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# **Gathering and analysing the future trends in the automotive and automation sector in Nova Gorica and Satakunta regions**

Second deliverable in WP 2: Understanding the Future trends

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## 1 Introduction

## **2 Current and future trends – theoretical view**

### **2.1 Youth culture**

Various terms are used to characterize generations. First of all, it has to be underlined, that a characterization of an entire generation, understood as a cluster of youth cohorts, never can predict the attitudes, preferences, values and behavior of an individual young person. As little as a country culture can predict the character of an individual citizen<sup>1</sup>. Personal and social background, as well as physical and intellectual capacities will always play a role. Furthermore, fundamental human needs and principles are independent from generations and other cultures.

Nevertheless, common attributes clearly emerge, when comparing youth cultures across the generations. And in the framework of RAY, youth culture is relevant for VET providers and training companies, as colleges and workplaces have to understand young people and be able to meet them with relevant conditions and methods.

This report does not study youth culture as a scientific discipline, but focuses on circumstances that influence those young people, passing through youth education these years.

### **Generation Z**

The commonly recognized term for the new generation, born after 1990, is Generation Z (Gen Z). German researcher Christian Scholz calls the new generation “a real game changer”<sup>2</sup>. According to the professor, most of the research so far has been done “in a corridor connecting Australia, USA, France, Germany and the UK” (2016)<sup>3</sup>, but surveys and research are coming up also in other countries. Also in RAY’s partner countries, relevant studies could be identified (see list of references).

As a common denominator across the European countries and cultures, Gen Z is grown up with the globally expanding, new digital technologies and has not experienced a reality without. This also means that they have grown up in an increasingly transparent

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<sup>1</sup> Jensen, Iben „Kulturforståelse“, Roskilde Universitets Forlag, Denmark, 2005.

<sup>2</sup> Saarland University (2016) with reference to Scholz, Christian „Generation Z. Wie sie tickt, was sie verändert und warum sie uns alle ansteckt“, Wiley (Weinheim), 2014.

<sup>3</sup> “Call for Applications - The Generation Z in Europe”, symposium, 28-29 Nov. 2016, Saarbrücken, Germany.

information society and a world with an unimaginable data amount, which growth is exponential<sup>4</sup>.

Digitalization is more or less natural for these young people. These *genuine digital natives* cannot personally remember a life before the internet.

The following dimensions are exposed, as they directly influence the design of teaching and training:

### *Digital relationships*

Social life takes place in cyberspace as much or even more than offline in real life. Gen Z does not differ between offline/online and expects things working digitally, also relations to people from older generations.

### *Accessibility & convenience*

Gen Z has high expectations to *accessing* learning and knowledge anywhere, any times and in multiple ways: *Learning on demand*. On the one hand, this opens for many new possibilities for distance- and time-independent learning and working. But we yet do not know the long-term consequences of being online and available 24/7.

### *Optimization & high speed*

The purpose of digitalization is to improve processes: either to make new processes possible or existing processes easier, more efficient, funnier, cheaper, faster etc. This also influences waiting times, which hardly are tolerable any more. However, many young people also feel a tremendous pressure having to perform a life in a high-speed world that *accelerates exponentially*<sup>5</sup>.

### *Specialization*

A new kind of pressure has come up: making choices in a globalizing world with endless possibilities. This includes the choice of a career and thus an educational pathway. Gen Z'ers are frightened to get caught somewhere in a blind alley of specialization and become outdated.

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<sup>4</sup>Reimsbach-Kounatze, Christian "Data-driven innovation for education", 5<sup>th</sup> Nov. 2014, OECD, Directorate for Science, Technology and Innovation, presentation: <https://www.slideshare.net/OECD/EDU/data-driven-innovation-for-education>.

<sup>5</sup> Pedersen, Jannick and Hvid, Anders "Forståfremtiden", People's Press, Denmark, 2016.

### *Job & identity*

Gen Z is said to have difficulties with the classic rules of the labour market: Meeting times, hierarchy, rules for decision making, etc. The organizational structure of Gen Z is the *network*<sup>6</sup>, and they relate to *hubs*, rather than to managers. But at the same time, they are very obtained of their work and their job. Losing their job means losing identity.

### *Individualization*

Gen Z navigates in individualized or individualizing societies. According to social psychological research<sup>7</sup>, in individualized society with a high degree of competition, it is essential for a young person to develop a *sustainable identity*: a consistent and at the same time a flexible experience and understanding of him/herself, his/her relationships to others and to the society. The identity is the basis for the countless choices to be made for education, work, and lifestyle, consume etc. The development of identity goes hand in hand with the learning taking place in formal education, in informal and informal context. Thus, learning also depends on the factual state of the individual's identity development.

Gen Z is not homogenous regarding these mechanisms<sup>8</sup>. As far as known by now, the individualized approach in a performance-oriented culture is to some degree advantageous for young people with strong resources and identity, offering them self-determination and personal deployment.

