the main concerns faced by those who develop education programmes. The researchers conducted a longitudinal study which involved 357 undergraduate students from National Kaohsiung University of Hospitality and Toursim (Taiwan). The study showed that during internships job satisfaction was achieved and devotion to the profession as well as overall satisfaction of the study programme increased. Research findings mean that the inclusion of work-based learning experience in vocational education and training curricula promotes students' personal growth and future careers.

Workplace-oriented learning and work-integrated learning are not equally the same concepts. Work-integrated learning (WIL) was well defined by Billet (2011). Work-integrated learning curricula are based on the “process whereby students come to learn through experiences in educational and practice settings and reconcile and integrate the contributions of those experiences to develop the understandings, procedures and dispositions, including the criticality and reflexivity, required for effective professional practice” (Billet, 2011). Workplace-oriented curricula are typically apprenticeship-based curricula and they are specifically implemented in the authentic work settings, where the major part of learning is organised (Rintala & Nokelainen, 2020). Thus, in the case of workplace-oriented

curricula we usually have an apprenticeship model; whereas WIL is more typically realised through internships, practicums, placement learning.

Smith (2012) defines the key dimensions of both types of curricula: work integrated and workplace-oriented, which are: **authenticity, integrated learning, alignment (of teaching and learning activities and assessments with integrative learning outcomes), supervisor access and induction/preparation processes**. A stronger alignment between learning environments, a more coherent integration of theory and practice, minimising fragmentation of knowledge developed in workplace and school-based environment are key challenges for work-place oriented curricula (Kaiser, 2020). This is one of the reasons why some EU countries, including Denmark, Germany revised their apprenticeship models trying to ensure more tight links and connectivity between two learning environments.

Apprenticeship is viewed as a social learning model (Guile, 2011) and it is based on the principle that vocation (profession) is developed through workplace experience combining theoretical knowledge gained at educational institution. **Thus, a qualification is gained through collaborative work in an occupational field or community**. The apprenticeship model, according to Guile (2011) proved to have no age or phase-specific limitations and currently we observe in such countries as France, UK, Italy practices regarding the implementation of "higher apprenticeships' leading to higher education vocational careers. Fjellström & Kristmansson (2019) note that in Sweden the apprenticeship model has a renaissance starting from 2008 educational reform which opened another model of apprenticeship - this includes studies in upper secondary education through an apprenticeship. The so-called "New apprenticeship" is constructed in a way that learners spent at least of 50% of learning time at the workplace (Karlsson et al. 2016) and at the same time remaining student at school and not an apprentice at a company. The main coordination of the learning process remains with the teacher, however, demands for more cooperative work and communication with companies is growing. As Kaiser (2020) notes, a recent research project on the apprenticeship model in Sweden found that the demands for VET teachers have changed towards being able to establish a kind of work-based school learning (Kaiser, 2020), i.e. even at school-based environment integrate more elements of workplace-oriented learning.

Both type of curricula (WIL and workplace-oriented) are characterised by authentic learning environment. As Smith (2012) puts, "authenticity is at the heart of all workplace-situated learning". However, in the case of **WIL, curricula authenticity also refers to "cognitive authenticity" when students are engaged in meaningfully consequential projects** (Smith & Worsfold, 2014). The structural elements of workplace-oriented curricula are presented in Table 4. The table reflects the characteristics of an apprenticeship model as it represents a more typical workplace-oriented curricula. Work integrated curricula will be later discussed.

Table 4. Structural elements of workplace-oriented curricula

Structural components	Clarifying questions	Characteristics
Rationale or Vision	Why are they learning?	The core idea of workplace-oriented curricula is adaptability to the labour market through authentic learning (Rintala & Nokelainen, 2020).
Aims & Objectives	Toward which goals are they learning?	To increase students' professional identity and develop competences through coordinated and sequential activities (tasks, projects, etc.) which allow to apply vocational knowledge in a workplace and vice versa, i.e. brining vocational knowledge from workplace to school (Kaiser, 2020).
Content	What are they learning?	The content is typically associated with work processes and theoretical concepts of the vocational field. As Guile (2011, p. 455) puts, "curriculum planners have to, on the one hand, take account of institutional considerations, for example, knowledge

		requirements set by professional bodies and/or curricula frameworks; and, on the other hand, select a range of theoretical concepts from their disciplinary field and practical concepts from workplaces, and then decide how to combine them to support vocational formation".
Learning activities	How are they learning?	Learning process in a workplace goes through typical stages which start from observation, then moving to assistance to working professionals, co-working, independent accomplishment of work-related tasks under supervision. Later learning in a workplace involves projects, solutions of complex problems, etc. (Smith, 2012; Guile, 2011).
Teacher role	How is the teacher facilitating learning?	There are teachers/supervisors in workplace and at school. The role is guidance, facilitation in the process of application of theoretical knowledge in the workplace and conceptualising practical experience (Rintala & Nokelainen, 2020).
Materials & Resources	With what are they learning?	Workplace related materials and objects combined with school curricula materials and resources (in a case of an apprenticeship model).
Grouping	With whom are they learning?	Learners are learning in diverse ways and the grouping may depend on the field/industry specifics, depending on the real contexts or work processes which require either more individual or group work, co-working, shadowing and etc.
Location	Location Where are they learning?	Depending on the model, the share of learning time in a workplace and school differs. Learning time in a workplace could take 50% and more.
Time	When are they learning?	After lower/upper secondary education following 1 or more years of apprenticeship or in parallel to upper secondary education. Other models may also be applied.
Assessment	How to measure how far learning has progressed?	As authenticity is at the core of workplace-oriented curricula, assessment is focused on performance-based tasks (projects, problem solutions, designs, etc.), which are close to the profession. However, researchers also note that assessment should involve complex assignments and in written assessment, it could include cases, problem-solving and essay questions, which act as a proxy of the real world (Ajjawi et al., 2020). Assessment should be cognitively challenging, encourage reflexivity (similar approach is observed in hybrid curricula), promote students' capabilities to judge the quality of their work (Aijawi et al., 2020).

For the workplace-oriented curricula strong linkages between industry and enterprise and education are needed. It is also important to ensure strong links between theoretical and practical training to avoid gaps and fragmentations.

2.2.2 Modular curricula

Frommberger and Krichewsky, 2012, Pilz (2012), Pilz et al. (2018), Boahin and Hofman (2014), Li and Pilz, (2017) see modularisation of curricula as a response to the need to tackle the current and future

challenges that result from issues such as **greater differentiation between trainees in terms of prior knowledge or performance and the need to operate a flexible training system that is capable of rapid adjustment to technical and organisational change**. The main three drivers for developing modular curricula in VET could be grouped as follows:

- Meeting labour market demands;
- Ensuring flexibility targeting diverse needs of learners;
- Complying to EU policies to promote mobility within the EU.

For example, analysing different rationale for modularisation of vocational education and training (VET) curricula in several European countries, Pilz et al. (2018) noted that, for example, rationale for modularisation in England, Finland, Austria and Hungary was related to **meeting labour market needs and to promote links with it; the second driver being to target the needs of specific student groups**. Whereas for Poland, modularisation was not only influenced by political will to meet needs of specific groups of learners but also to comply with EU policies and promoting mobility within EU.

Pilz et al. (2018) developed a set of five criteria which help to define modularisation and the principles of modular programmes. The first criterion is related to "a clear start and end point for a module, governed by the learning content and/or qualifications in the curriculum". In general, the timescale for the completion of the module might be rather flexible. This means that different modules can be taken at different time and learning pace, including intervals. The second criterion, characterising modular curricula, is a clear focus to outcomes-oriented learning. It means that learning outcomes are typically assessed based on the defined vocational or other type of standards. Typically, there is a certification of each module completed – and thus, individual certification is the third criterion of modularisation. Individual certification creates more diversified routes in the labour market, starting, for example, career from the jobs with lowest qualification or certificates. However, in traditional modular curricula individual certification is rare and is organised usually at the completion of the training programme. The fourth criterion is related to the length of learning time. Radical types of modular curricula do not impose restrictions for participation or the length of participation. In more holistic modular curricula restrictions regarding the sequence of modules are applied. The fifth criterion is related to the variety of training providers and their capacities to implement training.

This discussion discloses the fact that today in different countries we can find rather radical and more traditional forms of modular curricula. Some of the characteristics of these curricula are quite opposite. For example, strong and loose links between the formal learning process and learning goals and outputs. In some radical types of modular curricula, this link is very loose, meaning that individuals have flexibility to develop competences inside and outside formal education.

Table 5. Structural elements of modular curricula

Structural components	Clarifying questions	Characteristics
Rationale or Vision	Why are they learning?	Increasing flexibility for learners, adaptability to the labour market and accountability to society (Frommberger & Krichewsky, 2012, Pilz (2012), Pilz et al. (2018), Boahin and Hofman (2014).
Aims & Objectives	Toward which goals are they learning?	Ensure variety of paths to collect modules for diverse qualifications and specialisations based on learning outcomes and professional standards (Pilz et al., 2018)
Content	What are they learning?	Learning content is typically (yet not necessarily) based on work-processes or on the field units as defined in professional standards. Modules may be also subject-based. There is higher flexibility regarding students' choice of modules (Pilz & Canning, 2017).
Learning activities	How are they learning?	Typically learning involves many practical activities combined with theoretical studies. Modular curricula

		open more possibilities to individualise curricula based on prior learning or increase variety of specialisation routes and/or acquire additional qualifications through selection of extra modules (Pilz & Canning, 2017).
Teacher role	How is the teacher facilitating learning?	Teacher's role is changing but it requires high integration of theory and practice as modules are linked to work processes and disciplinary knowledge.
Materials & Resources	With what are they learning?	Depends on the module.
Grouping	With whom are they learning?	There are no specific models regarding the grouping and it depends on the module.
Location	Location Where are they learning?	Modular curricular might be realised combining school and workplace settings, also combining simulative environments, school workshops, etc.
Time	When are they learning?	Modular curricula in some cases have very flexible learning time regulations (for example, Finland) in other countries learning time is defined. In most typical cases modular curricular is most attractive for learners as it allows to learn at individual pace (Pilz & Canning, 2017).
Assessment	How to measure how far learning has progressed?	Assessment is typically outputs-oriented and aims to get evidences how specific competence is demonstrated in specific context(s). For this reason, several assessment methods are combined. The assessment process involves industry representatives and teachers.

For modular curricula one of the challenges is to ensure coherence in developing competences. As one of the criticisms is related to fragmentation of separate modules as students may choose modules, which they like, avoiding the modules which make the core of qualification. The "remedy" for that is to have well-regulated national systems (NQF), standards and clear regulations for obtaining qualifications. As Ante (2015) puts, modularisation is at the core of EQF.

2.2.3 Personalised curricula

Personalised curricula have diverse definitions but most typically it is defined as **a learner led curricula** responding to individual needs and interests of learners, aiming to disclose potential of every learner in achieving learning goals through engaging, inclusive approach (Mincu, 2012). The other variants of definitions refer to personalised curricula based on heutagogy ideas and the content of such curricula is self-created, **meeting the needs of individuals and their real-world context** (Stoten, 2020). Stewart (2017, p. 7) provides the key characteristics of personalised learning curricula:

- The use of authentic assessment for learning, and the knowledge of student needs.
- A flexible curriculum that allows for student voice and choice.
- The involvement of family and communities in the teaching and learning process.
- The use of information communication technology (ICT) for learning and the collection of student data.

Other researchers (UNESCO IBE, 2020) define personalised learning based on four core elements:

a) Collaborative dialogue, co-construction, personal reflection and mutual ownership by learners and teachers.
b) Flexible content, tools, and learning environments to facilitate learners' interests and needs and teacher-learner collaboration.
c) Targeted support in response to learner interests and needs, through learning communities and communities of reflective practice.

d) Data driven reflection decision-making and continuous improvement, drawing on self-evaluation and feedback to inform next steps in learning and teaching.

Despite the variety of definitions of personalised learning curricula, scientific literature is rather limited in providing comprehensive cases. Personalised learning curricula could be realised in a school or workplace environment or fully online.

One of the variations of personalised curricula is based on adaptive learning principles. Here we deal mainly with online curricula, which might be part of formal, non-formal and informal learning. Learning adaptation is defined as the adaptation of the learning process through decision making that is based on continuous feedback. In adaptive learning models, learning content consistently provides feedback and further learning if students provide an incorrect answer. Student assessment is conducted in a sequence of questions. This is a probability-based approach because it models that students with a lower level of knowledge are more likely to get simpler questions; when answered correctly, the content of learning becomes more complex, and so the process takes place until the planned results are achieved, which finally allows the most complex questions related to the learning topic to be answered (Jonsdottir et al., 2015). The adaptive learning system analyses students' responses and accordingly adapts the sequence of the learning content.

Table 6. Structural elements of personalised curricula

Structural components	Clarifying questions	Characteristics
Rationale or Vision	Why are they learning?	The key driver of personalisation to respond to diverse learner's needs and potentials and to avoid a "one-fits-all" concept, (Zmuda et al., 2015).
Aims & Objectives	Toward which goals are they learning?	To develop the required learning outcomes in an efficient way without repetition of prior knowledge and skills. In addition, it allows achieving learning "shortcuts" based on prior knowledge, interest, motivation and other factors (Stewart, 2017).
Content	What are they learning?	Content is adapted responding to learners' prior knowledge, interests, motivation, individual goals balanced with overarching goals of curricula (UNESCO IBE, 2020).
Learning activities	How are they learning?	Diverse activities, individual learning, peer learning, forums, networking.
Teacher role	How is the teacher facilitating learning?	The teacher acts as a consultant, advisor, mediator.
Materials & Resources	With what are they learning?	Materials and resources depend on the content but materials and resources are often selected at the individual choice of the learner and /or advised, recommended by the teacher.
Grouping	With whom are they learning?	Purposefully or randomly composed groups.
Location	Location Where are they learning?	Online, work-based learning and at school. Learning environment demonstrates overall learner-centeredness through, among other, collaboration, personal planning for learners, and individual support (Bray & McClaskey, 2013).
Time	When are they learning?	Often self-regulated, however, personalised learning can also take place at regular school time.

Assessment	How to measure how far learning has progressed?	Formative assessment, regular feedback aligned with summative assessment.

Flexibility is one of the prerequisites for personalised curricula. In order to address diverse learner's needs and potentials, curricula design and implementation should support learners' agency, ensure assessment of a personal progress (Zmuda et al., 2015). This also requires reconsideration of curricula goals, instructional practices, development of supporting tools, teachers' preparation.

2.2.4 Integrated curricula. Variations of integrated curricula

Curricula integration by many researchers is considered as an effective approach to challenges of 21st century learning (Drake & Reid, 2020; Drake & Savage, 2016; Christidis & Lindberg, 2019; Kamarudin et al., 2017; Mockler, 2018). Curricula integration gave rise to variety of new pedagogical approaches including personalization, problem-based, project-based learning and other, making the teacher to assume the learning facilitator role and **learning is constructed around ill-problems and complex situations which require interdisciplinary solutions.**

Integrated curricula – curricula which is constructed on the basis of integration of disciplines, themes or concepts. Integrated approaches might be based on multidisciplinary, interdisciplinary, transdisciplinary (Drake & Reid, 2020). Curriculum integration includes many forms such as thematic units, project-based learning, problem- based learning and place-based learning and other (Drake et al., 2015). Elements of integrated curricula could make parts of other type of curricula such as workplace-oriented or hybrid curricula. First of all, it is important to briefly discuss a typology of integration. Studies indicate that integration might be based on multidisciplinary, interdisciplinary and transdisciplinary approach (Dreik & Reid, 2020). In a multidisciplinary integration we usually have a theme, issue or a concept which is analysed, discussed from the perspective of different disciplines or fields. In this way the level of integration is not very high and connection between different fields and disciplines is not very strong. This type of integration is observed also in contemporary subject-based curricula, modular curricula as well as in phenomenon-based curricula. In the second type of integration - an interdisciplinary type, different fields are closely integrated based on their common concepts, problems, etc. Problem-based or project-based curricula represent a typical type of interdisciplinary curricula; many elements of interdisciplinarity are also observed in hybrid curricula. Transdisciplinary integration is the highest level of integration. Drake and Reid (2020, p. 123) note that in transdisciplinary curricula "students begin with an authentic real-world issue rather than with the disciplines". Some versions of project-based learning belong to the transdisciplinary model.

In vocational education and training there have been discussions whether academic (general) content should be integrated with vocational content or integration is more meaningful when only vocational contents are integrated. For example, in Sweden the recent reform returned to the recommendation to integrate vocational subjects and such type of integration also well contributes to the development of key competences (Christidis, Lindberg, 2019). More detailed discussion regarding integration of occupational or vocational content will be presented in the next section.

Table 7. Structural elements of integrated curricula.

Structural components	Clarifying questions	Characteristics
Rationale or Vision	Why are they learning?	To prepare learners for their future jobs and life in society, skills, knowledge and attitudes need to be developed in an integrated way (Drake & Reid, 2020; Drake & Savage, 2016; Christidis & Lindberg, 2019; Kamarudin et al., 2017; Mockler, 2018).
Aims & Objectives	Toward which goals are they learning?	To develop competences in a holistic way to solve real-life problems, to understand complex phenomena

		through diverse models of integration (Drake & Reid, 2020).
Content	What are they learning?	Integration of the content is usually based on the theme/concept/problem. The content, nevertheless, should be vocationally contextualized in VET curricula (Christidis & Lindberg, 2019).
Learning activities	How are they learning?	Practical experience and interdisciplinary collaboration as a necessary and complementary part of teaching, for the development of vocational knowing (Christidis & Lindberg, 2019).
Teacher role	How is the teacher facilitating learning?	Different types/levels of integration lead to different models of teacher engagement and collaboration in integrated approach. Co-teaching is also rather typical (Sharma et al., 2017; Christidis & Lindberg, 2019).
Materials & Resources	With what are they learning?	Special material developed and based on formal curricula. For example, the content can be related to central concepts from the point of view of several disciplines/fields.
Grouping	With whom are they learning?	Grouping depends on a case/problem or personal choice (based on similarity of learning interests, goals). Grouping could be based on interdisciplinary, multidisciplinary approach – creating teams and also working individually to contribute to the group work at a later stage.
Location	Location Where are they learning?	Integrating school, workplace and other (community, cultural places, etc.) contexts.
Time	When are they learning?	Depending on the type of integrated curricula. In time slots (two weeks, etc.) while the theme/project is fully developed in the case of interdisciplinary based curricula; in a continuous project throughout the year /semester in the case of project-oriented curricula (
Assessment	How to measure how far learning has progressed?	Big focus to formative assessment, regular feedback and peer learning. Less stress to a single subject.

Integrated curricula meet with the challenge to maintain and find models to develop disciplinary knowledge (Young, 2010; Mockler, 2018) at the same time supporting multidisciplinary, interdisciplinary or transdisciplinary approaches. It would be worth further analysis on benefits and impacts of these integration models specifically in VET.

2.2.5 Variations of integrated curricula: problem/project-based curricula

Project-based curricula (PjBL) and **problem**-based curricula (PBL) have many common characteristics however, they are not identical. Moreover, PBL and PjBL can be mono-disciplinary and interdisciplinary in nature. In our research we will focus more on interdisciplinary PBL and PjBL curricula. In some specific cases problem-based curricula may have a transdisciplinary approach.

Both curricula have a strong interdisciplinary character and **are associated with the constructivist philosophy**, (Dole et al., 2015). Brassler & Dettmers (2017) state that “the constructivist philosophy focuses on learning as an active process in which the inquiry of knowledge is based on personal experiences and interactions with the environment”. Thus, learners in the case of PBL and PjBL are active constructors of knowledge through iterative questions, tests, and answers. Both PBL and PjBL

are student-centred pedagogies that facilitate collaborative teamwork toward an understanding and reflection of real-life, complex problems (Brassler, Dettmers, 2017).

Project-based and problem-based curricula are well aligned with workplace-oriented curricula. Gessler and Howe (2015) coin a term "grounded work-based learning" which implies learning based on a didactic approach which represents vocational work process-oriented learning in problematic situations in an operational reality.

Table 8. Structural elements of problem/project-oriented curricula.