However, lately, also shady sides have shown up, when especially young girls seem to practice perfectionism and to suffer under the pressure of delivering top performance on all levels: education, work, looks, social life etc. The individualization is possibly even more threatening for young people with disadvantaged personal and social resources, often resulting in disorientation, self-accusation and regarding to education, also demotivation, drop-out or destructive behaviour.

### *Learning styles*

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<sup>6</sup> Bay, Morten "Homo Conexus", Gyldendal Business, Denmark, 2009.

<sup>7</sup>Katznelson, Naomi "Fundamentale præmisser for ungdomsuddannelserne" in Illeris, Knud (ed.) "Læring i konkurrencestaten", Samfundslitteratur, Denmark, 2014.

<sup>8</sup>Katznelson (ibid), with reference to the Nordic countries.

Gen Z prefers learning with a high degree of independency. This can be peer learning with ongoing feedback, also via media. A major part of the learning process happens via cooperation and co-creation. Project work has become a mainstream method in many countries' education systems. Using books or even only longer texts can cause resistance.

Traditional approaches to learning are often questioned. This has led to an experimental orientation with an urge for constantly looking for new perspectives. No matter what, Gen Z has to a high degree the need for feedback and appreciation. Both digitally and personally, and preferably instantly.

Gen Z lives with their digital tools in an *embodied interaction*<sup>9</sup>, as nearly a part of their bodies, first of all with their smart phones and apps. Also other wearable and devices are intervening these days our physical intimate zones<sup>10</sup>, and Gen Z adopts them all.

### *Didactic*

This approach challenges the traditional educational thinking and requests much more co-design and influence of teaching. This student-centered approach is not new, but has become unavoidable since Gen Z. Innovative didactic experts<sup>11</sup> have developed models to design teaching in digital environments, and many exemplary results of best practice exist<sup>12</sup>.

### *Teacher role*

Overall, the student-centered learning approach still challenges the teacher role, which has changed (or is changing) from expert-centered lecturing to something like facilitation, consultancy, coaching or guidance of students' learning processes. In many cases, students may now be smarter or even more experienced than teachers. Their resources are expected to be taken into account to promote their learning processes.

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<sup>9</sup>Dourish, Paul "Where the action is – the foundation of embodied interaction", 2004, Massachusetts Institute of Technology.

<sup>10</sup> Such as Smartwatch, Google Glass, Virtual Reality, intelligent textiles, voice steered devices, Cyborg discussions.

<sup>11</sup>Example: "Flipped learning", Hachmann and Holmboe, [extract](#) exclusively translated into English for EU project MAPPING (2014), with reference to "Flipped Learning", NytTekniskForlag, Denmark, 2014.

<sup>12</sup>Europe: <http://ec.europa.eu/programmes/erasmus-plus/projects/>

## 2.2 Digitalization and Industry 4.0 and 5.0

### 2.2.1 Definitions

DIGITALIZATION (OR DIGITIZATION): It is the networking of people and things and the convergence of the real and virtual worlds that is enabled by information and communication technology (ICT).<sup>13</sup> Digitization is of crucial importance to data processing, storage and transmission, because it "allows information of all kinds in all formats to be carried with the same efficiency and also intermingled".<sup>14</sup> Digitalization has had (and is still having) a major impact on the industry: from supply chains to production to customer experience, it is transforming the way industry functions—and unleashing global opportunities for value creation.

INDUSTRY 4.0: The term "Industrie 4.0" refers to the current trend of automation and data exchange in manufacturing technologies. It originates from a project in the high-tech strategy of the German government, which promotes the computerization of manufacturing.<sup>15</sup> It includes cyber-physical systems, the Internet of things, cloud computing<sup>16</sup> and cognitive computing. Following Pentek,<sup>17</sup> there are four design principles in Industry 4.0: Interoperability, Information transparency, Technical assistance and Decentralized decisions. Another term is the "fourth industrial revolution", while in the United States and in the English-speaking world in general some commentators also use the terms the "Internet of Things" (IoT), the "Internet of everything" and the "Industrial Internet".<sup>18</sup>

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<sup>13</sup>*Change Through Digitization—Value Creation in the Age of Industry 4.0*, Kagermann, In: Albach, H., Meffert, H., Pinkwart, A., Reichwald, R. (eds.) *Management of Permanent Change*, pp. 23–45. Springer Fachmedien Wiesbaden, Wiesbaden (2015).

<sup>14</sup>McQuail, D (2000) *McQuail's Mass Communication Theory* (4th edition), Sage, London, pp. 16-34.

<sup>15</sup>BMBF-Internetredaktion, "Zukunftsprojekt Industrie 4.0 - BMBF". Bmbf.de, (2016).

<sup>16</sup>References to the term have been taken from: Jasperneite, J.: *Was hinter Begriffen wie Industrie 4.0 steckt in Computer & Automation*, 2012. Kagermann, H., Wahlster W. and Helbig, J. eds., *Recommendations for implementing the strategic initiative Industrie 4.0: Final report of the Industrie 4.0 Working Group*, 2013. Lasi H., Kemper H-G., Fettke P., Feld T., Hoffmann M., *Industry 4.0. In: Business & Information Systems Engineering* 4 (6), pp. 239-242.