Structural components	Clarifying questions	Characteristics
Rationale or Vision	Why are they learning?	Learning is an active process. Learning happens when actively constructing knowledge and collaborating with peers while solving problems, cases, finding innovative solutions (Yadav et al., 2011; Kang et al., 2012; Chung et al., 2016; Brassler & Dettmers, 2017).
Aims & Objectives	Toward which goals are they learning?	Develop competences through solving cases or real-life problems (Yadav et al., 2011; Kang et al., 2012; Chung et al., 2016; Brassler & Dettmers, 2017).
Content	What are they learning?	Ill-structured cases, problems which need interdisciplinary and /or transdisciplinary solutions (Gessler and Howe, 2015; Brassler, Dettmers, 2017)
Learning activities	How are they learning?	In problem-based curricula there are clear methodological steps in a sequence starting from definition of the problem, concepts, then moving to brainstorming and other steps. In project-oriented curricula the learning process is less structured following mainly broad, project-management principles (organisation, planning, etc.) and can be based on different methodologies, for example, design thinking (Brassler, Dettmers, 2017).
Teacher role	How is the teacher facilitating learning?	Process-oriented supervisor/facilitator in the case of problem-based curricula but also a leading role in framing the problem (Svihla & Reeve, 2016). In project-oriented curricula teachers' role is more linked to guide and supervise the process of the "product" development (Brassler, Dettmers, 2017).
Materials & Resources	With what are they learning?	Cases, ill-structured problems collected from authentic, workplace contexts. Learning material is typically not limited to one field or discipline.
Grouping	With whom are they learning?	The most common approach is to work in teams and groups. They can be formed by the decision of the teacher or by students based on their interest/problem/situation (Yadav et al., 2011).
Location	Location Where are they learning?	Students may learn in different environments however, it is more typical that problems, challenges, cases come from real workplaces. There are alternatives when "cases" are proposed by experienced teachers (Brassler, Dettmers, 2017).
Time	When are they learning?	The process of learning in PBL case is rather short and is based on maximum 5-6 problems per semester. In PjBL, the learning time is longer and curricula can (but not necessarily) be organised to accomplish one project per year /per semester.

Assessment	How to measure how far learning has progressed?	Individual and group assessment of a solution/project, design, product and other tangible outputs. In problem-based curricula the learning outputs are not necessarily tangible and are related to more complex mental and cognitive solutions.

Successful implementation of problem/project-based curricula needs very careful planning and teachers' preparation (Brassler, Dettmers, 2017). Curricula need logical structuring in order to develop basic knowledge which is needed for further studies so that students could work on specific complex problems and /projects. More attention should be paid to regular supervision, constructive feedback, students' reflection and assessment of a group work. Students' preparation is also important and usually introductory courses to explain problem-based /project-oriented learning approaches are needed.

2.2.6 Variations of integrated curricula: hybrid curricula

Researchers question how to link and integrate knowledge, skills attained in school and workplaces. Schaap, Baartman, de Bruijn (2012) indicate that learners need to transfer what is learnt from one context to another (school to work and vice versa) and most of the them experience difficulties. De Bruijn and Leeman (2011) note that there is also a lack of consistent guidance that explicitly accounts for students' integration processes in both learning environments. Accordingly, in VET curricula are constructed either around labour market demands and work processes or logics of disciplines. In some cases, curricula try to converge both approaches which results in a mixed type or hybrid curricula.

Hybrid curricula are characterised by the attempt to bridge and ensure smooth connectivity between two unique learning environments: work and school. Unique, as noted by Zitter et al., (2016) "refers here to own aims, responsibilities, targets, markets and thus learning possibilities, since there is no physical distinction between a vocational school (i.e., learning) and an organization (i.e., working)". A hybrid curricula might be considered as a type of work integrated curricula but at the same time it contains several specific characteristics: 1) this type of curricula is constructed on the assumption that work and school based learning processes should be more integrated and simple physical transition from work to school does not sufficiently ensure to build connections between the knowledge acquired in work and at school; 2) connectivity of knowledge gained in different learning environments is the key idea and "philosophy" of this type of curricula; 3) connectivity can be achieved through structural and pedagogical approaches which are realised "in an intentionally designed hybrid VET curriculum 'different (…) elements are woven together into coherent programs of learning (…) rather than a program that combines different components with the aim of offering a more enticing menu of learning' (OECD, Zitter & Hoeve 2012, p. 138). Learning in hybrid curricula is situated on ill-structured, authentic tasks (here we see similarities with project-based, problem-based curricula), and it often transcends disciplines, traditional structures and sectors (Cremers et al., 2016) as it is in the case of integrated curricula. The concept of hybrid curricula is based on the idea of boundary crossing. Akkerman and Bakker (2011) state that boundary crossing is a cognitive process that entails four specific learning mechanisms: identification, coordination, reflection and transformation. Identification is linked to exploring and utilising different learning environments which helps developing different types of knowledge. Coordination is needed to ensure exchanges between vocational schools and workplaces. Reflection supports students developing linkages (connections) between the knowledge developed in school and work learning environments. Transformation implies collaboration and co-development of (new) practices. Baartman (2011) stresses that students need regular reflection during their learning practices. This is important for learning in both vocational schools and workplaces. Students therefore need to develop transversal skills to navigate in hybrid learning environments.

Table 9. Structural elements of hybrid curricula

Structural components	Clarifying questions	Characteristics
Rationale or Vision	Why are they learning?	Prepare students for their future jobs, to prepare them the best way by creating authentic learning environments and bridging workplace-oriented and

		school-based learning (Cremers et al., 2016; Zitter et al., 2016)
Aims & Objectives	Toward which goals are they learning?	Develop an integrative approach in analysing phenomena, solving problems, etc. (Cremers et al., 2016)
Content	What are they learning?	Theoretical knowledge, practical skills development in real and simulative learning environment in order to ensure coherence and connectivity between knowledge developed in workplace and school-based learning environments.
Learning activities	How are they learning?	Typically, 4-steps approach (Zitter et al., 2016): theory, observation and assistance/simulation; practical /autonomous work; reflection (usually integrated into the first 3 steps).
Teacher role	How is the teacher facilitating learning?	The role is changing depending on different steps: mediator; acting as a role model (in simulation, observation); coach /tutor/advisor in practical learning environment; supervisor in reflection process.
Materials & Resources	With what are they learning?	Learning material and resources should ensure high level of complementarity of the learning unit, i.e. learning materials from workplace learning environment and school-based learning environment should match and complement each other.
Grouping	With whom are they learning?	Specific steps in implementing hybrid curricula were defined by Zitter et al. (2016). Grouping changes according to the steps: Step 1. Lecturing; self-directed studies; Step 2 Individual and group (team) work in workplace environment Step 3 Project-based work; problem-based work; self-directed learning in workplace and school environments; Step 4 Group work and individual discussion in the school environment together with teachers and/or experts from industry.
Location	Location Where are they learning?	School, labs, simulative firms; companies, school companies (workshops, restaurants, cafes, shops, etc.).
Time	When are they learning?	School-work place interchange /weekly. Open possibilities to learn outside school hours, e.g. nurses, cook they can work and learn during the weekend, night shifts, etc. (Zitter et al., 2016).
Assessment	How to measure how far learning has progressed?	Outputs oriented (project, product, etc.). Formative assessment, constructive feedback, reflection (Baartman, 2011).

Growing attention and national initiatives to develop higher vocational education curricula linking vocation continuing and higher education (Köpsén, 2019) produced the other variation of hybrid curricula. This created new models of hybrid vocational and higher education curricula resulting in two-years or the so-called “short-cycle” programmes which are offered at colleges or universities through higher level and degree apprenticeships, or hybrid programmes combining vocational and academic education (Bathmaker 2017; Köpsén, 2019). These models have found their path in some European countries (for example, Sweden, The Netherlands), China, North America and Australia (Bathmaker 2017). Thus, the hybridity of curricula acquires slightly different aspect where different learning environments and knowledge developed in them, is linked through a vertical (vocational-academic) perspective aiming to develop higher level vocational qualifications (ISCED 5 and above). This type of hybrid curricula is strongly linked to continuing vocational education and self-regulated learners.

A certain hybridity is observed in blended curricula, where connectivity is ensured and knowledge operates in two learning environments – virtual, digital and real, physical (Boelens et al., 2017; Jonker et al., 2020). Blended curricula, however, cannot be called as "purely" hybrid curricula. Blended curricula incorporate characteristics of many types of curricula and the core of the curricula design could be subjects, modules, problem-based learning, etc. Even though we should admit that blended curricula have their specific features, still it is more related to the way or model of implementation of diverse curricula and ensure higher learning flexibility in relation to place, time, pace (Jonker et al., 2020). This type of hybrid curricula is closely linked to personalised curricula.

2.2.7 Emerging types of contemporary curricula

The analysis of the scientific literature revealed varieties of typologies of curricula, which are based on teacher-led and student-centred, input-output and demand driven or supply-driven approaches (Frommberger & Krichewsky, 2012). However, the main challenge with curricula typology that in practice we do not have "pure" type of curricula and many dimensions and characteristics of curricula overlap. For example, subject-based curricula might have elements of integrated curricula, problem-based curricula, while modular curricula might be also discipline-driven.

The easiest way would be to differentiate curricula based on the learning place – workplace, school-based and mixed (hybrid) type of curricula. However, we also see that the so-called school-based curricula have more and more time and content related to workplace, while "typical" workplace curricula tend to have more connections with theory learning in school settings. As our research strives to disclose diversity of curricula, the proposed types of contemporary curricula are differentiated taking into consideration the main focus underpinning the structural design of curricula as analysed in sections 2.2.1-2.2.6. Our research indicates that different types of curricula emerging in the literature seem to emphasise one or more of the characteristics defined in section 2.1.5.

Based on literature analysis we observe that workplace-oriented curricula emphasis the place where students learn, this way emphasising **authentic learning and adaptability to labour market demands and collaborative learning** (Billet, 2011; Rintala & Nokelainen, 2020).

Modular curricula emphasise more the organisation of the learning content, often introduced to allow **for flexibility** (Hennessy et al., 2010; Pilz, 2012; Li & Pilz, 2017; Mazrekaj & De Witte, 2020). Personalised curricula **emphasise learner's agency and flexible curricula** (Zmuda et al., 2015; Mincu, 2012; Stewart, 2017; UNESCO IBE, 2020).

Integrated curricula focus more on the **organisation of content, referring more to principles of concept-based learning, integration of theory and practice and also the creation of authentic learning environment and collaborative learning** (Drake & Reid, 2020; Drake & Savage, 2016; Christidis & Lindberg, 2019; Kamarudin et al., 2017; Mockler, 2018).

Hybrid curricula emphasise a very specific aspect, **the transfer of knowledge and skills between different learning environments**, which ensures a more **coherent integration of theory and practice** (Schaap et al., 2012; Bathmaker, 2017; Cremers et al., 2014, 2016; Zitter et al., 2016).

Thus, based on the key and most expressed characteristics as discussed above, we suggest the following 6 types of contemporary curricula: 1) integrated curricula; 2) workplace-oriented curricula; 3) modular curricula; 4) personalised curricula; 5) hybrid curricula; 6) discipline driven curricula.

Table 10. Emerging types of contemporary curricula.

Type	Variety of curricula	Focus

Workplace-oriented curricula	Apprenticeship based curricula In some cases, WIL (work integrated curricula)	Collaboration with stakeholders (industry, community) and shared responsibility, ensuring authentic learning environment
Modular curricula	Modular curricula based on work-process Modular curricula based on disciplinary knowledge	Learning structured into separate units which allow flexibly construct a qualification
Hybrid curricula	Hybrid curricula Blended curricula	Bridging, connecting workplace and school-based knowledge and contexts
Integrated curricula	Phenomenon-based curricula curricula Problem-oriented curricula Inquiry-based curricula Project based curricula	Phenomenon/concept Experience
Personalised curricula	Personalised curricula Adaptive learning curricula	Learner autonomy and personalisation
Discipline-driven curricula	Subject-based curricula Subject-based and/or competence-based curricula	Disciplinary knowledge and/or competences

The proposed grouping still does not allow to identify “pure” types of curricula and some overlaps are observed. For example, workplace integrated curricula at the same time might be modular, integrated or problem-based. However, other typologies based on the criteria such as demand or supply driven, teacher-centred, student-centred, also meet with similar problems. This happens due to the complex nature of curricula and the fact that curricula have many dimensions.

2.2.8 The contexts in which the different types of curricula are implemented

Understanding the contexts helps to evaluate possible transferability of curricula implementation models in different countries and different educational levels: VET, adult, non-formal and informal. The literature analysis suggests that the characteristics of the contexts are related to macro, meso and micro levels:

- Country specific contexts (Caves et al., 2019)
- School /enterprise contexts; (Edström, & Kolmos; Kolmos et al., 2015)
- Curricula construction contexts, rationale (Acedo & Huges, 2014).

Caves et al. (2019) postulate that context fit is a key success factor in VET reforms. For example, in Finland both apprenticeship and school-based VET co-exit but historically school-based VET has been promoted due to the fact that there has been a continuous policy to ensure equal educational opportunities (Rintala, Nokelainen, 2020; Stenström and Virolainen 2018).

Harmonisation with national qualification frameworks, competences frameworks is another macro-level factor which should be carefully considered by curricula developers (Cort, 2010). Orientation on learning outcomes (competences) should be legally formalised so that ensuring flexibility for learners in their learning pathways (for example, as in the case of modular curricula).

Secondly, it is necessary to evaluate institutional (meso) and micro contexts and readiness of institutions to adapt changes in curricula. For example, the decision to design and develop curricula in VET with active and substantial involvement of employees cannot be made without consultations and evaluation of capacities of national/regional enterprises to participate as co-partners in implementing VET curricula. Stakeholders involvement in curricula design and implementation is an important prerequisite for certain type of curricula (Brown Wilson & Slade, 2020). For example, countries, where industries do not have enough resources (developing countries) or there is no long tradition of cooperative work in VET, it would be hardly possible to move to pure workplace-oriented or even hybrid type of curricula.

Meso and micro aspects are also related to the theoretical and epistemological aspect of curricula. What is the key concept behind the decision to develop new curricula? Is it aligned with national priorities, objectives and strategic plans? International organisations (for example, World Economic Forum, OECD, European Commission, etc.) offer variety of conceptual frameworks (competencies frameworks, capabilities, literacies, etc.) which could serve as a basis of designing contemporary curricula. Researchers (Acedo & Huges, 2014) note that it is important to take a decision what learning is at the core of new curricula as this decision will affect learning objectives, assessments and classroom practice. For example, in Finland introduction of phenomenon-based learning was not a surprise for most of the schools and teachers could start working with a new curriculum without major obstacles. The reason for that is country's experience with integrated learning approach as well as teachers' competency which is reflected in the national regulation to obtain Master degree (for VET schools – Bachelor degree).

The latter dimension is related to the knowledge and cognition processes and understanding why some attempts to implement alternative curricula fail. As noted by Abadzi (2016), now many curricula reforms supported by international organisations strive to construct curricula oriented exceptionally for the development of higher order thinking skills and such competences as critical thinking, ability to solve complex problems and similar, however, forgetting that these skills and competences can be developed only when basic skills become fully "automated".

2.3 Impact of contemporary curricula

Scientific literature provides diverse aspects how contemporary curricula impact learning process and learning outcomes. Modular curricula have been considered as an efficient tool to keep learners engaged and minimize the rate of school dropouts and reduce the ethnic attainment gap (Mazrekaj & De Witte, 2020). Researchers (Mazrekaj & De Witte, 2020) specifically focused on the problematics of high school dropouts. They defined modular curricula as modular education which divides the educational programme into smaller autonomous components. Even though this type of education remains rather linear as in conventional programme, learners have higher autonomy in choosing among the modules. Other benefits of modular curricula are related to more positive socio-economical situation of learners. Research studies also indicate that students enrolled in modular education are more likely to be employed and to incur higher earnings on the labour market (Cedefop, 2015; Mazrekaj & De Witte, 2020).

In VET curricula the most evident change in the EU member states is observed through intensive modularisation process which have led to transforming VET programmes into modular ones, based on occupational standards or national qualification profiles. The tendency from subject-based curricula to more interdisciplinary and work-process oriented curricula is also visible in most countries, where it is closely linked to modularization (Frommberger, Krichewsky, 2012; Pilz et al., 2018). Modularisation promotes the development of professional competencies for successful employment (Hennessy et al., 2010).

The findings of research on benefits of work-integrated curricula show (Taylor & Govender, 2015) that students experienced this type of learning as rewarding, with multiple opportunities for employment. Jackson (2015) notes that work-integrated learning curricula are highly valued for enhancing students' employability skills which is reflected in their confidence in workplace contexts, a better understanding of industry related skills. Freudenberg, Brimble and Cameron (2011) conclude that work-integrated

learning contributes well to the development of team working, problem-solving, communication, information literacy and professionalism. Work integrated curricula might be a good alternative to VET systems where fully workplace- oriented curricula or even hybrid type of curricula are less attractive due to a weaker participation of industrial stakeholders.

Personalised curricula are relevant to develop metacognitive skills, trying to find most efficient learning ways, and building competences of autonomous learner through strengthening self-efficacy (as this type of curricula is clearly student-led, inclusive and engaging) (Mincu, 2012; Deakin-Crick, R., 2012; Stewart, 2017).

Hybrid learning curricula (Cremers et al., 2014; Cremers et al., 2016) help to connect knowledge from two learning environments as well as support self-directed learning which implies a move away from pre-determined and fixed assessment goals and criteria towards more emergent and dynamic assessment goals and criteria that are set by the students in dialogue with the teachers. Schaap et al., (2012; 2017) make a conclusion that students' integration of knowledge, skills and attitudes is enhanced in hybrid learning environments in which different boundaries can be crossed. This can be achieved in providing adaptive and differentiated guidance for students.

Drake & Reid (2020) define key benefits of integrated curricula, stressing that integrated curricula help students in achieving higher academic results compared to traditional, subject-oriented curricula (Drake and Reid, 2018). Research also presents evidence that integrated curricula contribute significantly to the development of students' self-regulation, social attitudes, emotional health, creativity and motivation (Durlak et al., 2011). Regarding the benefits of integrated curricula Mockler (2018) refers to historical developments and approaches towards integration. The researcher points to current national educational strategies, which admit that contemporary education crosses disciplinary boarders and integration leads to the development of innovations related competences including creativity and resourcefulness, the ability to solve problems in ways that draw upon a range of learning areas and disciplines, and the ability to make sense of their world (*The Melbourne declaration on educational goals for young Australians*, 2008). Students' disengagement has been also widely reported (Drake et al., 2015) and integrated curricula are evidenced as efficient approaches to increase learners' engagement (Guthrie et al., 2013).

Project-based curricula are set to have a positive effect on student content knowledge and the development of skills such as collaboration, critical thinking, creativity, innovation, and problem solving which increases students' motivation and engagement (Bedard et al., 2010). Evidences from research also speak for the benefit of problem-based learning which in some fields (medicine, engineering) allows achieving higher academic results (Kuipers et al., 2019). Chung et al. (2015, p. 288) observe that learning courses with problem-based learning "cultivate students' problem-solving skills to achieve these goals: (1) enhance students' comprehension; (2) enhance students' expression competence; (3) enable students to recognize the gap between practice and theory; (4) and by equipping students with problem-solving competence".

Apprenticeship-based curricula have also experienced transformations in the last decades, which made some researchers speak of a renaissance in apprenticeships (Fjellström & Kristmansson, 2019), and acknowledge its social model of learning (Guille, 2011). It is stressed that revising apprenticeship will successfully facilitate the development of both vocational and key competences, seeing this type of learning most relevant for developing entrepreneurial competences, collaborative learning skills, decision-making and etc. (Odora, Naong, 2014).

All types of curricula have their cons and pros. Researchers debate whether a paradigm shift from knowledge-based to outputs (learning outcomes) based curricula is the best response to 21st century needs. McPhail & Rata (2016) argue that in the so-called 21st century learning type, the structuring principle is located outside the concepts but on external organisers. As "external organisers" they define themes, topics, projects rather than disciplinary-based subjects. Similar idea is found by Drake & Reid (2020) who see series of challenges and criticism related to integrated curricula. These include **"**ambiguity around definitions, issues with measuring interdisciplinary knowledge and behaviours, logistics such as scheduling and reporting, territorial battles, teacher identity as a subject expert, and

resistant educators". The major criticism is focused on the fact that integrated curricula loose logics of disciplinary knowledge which is objective "powerful" knowledge, and thus, is more subjective, more sensitive to be influenced by different stakeholders (Young, 2010; Rata, 2012; McPhail & Rata, 2016; Mockler, 2018).

Modular curricula also receive criticism related to their fragmental character and that a set of competences does not necessarily ensure the quality of the qualification (Mazrekaj & De Witte, 2020). Personalised curricula are characterised as having rhizomatic learning approach as thus, lack coherence and consistency, while putting too much emphasis on learner's choice, some core aspects in learning might be missed (Stewart, 2017).

Workplace-oriented curricula, for example based on apprenticeship have also weak points. Aarkrog (2012, p. 351) discussed the new apprenticeship model in Denmark and noted a series of challenges regarding this model of acquiring qualification: "it does not "convincingly reach the target group: the academically weak students; it does not improve the drop-out rate nor lead to the same learning outcome as the school-based entrance; it can be a socially vulnerable institution". Insufficient pedagogical support and scaffolding for students is one of most common critiques for workplace-oriented curricula (Aarkrog, 2012). As a response to that on EU level some initiatives have been taken to develop special continuous training programmes for companies' mentors/supervisors.

However, notwithstanding all critical observations regarding different types of curricula, it is obvious that contemporary curricula cannot be rigid and even traditional, subject-based curricula have been transformed in many countries focusing on competence-based or learning outcomes approach (Tiana, Moya & Luengo, 2011; Wang, 2019).

Discussions about discipline-driven curricula have never lost its actuality. The strongest arguments come from cognitive psychology and social realists' field (Winch, 2013). These researchers stress the importance of the logical patterns and interrelations of concepts, which explains why traditional curricula is structed around disciplines (subjects). The relations between concepts advance from lower to higher levels ensuring epistemic coherence. McPhail & Rata (2016) claim that discipline-driven curricula are more compatible with this theory of conceptual progression. This idea is also strongly supported by Michael Young (2010), Young & Muller (2013), Abadzi (2016).

2.4 Drivers and barriers implementing new curricula

Researchers (Caves et al., 2019) note that there are much more studies on curricula design and development than curricula implementation. Understanding the main drivers and barriers in implementing curricula should help national governments, policy makers, schools, teachers and researchers to take into account important aspects while designing, planning and monitoring curricula implementation.

Researchers discuss enablers or barriers while designing and implementing different type of curricula and most common factors are related to:

1. Teachers' readiness to implement new type of curricula (Smith, 2012; Lewis et al., 2019).
2. Curricula design practices, traditions, methodological clarity (Priestley & Sinnema, 2014; Acedo, Hughes, 2014)
3. Revised assessment practices (Pepper, 2011; Zitter et al., 2016)
4. Scientific evidences regarding benefits, impacts of contemporary curricula (Young, 2010).
5. Support from stakeholders' side related to their limited knowledge about the new curricula, pressure for high academic and disciplinary achievements (Billett, 2016; Albashiry et al., 2015; Caves et al, 2019).
6. Bridging school-based and workplace learning environments (Baartman et al., 2018).

These factors in different situations and contexts may work as barriers and drivers. Teachers' professional development is the cornerstone in most educational reforms, and curricula changes also

require additional professional development of teachers in order to ensure a coherence between the intended, implemented and the attained curricula (Wallace & Priestley, 2011; Kuipers and Berkvens, 2013). For example, Humes (2013) notes that interdisciplinary work may require a different type of teaching from that associated with the subject-based curriculum - less formal, more exploratory, learner-centred rather than teacher-centred. If one of the aims is to encourage learners to be flexible and creative, and acquire skills that would make them more independent in their learning, this would suggest that the teacher's role should become less directive.

Collaborative and professional partnerships between teachers, schools and universities, schools and enterprises are playing significant role in planning and implementing contemporary curricula. These partnerships open new learning environments not limiting education and learning process to school settings and promote new, engaging curricula through connecting different contexts (Drew et al., 2016). Industry participation is crucial in implementing competence-based curricula and recognising prior learning (Boahin et al., 2014). The most typical models include participation in apprenticeship, vocational standards development, final examination (approval of qualification).

Methodological clarity and coherence are important drivers for successful implementation of contemporary curricula. It is observed by researchers (Priestley & Sinnema, 2014) that for example, the concept of active learning is poorly understood by many teachers, some interpreting it merely in terms of physical activity rather than intellectual, psychological and emotional engagement with the material to be learned, thereby producing a deeper form of learning than that arising from routine classroom activities.

Revised assessment practices are closely linked with successful implementation and challenges of new curricula (Pepper, 2011). For example, personalised curricula, problem-based curricula, hybrid curricula and other models of contemporary curricula require more focus to formative assessment, including such practices as peer review, critical discussion, reflection, individual learning plans (Zitter et al., 2016).

The study performed by Albashiry et al. (2015) indicates the main hindering factors in competence-based curricula. At the institutional level barriers are related to the competency of the school administration and the teachers, also lack of top management support (e.g., training, incentives, and time provision). Another barrier concerns the shortage of equipment necessary to train the students on the vocational skills expected by industry. Other challenges include the poor coordination of students' industry internships and the lack of up-to-date references in the college library. Supporting factor is the great autonomy the college has in designing its curricula.

The main difficulties while designing and implementing hybrid curricula arise while trying to bridge and minimise fragmentation between two learning environments: work and school. Bouw et al. (2019) note that efforts to position vocational knowledge in vocational curricula are extremely challenging. Thus, a connective curricula framework which is at the core of hybrid type of curricula tries to link school-based knowledge and experience with workplace knowledge and experience, however, posing tensions and challenges for VET teachers, company trainers and learners themselves (Baartman et al., 2018). Researchers (Baartman et al., 2018) note that these tensions are related to support for students in developing their capacities to connect knowledge from different learning environments while this intention has often an implicit character in curricula.

Summarising the findings of the first part of the research we see that a need for diversity of contemporary curricula is growing and it is related to variety of factors, including developments in the labour markets, globalisation, digitalisation, EU and national policies focused to competence-based education, developments of qualification frameworks, stakeholders influence. The response of curricula is reflected in approaches to increase flexibility, adaptability to labour market demands, ensuring authenticity of the learning environment and more coherent integration of theory and practice. Contemporary curricula are built on collaborative and co-creative learning, engagement with communities, personalised approaches; they aim to support learners' autonomy, enhance concepts-focused learning, knowledge transferability and connectivity. The research indicates that these characteristics are differently reflected in contemporary curricula. We see a higher level of flexibility in curricula with more choices for elective courses, learning time and pace, learning environments (Boahin, Eggink, Hofman, 2014; Tsatsaroni, &

Sarakinioti, 2018; Zwan, & Afonso, 2019; Crato, 2020), possibility to combine general education with vocational education courses in parallel like in Australia, Germany, Finland and other countries. In cases, when we have problem-based, project-based curricula, flexibility is associated with learners' choice of projects and approaches to their development and /or solution of the problems (Jonker, März, Voogt, 2020).

However, it is also evidenced by the analysed research literature (Pilz et al., 2018), that flexibility is highly visible in modular curricula in terms of learning units, time of learning (for example, Finland, Denmark), the ways and place where learning outcomes are developed and obtained (for example, India and other countries where vocations are traditionally acquired through non-formal learning). Nevertheless, it also should be noted that modular curricula may be less flexible (for example, Austria and in some aspect Germany), where curricula are clearly linked to occupational standards and modules should be completed in a certain specified order.

Connectivity, integration of theory and practice, learner's autonomy are also closely related charcateristics. In workplace-oriented curricula and hybrid curricula these aspects are clearly articulated in curricula design, structure and pedagogies (Zitter et al., 2016; Bouw et al., 2019). For example, in hybrid type of curricula the key message is to ensure efficient and smooth transferability of knowledge acquired in workplace and school-based environments. Authentic learning environments, thus, is the main bridge which helps to link work and school and for this reason VET schools tend to adapt their learning environment as close as possible to reality through workshops, simulative enterprises, canteens, hairdresser's saloons and etc. (Cremers et al, 2016).

Learner's autonomy is supported by different structural and instructional decisions. The study performed by Жанкина et al. (2019) revealed that learner autonomy is supported by a learner-centred approach, effective use of information and communication technologies, and strong student-teacher interaction.

The analysis of curricula types disclosed that each of them have their unique "mission" (rationale, focus) while approaches (instruction) in many cases overlap. Different curricula are not "pure" and they tend to borrow elements from each other (for example, modular curricula may have elements of problem-based, integrated curricula and so on). Notwithstanding the fact the there is an ongoing debate regarding positive impacts of contemporary curricula, research provide evidences that different type of curricula might significantly contribute to increased employability, faster integration and adaptation in workplace environment, decreasing dropouts from educational system as well as a more integrated development of key and occupational competences. The conceptual conflict regarding the core of curricula design (knowledge – concepts – competence-based) still remains, yet critical voices seem to agree that contemporary curricula should find a more balanced knowledge – competence-based approach. The main difficulties in developing and implementing contemporary curricula are related to teachers' readiness and professional development, stakeholders' support and engagement, curricula design practices and traditions.

THE ROLE OF KEY COMPETENCES AND THE TRENDS IN THEIR INTEGRATION IN VET CURRICULA

The second part of the research addresses the problematics of key competences development within different VET curricula. We tried to analyse what international frameworks are used and how they attempt to structure key competences. We also observed how key competences, occupational competences and general knowledge are offered in curricula, whether they are integrated or developed as separate units. And finally, we will discuss what are the drivers and barriers when integrating key competences into the different types of vocational curricula.

3.1 Key competences in the context of EU policy and international developments

3.1.1 Competence-based approaches

Key competences development in education has been widely discussed in scientific literature since the end of 20th century (Hoskins & Crick, 2010;) including or focusing specifically to VET context (Wild & Heuling, 2020). Key competences development has also been an important policy imperative for EU countries (Pepper, 2011). The concept of developing competencies in education has gathered momentum in recent years because of its perceived value from economic and learning perspectives (Child, Shaw, 2019).

Literature analysis indicates that for educational systems "competence" marked a significant move from academic results to broader educational outcomes (Hoskins & Crick, 2010). In education competence-based approach is linked with higher flexibility, accountability and transparency. On the individual level competence implies a sense of agency, action and value. In the study *Developing a European Framework for the Personal, Social & Learning to Learn Key Competence (LifEComp)*, Caena (2019, p. 17) indicate that these key competences "empower individuals to develop and exercise agency - the will and capacity to initiate and control events, act and make a difference in relation to others and contexts".

There is a variety of definitions of the term "competence" (Pepper, 2011). Not going into a detailed discussion on the definition of this concept, we will refer to the definition proposed by EU Recommendation on Key Competences for Lifelong Learning (European Council, 2006). Competences are defined a combination of knowledge, skills and attitudes appropriate to the context.

The variety of definitions could be explained by a complex nature and character of a competence phenomenon. Hoskins & Crick (2010) stipulate that a competence refers to a complex combination of knowledge, skills, understanding, values, attitudes and desire which lead to effective, embodied human action in the world in a particular domain" (Hoskins & Crick, 2010, p. 122). Thus, they propose a holistic model of competence which spans a range of human processes and actions; accordingly, competences are broader than knowledge or skills and are acquired in an ongoing, lifelong learning process across the whole range of personal, social and political contexts. Zhao (2014) indicates four characteristics of the competence: differentiation in individuals (it is developed differently by each person); comprehensiveness (competence is composed of many elements, which create a certain competence structure; if needed these elements can be improved); practicality (competence is realised in specific, real world contexts); functionality (competence help to achieve diverse needs and thus can be developed and their efficacy measured).

3.1.2 Main key competence terms and definitions

Competence-based approach in education "produced" variety of related or overlapping terms, including literacies, 21st century skills, life skills and other. OECD project Definition and Selection of Competencies: Theoretical and Conceptual Foundations (DeSeCo, 2003; Executive summary, 2005) the term key competencies equated with such terms as transversal, generic, core or 21st century

competencies. The term 21st century competences is also used by the World Economic Forum (2015), while UNESCO IBE (2013) in the Glossary of Curriculum Terminology provides the definition of key competences referencing to Council Recommendations on Key Competences (2006) and also notes that parallel terms like core competences, general, generic, basic, cross-curricula or transversal competences are frequently used. Moreover, in 2019 OECD introduces the term competences for 2030.

Table 11. Mapping variety of definitions of key competences proposed by international organisations

Diverse "names" of key competences	Definitions of key competences
21st century competences (OECD, 2015)	21st-century competences focus on such skills and competences which are required by a global, digital society.
21st century competences (World Economic Forum, 2015)	World Economic Forum (2015) key competences defines on the basis of foundational skills like literacy and numeracy, competencies like collaboration, creativity and problem-solving, and character qualities like persistence, curiosity and initiative.
Competences for 2030 (OECD, 2019)	Competences for 2030 are viewed as relational, integrated and holistic.
Core competences (OECD, 2014)	Core competences grouped into three clusters including delivery-related competences, interpersonal competences and strategic competences.
Generic competences (UNESCO, 2016)	Generic competences constitute a general stock of knowledge for the learner, notably including socio-affective competences. Generic competences transcend disciplines and are not associated with disciplinary situations or specific tasks.
Core foundations (OECD, 2019)	Core foundations as the fundamental conditions and core skills, knowledge, and attitudes and values that are prerequisites for further learning across the entire curriculum. The core foundations provide a basis for developing student agency and transformative competences.
Transformative competences (OECD, 2019)	Three transformative competences that students need in order to contribute to and thrive in our world and shape a better future: creating new value, reconciling tensions and dilemmas, and taking responsibility.

Key competences (Council Recommendation 2006; 2018; UNESCO, 2013;)	Key competences as those which all individuals need for personal fulfilment and development, employability, social inclusion, sustainable lifestyle, successful life in peaceful societies, health-conscious life management and active citizenship.
Transversal competences (UNESCO, 2015)	Transversal competences mark learners' holistic development and adapting to change.

All these terms disclose diverse aspects of key competences and as Keevy and Chakroun (2015, p. 40) put, the "key driver for core competences is the notion that some competences are universal in that they can be recognized across contexts, including across countries". The discussion on key competences show that despite the variety of structuring (and naming) key competences, the overall tendency is that "old" key competences are reshaped and /or integrated into larger competence clusters, which apparently show that changing technological, economic and social systems require higher flexibility and transferability of competences.

Halász and Michel (2011) observe that in many countries the notion of key competences refers to subject-independent competences which are considered as providing a core or basic set (Spain) or a foundation (French-speaking Belgium, France and Luxembourg). The set of competences varies according to the education system. Some countries (like Hungary) used the original text of the European Recommendations (2006), while in England, the curriculum key competences are clustered into functional skills (mathematics, English language, ICT) and personal learning and thinking skills (creative thinking, reflective thinking, team-work, self-management and effective participation, Halász and Michel, 2011).

Council Recommendation of 22 May 2018 on Key Competences for Lifelong Learning (2018) defined eight key lifelong learning competences covering literacy; languages; mathematics, science, technology, and engineering; digital competence; personal, social, and learning competence; civic competence; entrepreneurship competence; and cultural awareness and expression are specified and explained. Still, these definitions of key competence also present variety of aspects and may lead to different interpretations (The Working document on Key Competences for Lifelong Learning, 2018). For example, only 61% of respondents during online consultations carried out in 2017 (The Working document on Key Competences for Lifelong Learning, 2018) answered that the definition of digital competence was adequate. More detailed discussions regarding each of 8 competences have been developed in the recent studies and developed frameworks (for example, European Digital Competence Framework, study on Lifelong learning Key Competence (2019), European Entrepreneurship Competence framework (EntreComp) and supporting studies in 2018 and 2020 (McCallum et al., 2018; McCallum et al., 2020).

Life skills are defined as skills needed to tackle life challenges and they include a long list of personal, interpersonal cognitive, meta-cognitive and reflective skills. Soft skills are seen as broadly applicable qualities. In study on Lifelong learning Key Competence (2019) it is noted that soft skills listed by UNESCO cover many elements of the Lifelong learning Key Competence. Socio-emotional competences are related to personal and social aspects. Non-cognitive skills are referred to personality characteristics and personal qualities (OECD, 2015).

In the context of discussing key competences, the term of literacy become also visible. Glossary of Curriculum Terminology (UNESCO, 2013) defines literacy as the ability to identify, understand, interpret, create, communicate and compute, using printed and written materials associated with varying contexts. Still, literacy has limitations compared to the competence concept as it has strong associations with the ability to "read and understand the real world" and, thus, literacy could be understood as a structural component of a competence.

Hoskins and Crick (2010) more specifically analysed two key competences from the European Education Council Framework of key competences: learning to learn and civic competence. They came to the conclusion that competences are closely connected with real world tasks, they have not only a cognitive element, but also a strong affective dimension, also such skills as critical thinking, creativity and values make important dimensions of both.

Development of digital competences deserved much attention from researchers. Wild and Schulze Heuling (2020) analysed how the digital competences of students in vocational schools differ from those of students in cooperative higher education institutions in Germany. Researchers (Butler et al., 2018) investigated the application of the UNESCO framework on ICT competency standards for teachers, 2008 and 2011). Aesaert et al. (2013) focused on educational technology curricula in general education.

Entrepreneurship competence has also been widely explored (Lackeus, 2015; Komarkova et al., 2015; Tittel & Terzidis, 2020). A study based on responses of 730 secondary vocational school students in China (Ni & Ye, 2018) indicated high participation rate in entrepreneurship education.

3.1.3 Key competence frameworks

It would be hardly possible today to speak about curricula based only on specific disciplines or occupational competences. Tedesco, Opertti and Amadio (2013, p. 11) after analysing curricula frameworks from all regions in the world, observe that that almost 90 countries refer to key competences in general education curricula. Key competences became full-fledged in VET curricula too. This is reflected in the fact that a number of 21st century competences frameworks proposed by international organisations and adopted by national bodies were not linked specifically to one educational segment but are encouraged to be used as references in lifelong learning perspective.

Variety of grouping and clustering of key competences is found (OECD, 2005; Halász & Michel, 2011; Keevy & Chakroun, 2015). On the EU level, the initiative to name and define key competences was closely linked to the Lisbon process and the knowledge society (Hoskins & Crick, 2010). A Recommendation on key competences for lifelong learning adopted by the Council and the European Parliament in 2006 after 5 years of intensive work of experts (Halász & Michel, 2011) and revised in 2018 focused on 8 key competences. Competence in the framework are regarded as equally important, to some extend they may overlap and interlock.

Table 12. Recommendations on key competences adopted by EU Council (2006 and 2018).

EC, 2006[2]	EC, 2018[3]	Modifications in the revised Recommendations

[2] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32006H0962

[3] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.C_.2018.189.01.0001.01.ENG&toc=OJ:C:2018:189:TOC

1. Communication in the mother tongue; 2. Communication in foreign languages; 3. Mathematical competence and basic competences in science and technology; 4. Digital competence; 5. Learning to learn; 6. Social and civic competences; 7. Sense of initiative and entrepreneurship; 8. Cultural awareness and expression.	1. Literacy competence, 2. Multilingual competence, 3. Mathematical competence and competence in science, technology and engineering, 4. Digital competence, 5. Personal, social and learning to learn competence, 6. Citizenship competence, 7. Entrepreneurship competence.	Introducing literacies. Introducing integrated STEM competence: mathematical, science, technology and engineering. Entrepreneurship competence. Introducing personal and citizenship competences. Merging/expanding/adapting personal, social and learning to learn key competences.

The Working document on Key Competences for Lifelong Learning (2018) presents the most known competences frameworks:

- The OECD Key Competencies (DeSeCo) – 2003, 2005;
- The OECD Global Competency framework (2016);
- The US competences framework Partnership for 21st century learning;
- The World Economic Forum framework (2015);
- The Council of Europe Competences for Democratic Culture (2016);
- The UNESCO Intercultural Competences Framework (2013);
- The UNESCO Global Framework of Learning Domains (2012, 2013).

In the DeSeCo programme initiated by OECD in 1998 which ended in 2003 with the report "Key Competencies for a Successful Life and a Well-Functioning Society in 2003 and with the Executive Summary in 2005, key competences were grouped into three broad categories: act autonomously, use tools interactively (for example, language, technology), interact in heterogeneous groups. In addition, during the DeSeCo project OECD countries were asked to list which competences they considered to be key competences. Four groups were most frequently mentioned in the country reports and included social competences/cooperation; literacies/intelligent and applicable knowledge; learning (lifelong learning) competence; communication competences (Hoskins & Crick, 2011).

The OECD Global Competency framework (2016) presented and explained dimensions of global competence. Child and Shaw (2019), Voogt, and Roblin (2012) note that the Partnership for 21st Century Skills developed in the United States, had raised the goal of positioning 21st century competences at the centre of K12 education. The World Economic Forum (2015) grouped key skills into 3 large domains: foundational literacies, competencies and character qualities and they reflect an increased demand in skills dealing with critical systems. The Council of Europe Competences for Democratic Culture (2013) supports the development of democratic competences which strengthen sense of belonging and make their own positive contributions to the democratic societies. The framework presents 20 competences which are divided into four areas Values, Attitudes, Skills and Knowledge and offers descriptors of competences development (basic, intermediate, advanced) and guidance for their implementation.

The UNESCO Intercultural Competences Framework (2013) which assesses the competences needed to live in a globalised world and The UNESCO Global Framework of Learning Domains (2012, 2013), based on the recommendations of the 39 working group members and global consultations, proposed seven domains related to learning as important for all children and youth. These seven domains include:

1. Physical well-being
2. Social and emotional
3. Culture and the arts
4. Literacy and communication

5. Learning approaches and cognition
6. Numeracy and mathematics
7. Science and technology

One more initiative - Assessment and Teaching of 21st Century Skills (ATCS), developed as part of an international project sponsored by Cisco, Intel and Microsoft). ATCS (2015) aimed to develop clear definitions of 21st century skills. They concluded, according to Binkley et al. (2010), that these skills can be grouped into four broad categories:

1. ways of thinking;
2. ways of working;
3. tools for working;
4. skills for living the world.

Furthermore, within each category, they identified 10 skills as encapsulating all others. These skills are important focuses for education and indicators of readiness for the labour market, current and future society.

OECD developed Education Conceptual Framework 2030: Key Competencies for 2030, where three transformative competences creating new value; taking responsibility; coping with tensions and dilemmas are regarded as essential in 2030. Framework mainly addresses challenges for secondary education level.

The tendency is that international organisations and other stakeholders initiate the development of one or a group of key competences frameworks (reference frameworks and guidelines) which should facilitate the process of developing key competences and assessing their progress. This process is clearly visible on the European level. Variety of such competence frameworks are aimed to help and support national governments, teachers, schools and learners to have guidelines while developing key competences. For example, The Digital Competence Framework DigComp (Ferrari, 2013) integrates the following five competences in the context of digitization: (1) information and data literacy (2) communication and collaboration, (3) digital content-creation, (4) safety, and (5) problem solving. The later version DigComp 2.0 (2016) offers 8 proficiency levels. EntreComp (2016) develops a comprehensive understanding regarding entrepreneurship competence and defines it by 3 competence areas (Ideas and opportunities, Resources and Into action) each providing a list of 15 competences, learning outcomes and proficiency levels. The LifEComp Key Competence framework (EC, 2018) covers intrapersonal, interpersonal, cognitive and metacognitive aspects. LifEComp does not offer any levels yet.

Thus, we could see from a discussion above that diversity of competences framework may create an impression that each of them present different sets of competences. However, the analysis indicates that differences are mainly related to the grouping of competences but the key competences remain more or less the same. Thus, more work and research are further needed in the field of developing reference frameworks and guidelines for their implementation, which could help and guide national governments to integrate key competences in curricula and ensure relevant design, pedagogies, assessment as well as teachers' preparation (Working document on Key Competences for Lifelong Learning, 2018).

3.2 Types of approaches for key competence embedding in VET curricula

Contemporary curricula today meet with the big challenge to find the best and most efficient ways to develop key competences without undermining the importance of occupational skills and competences. In addition, researchers also continue debates regarding which competences are needed for contemporary education (Harris & Ormond, 2019). A clear definition is important as curricula designers should make the necessary structural and instructional decisions which would lead to achieving the set objectives.

Researchers (Succi & Canovi, 2020) observe that different stakeholders emphasised the importance of key competences as they linked them with higher adaptability at the work place, also ability to work independently, a sense of responsibility and the ability to learn.

3.2.1 Integrating key competences in VET curricula

Key competences development in VET curricula should be well aligned through learning outcomes as most qualifications are learning outcomes based (Keevy & Chakroun, 2015). This is a crucial moment in order the developed key competences were identified, assessed and recognised.

The analysis of different type of curricula helped to identify the main types of integration of key and occupational competences. The most typical ways of integration could be grouped into two broad approaches: 1) structural (integration through learning outcomes or assessment criteria); 2) instructional (through specific pedagogies or instructions). In many cases we find a mixed approach of the bellow-presented approaches (Deitmer & Heinemann, 2010; Deitmer, 2018).

Table 13. Key competences integration approaches in curricula

Design and structural approach	Instruction and pedagogical approach
1) a matrix approach, cross-curricula integration (Gordon et al., 2009; Kallioinen, 2010; Voogt & Roblin, 2012; Kirschner & Stoyanov, 2020;).	1) technology literacy approach (Voogt, Roblin, 2012) with a specific focus on digital competences development throughout the curricula;
2) integration within particular modules/subjects/projects, based on the relevance (Gilbert, 2019; Christidis & Lindberg, 2019);	2) developing key competences through specific instructions (Hoskins & Crick, 2010; Pilz and Fürstenau, 2019)
3) added to the already existing curriculum as new subjects (Voogt & Roblin, 2012; Kirschner & Stoyanov, 2020);	
4) be part of a new curriculum in which the traditional structure of school subjects is transformed (Gordon et al., 2009; Kallioinen, 2010; Voogt & Roblin, 2012; Kirschner & Stoyanov, 2020).	

5) other structural approaches based on rationale: • a rationale based on alignment between two separate practices, • a rationale based on incorporation of elements from one practice into the other practice and • a rationale based on (partial) hybridisation between the two practices (Bouw et al., 2019, p. 5).	

Matrix approach

A matrix approach is more evident in general curricula (Wang, 2019), which may lead to sufficiently overcrowded and unbalanced curricula. Cross-curricula integration of key competences also needs clarity regarding pedagogical approaches and assessment. For example, a list of key competences is often provided and these competences are supposed to be developed throughout the whole of the curricula, however, key competences might be vaguely reflected in the defined learning outcomes. The challenges of a matrix approach to curriculum design (Tedesco et al. 2013) are related to the problem of that key competences are "inevitably seen as 'add-ons' and of secondary importance, and that linking capabilities to subjects tends to be an arbitrary and forced process" (Gilbert, 2019, p. 171).

Integration within particular modules/subjects/projects, based on the relevance

The latest research indicates (Gilbert, 2019; Saavedra and Opfer 2012; Ercikan and Oliveri 2016) that an increasing emphasis in curricula is on the development of key competences through the disciplines related content, rather than promoting them as a series of stand-alone competencies. This model of integration seems most relevant to VET curricula due to the need to develop professional identity and develop key competences which are realised in diverse work-related settings. Still, more investigations are needed to confirm this opinion. Integrating key competences within occupational themes or modules could be explained by the fact that VET curricula are typically designed based on VET standards, which reflect the main fields of professional activity or are based on the logics of work processes (Hupfer, Spöttl, 2014). Integration of several vocational content modules within vocational curricula can also be considered as a way to develop key competences. The study presented by Christidis & Lindberg (2019) shows one of the examples that integration of modules with vocational content (in this case work ethics and health care) can lead not only to better academic results and vocational knowing but also contribute to the development of students' argumentation skills.

Added to the already existing curriculum as new subjects

The research suggest that some key competences can be integrated into existing curricula and some could be developed as distinct areas of knowledge, for example, ICT, languages. Co-curricula approach or integrating key competences into curricula through separate units has the major problem which is related to the risk of making curricula too complex and overloaded. This is particularly observed with general education curricula (Jackson, 2015). For example, Gilbert (2019) provides an interesting case of the Victorian approach: "literacy, numeracy, ICT and possibly thinking can readily be integrated across the curriculum as skills supporting learning, while ethical and intercultural understanding and personal and social capability are distinct areas of knowledge, skills and dispositions which cannot be addressed with integrity in the same way". Similar findings are observed by Voogt & Roblin (2012). They conclude from the analysis of international studies that "competences are integrated across the curriculum, with the exception of ICT-related competences which in the majority of the countries were either introduced as separate subjects or accompanied by specific guidelines to facilitate its teaching and assessment" (Voogt & Roblin (2012, p. 314).

Be part of a new curriculum in which the traditional structure of school subjects is transformed

One of the examples of this type of integration of key competences is reported by Watters & Christensen (2014) who presented two cases when newly developed curricula attempt to integrate science and mathematics with workplace knowledge and practices. These curricula were collaboratively developed by school teachers and partners from mining and aerospace industry. This resulted in new integrated curricula named *Science, Maths and Related Technologies for Engineering and Electrical School-based Apprentices* (or QSMART) and *Aerospace Curriculum*. The curricula design was based on the following principles:

1. a clear and consistent focus on *applied learning* in terms of approaches to teaching and assessment processes;
2. a clear representation of the workplace practices of the trade concerned;
3. a strong focus on embodied, embedded, encultured and encoded knowledge related to the trade, alongside the required embrained knowledge (Watters & Christensen, 2014).

In addition, the implementation of this type of curricula require appropriate teaching practices and assessment.

Technology literacy approach

For example, in German curricula key competences are not clearly mentioned (Hensen & Hippach-Schneider, 2016), but key competences are viewed holistically and are developed in workplace and school-based environments. Hensen and Hippach-Schneider (2016) give an example of industrial clerk curricular where information procurement, processing and evaluation (key competence 1, 4) is delivered in an integrated manner via media and information technology systems in all learning fields.

Pedagogical strategies

Key competences can be well developed in different curricula by specific pedagogic strategies, such as problem-based learning, co-operative learning, experiential learning, and aligning assessment of competences developed at workplace and school-based environments (Ajjawi et al. 2020), also self-assessment (Kyndt et al., 2013). This means that the development of key competences is not only linked to structural design of curricula, which need to find room for key competences but other supporting factors play an important role and they are related to teachers' professionalism, involvement of diverse stakeholders, revision of the assessment (Halász & Michel, 2011). Most of the analysed curricula (integrated, workplace-oriented, WIL, project/problem oriented, and other) stress a need to develop key competences through collaborative learning and inquiry-based learning in authentic contexts or solving problems from real world situations (Pilz and Fürstenau, 2019). For example, in German VET curricula, which can be defined as workplace-oriented, curricula are structured on the so-called learning fields, which are geared to the wide-ranging and problem-based activities that apprentices will encounter as they learn the full range of skills needed to plan, carry out, and monitor tasks. This approach helps to cover a whole spectrum of work activity and develop occupational competences, at the same time enhancing capacities for self-directed planning, execution and evaluation of the action while also taking into account interdisciplinary aspects (e.g. technology, economics, ecology, law, etc.). Hoskins & Crick (2010) note that key competences, namely, civic and learning to learn competences are successfully developed through learner-centred pedagogies and an environment built on trust and respect, engaging with wider communities.

Mixed approaches

The analysis of different types of curricula suggest that a mix of approaches is frequently applied. For example, in workplace-oriented, WIL curricula learning units are designed and developed mainly based on work processes through the multidimensional project topics (Deitmer & Heinemann, 2010; Deitmer, 2018) to develop both occupational and key competences because work processes are related to different situations and contexts (for example, communication with clients and ethical standards). In practical cases described in part 3 of this research we can see such practices are very typical for VET curricula.

Other structural approaches

There are other approaches to analyse how key and occupational competences are integrated. The researchers (Halász & Michel, 2011; Bouw et al., 2019) identify that competences development in contemporary curricula is related to effective transfer ways through integration of different types of knowledge, developing conceptual understanding, developing problem-solving abilities, professional skills, knowledge-development, occupational identity and mastering job performance. Bouw et al. (2019) concludes that ensuring connectivity could be achieved through structural approach, i.e. design of curricula based on one of the three possible rationale:
1) a rationale based on alignment between two separate practices,
2) a rationale based on incorporation of elements from one practice into the other practice and
3) a rationale based on (partial) hybridisation between the two practices (Bouw et al., 2019, p. 5).

In the first case we would link occupational competences developed in workplace environment with theoretical knowledge and key competences developed in the school-based learning environment. The second approach is based on the practice to integrate both types of competences notwithstanding the place where learning takes place. The third approach would be close to the idea that coherence can be achieved through a mixture of integrative ways.

Voogt and Roblin (2010) summarise recommendations regarding key competences development:

1. Key competences should be integrated across and within core subjects; however, the changes this entails for subject-bound knowledge, instructional methods and assessment procedures should be explicitly explained.
2. The weight of key competences in the curriculum and across the whole range of schooling should be specified, identifying the levels of proficiency expected for each skill at different stages.
3. The role of non-formal and informal education contexts in supporting the acquisition of key competences should be acknowledged and taken into account. Strategies to link what is learnt in and outside the school should be developed.
4. Technology should be regarded as a powerful learning resource that can support the acquisition of key competences. ICT facilities ought to be made available in quantity and in quality at schools to guarantee the opportunities for technology use in the classrooms (Voogt & Roblin (2010, p. 30)

The research shows that the question of integrating, developing, assessing key competences within different curricula needs more attention. The analysis how different descriptors for monitoring and following the progression of competences would be useful (Keevy & Chakroun, 2015). Further research regarding how specific key competences are integrated within VET curricula would help to map more relevant practices regarding different approaches.

3.2.2 Key competences vs. occupational competences in VET curricula

The most important target of VET is to promote professional competence development as competences make an important part of the qualification (Zhao, 2014). In research literature we find discussions regarding the development of key competences or occupational competences, balancing general subjects and vocational modules in curricula (Aarkrog, 2019), preparing graduates to become lifelong learners. The discussion of how occupational competences are embedded in curricula should be linked to such factors as vocational tradition and VET systems (Zhao, 2014).

In 2016 studies across European countries regarding key competences development were carried out and they provide useful insights about key and occupational competences representation in VET curricula. For example, in Czech Republic (Kašparová, 2016) competences as defined in the national curricula and developed through separate subjects (general subjects, vocational subjects, specialised subjects focusing on a specific key competence) and integrated in other subjects or student projects.

Ireland (Burke, Condon, 2016) launched The Skills for Work programme which aimed to develop key competences for people working in specific sectors such as agriculture, transport, food and beverage services, and manufacturing. The courses of the programme were adapted to the specific work-situation of the learners. In Iceland (Stefánsdóttir, 2015) key competences are mainly developed at schools rather than during workplace training. Key competences have been integrated with occupational modules and /or other relevant contents. Poland (Siekiera, Luck, 2016) has varied approach, and key competence are developed either through separate subjects or modules on entrepreneurship, native language, foreign language, computer science, and etc. and as integrated into other contents and activities (extracurricular activities; social projects and teamwork). In Spain (*Servicio Público de Empleo Estatal*, 2016) VET programmes are based on occupational standards which comprise key competences which are also integrated in the learning outcomes. Similar trends are observed in other European countries too. Key competences in VET curricula might be developed separately, but in many cases key competences become closely interconnected or even they overlap with occupational competences. For example, foreign languages become a standard requirement for most of the professions, as well as ICT skills, etc. The next section will discuss key competences in different types of curricula.

3.2.3 Key competences in different types of contemporary VET curricula

Different types of curricula have their "ideologies" and therefore the construction of learning outcomes is closely related to their vision and objectives which are defined either by national authorities, employers, professional bodies, international organisations and other stakeholders. Learning environments also influence the way curricula are designed and what competences they aim to develop. We find that in most curricula type such competences as creativity, complex problem solving, communication, collaborative work and team work, digital competences, lifelong learning are most frequently developed (Voogt & Roblin, 2012; Nilson et al., 2013; Stoten, 2020; Kirschner and Stoyanov, 2020).

We tried to define what key and occupational competences are represented in different types of curricula. For example, in project/problem-oriented curricula (Lewis et al., 2019) authentic project-based learning is a highly effective way for instructors to help students learn disciplinary skills, modes of thinking, and collaborative practices, conceptual understanding, problem-solving and metacognitive skills by creating solutions to real-world problems for real users and clients. This type of learning increases student retention, better prepares students for professional work and promotes greater learning of conceptual knowledge and teamwork (Yadav et al. 2011).

Analysing the research about different curricula, it becomes evident that it would be extremely difficult and at the same time a limiting conclusion that one or another type of curricula is more or less favourable for the development of key competences. We also observe that notwithstanding the type of curricula, the most typical approaches of occupational and key competences integration could be found in most of the types of curricula, not excluding subject-based ones. The difference is that for example, some types of curricula are more flexible to introduce more models of integration as compared to others. This could be said, for example, about modular curricula (Brewer & Comyn, 2015) or integrated types of curricula are also appropriate for multiple key competences integrations. The cases presented later in this report reflect this tendency. For example, in Germany key competences (like multilingualism) or occupational competences can be developed as additional qualifications, whereas in the Slovenian model we see openness for choosing the learning units.

The research also shows that VET curricula which is closely linked to workplace learning environment or aims to link workplace and school-based learning, demonstrate a higher degree of "contextualising" key competences in different environments (hybrid curricula, workplace-oriented, WIL curricula) compared to subject-based curricula. Thus, the concept of transferability, as discussed by researchers (Veillard, 2012; Cremers et al., 2014; Zitter et al., 2016), applies not only to occupational but to key competences too.

Design and implementation of contemporary curricula needs careful planning and coherent methodology. For example, Lewis et al. (2019, p. 953) observe that in project/problem oriented curricula,

teachers reported the following challenges related to the design, development and implementation of curricula: “(a) scoping, sourcing challenges and balancing the needs of the program, students, and clients; (b) curriculum preparation, making the curriculum flexible enough for shifting project problems and codify standards to help students understand how to do quality work; (c) providing assistance to teams, including monitoring, and delivering assistance; and (d) coordinating a range of stakeholders involved in assisting teams, including co-instructors, clients, and students”.

Yadav et al. (2011) critically note that schools, faculties should carefully plan curricula and decide which content to teach with the problem-based approach and what to cover with lectures. Their research in engineering studies at higher educational level shows that, for example, in engineering education, it is important that students first develop key concepts before using problem-based learning which will not compensate this knowledge.

In work integrated curricula the main challenges are related to planning of the process, curricula design (implemented as co-curricula) and active contribution from industrial partners. Jackson (2015) also observes difficulties in assessing key competences, as for example, not very clear standards and the degree to which targeted outcomes and goals were achieved.

Based on the findings of the second part of the research, we can conclude that competence-based approach has become a dominant paradigm in curricula design. This change from knowledge-based to competence-based approach still raises many debates. The complex nature of the competence also promotes further discussions among scholars and policy makers how to design, develop, implement and assess competences. Competence-based curricula in VET has a specific challenge related to alignment, integration of key and occupational competences. Despite the variety of approaches how key competences can be integrated in VET curricula, the research shows that scientific literature does not provide a clear answer if different types of curricula imply integration and development of specific type of key competences. We also observe that the identified approaches used for integrating key competences could be found in most of the types of curricula. What is getting obvious is that curricula should be an open system capable to absorb fast changing knowledge and also be focused on the development of such key competences which allow adapt to changing complex social, technological, economic systems.

CONCLUSIONS

1) The research indicates that contemporary curricula is distinguished by such characteristics as flexibility, adaptability to labour market demands, ensuring authenticity of the learning environment and more coherent integration of theory and practice, collaborative and co-creative learning. The analysis of different types of curricula presents evidences regarding their positive impacts and benefits for learners. These impacts and benefits could be linked to broader socio-economic impacts as well as personal benefits. The first category would include such positive effects as a better adaptability to the labour market demands, increased employability, faster integration and adaptation in workplace environment, higher earnings in the future career, decreasing dropouts from educational system, increased engagement and motivation. On the individual, competence development level, contemporary curricula well contribute to the development of self-regulated, autonomous learning, metacognition (personalised curricula, hybrid curricula), higher academic results (integrated curricula, problem-based curricula), team working, problem-solving, communication, information literacy and professionalism, creativity and motivation (integrated curricula), critical thinking, innovation, and problem solving which increases students' motivation and engagement, entrepreneurial competences (modular curricula, workplace-oriented curricula), collaborative learning skills, decision-making and etc. The main difficulties in developing and implementing contemporary curricula are related to teachers' readiness and professional development, stakeholders' support and engagement, curricula design practices and traditions.
2) The main types of integration of key and occupational competences are linked to structural approaches such as a matrix approach or cross-curricula integration; integration based on the relevance with particular modules; integration of vocational content modules/units, added to the already existing curriculum as new subjects or as new content within traditional subjects, be part of a new curriculum in which the traditional structure of school subjects is transformed and schools are regarded as learning organizations. Instructional approaches are related to contemporary pedagogies and key competences development can be enhanced through problem-based learning, co-operative learning, experiential learning, blended learning, reflection and formative assessment. A technology literacy approach with a specific focus on digital competences development throughout the curricula can be also linked to instructional approach. In most case a mix of the above-mentioned approaches is observed in curricula. The research indicates that scientific literature does not provide clear answer if different types of curricula imply integration and development of specific type of key competences. The identified approaches used for integrating key competences could be found in most of the types of curricula.

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