<sup>17</sup>Pentek, H., *Design Principles for Industrie 4.0 Scenarios*, 2016.

<sup>18</sup>Deloitte: *Industry 4.0: Challenges and solutions for the digital transformation and use of exponential technologies*, 2015. <https://www2.deloitte.com/content/dam/Deloitte/ch/Documents/manufacturing/ch-en-manufacturing-industry-4-0-24102014.pdf>.

The term "Industry 4.0" was revived in 2011 at the Hannover Fair.<sup>19</sup>The characteristics given for the German government's Industry 4.0 strategy are: the strong customization of products under the conditions of highly flexible (mass-) production. The required automation technology is improved by the introduction of methods of self-optimization, self-configuration, self-diagnosis, cognition and intelligent support of workers in their increasingly complex work. As a result, with Industry 4.0, steps towards automation proceed more disruptively and with greater risk<sup>20</sup>, and the spectrum of social challenges is correspondingly wide. According to Pfeiffer<sup>21</sup>, Industry 4.0 is a systemic change, bringing about extensive changes to the world of work.

INDUSTRY 5.0: The term is still very recent in literature. While Industry 4.0 focus on process states enabled by digital/Web-based technologies, Industry 5.0 is likely to have a more fundamental and tec-tonic, disruptive shift.<sup>22</sup> As such, interaction between humans and machines in a synergy environment might be a major component of the future Industry 5.0, continuing the push towards more advanced human-machine cooperation, industrial up cycling and improved productivity.<sup>23</sup>According to Esben H. Østergaard, Chief Technology Officer at Universal Robots, Industry 5.0 will bring the human touch back to manufacturing. Whereas 4.0 puts advanced technologies at the centre stage of production, Industry 5.0 will actually see people working alongside factory systems.<sup>24</sup>

## 2.2.2 What is the influence of digitalization on the field of industry (automotive) and education?

We can find diametrically opposed assessments in the literature:

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<sup>19</sup>"Securing the future of German manufacturing industry: Recommendations for implementing the strategic initiative INDUSTRIE 4.0 : Final report of the Industrie 4.0 Working Group", April 2013.

<sup>20</sup>*Digitale Vernetzung und Zukunft der Wertschöpfung in der deutschen Wirtschaft*. Acatech, Dossier für den 2. Innovationsdialog in der 18. Legislaturperiode. Berlin: Deutsche Akademie der Technikwissenschaften, 2015.

<sup>21</sup>Pfeiffer S. *Effects of Industry 4.0 on vocational education and training*, Institute of Technology Assessment (ITA), 2015.

<sup>22</sup>*Industry 5.0—The Relevance and Implications of Bionics and Synthetic Biology*, Sachsenmeier P. Hertford College, University of Oxford, 2016.

<sup>23</sup>*What Is Industry 5.0 — and How Will It Affect Manufacturers?*, Shelzer R., 2017. <https://blog.gesrepair.com/industry-5-0-will-affect-manufacturers/>.

<sup>24</sup>*Industry 5.0 – Return of the human touch*, Østergaard E., 2016. <https://blog.universal-robots.com/industry-50-return-of-the-human-touch>.

Recent studies<sup>25</sup> estimate that digitization of products and services can add more than €110 billion of annual revenue in Europe in the next five years. Other studies<sup>26</sup> estimate that digitisation of products and services will add more than 110 B€ of revenue for industry per year in Europe in the next 5 years. Close to a third of the growth of the overall industrial output in Europe is already due to the uptake of digital technologies.<sup>27</sup> Frey and Osborne<sup>28</sup> predict that 47 per cent of employees in the USA will face a high risk of rationalization as a result of big data, robotics and intelligent algorithms. With the same methodology, Bowles<sup>29</sup> uses ILO data for Germany to predict that 51 per cent of jobs are at risk of automation. Neumann sees<sup>30</sup> a reduction in employment –for the automotive industry at least –as unavoidable, even in Germany, but it is argued that the demographic change means it will be possible to manage this in a socially responsible manner. The combinatorial effects of digitalisation– mobile, cloud, artificial intelligence, sensors and analytics among others – are accelerating progress exponentially. As digital transformation becomes ubiquitous and accessible to the wider population, it provides industry with unparalleled opportunities for value creation from expanding profit pools, creating new revenue models and enabling unprecedented access to global markets.<sup>31</sup> However, general assessments about work organization in Industry 4.0 mostly vary between two poles: some postulate a polarization between qualified experts on the dispositive level, and simple, semi-skilled activities on the operative level, others<sup>32</sup> a swarm organization, which identifies skilled personnel with high levels of autonomy on both the dispositive and the operative level.

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<sup>25</sup>European Commission, *Digitising European industry - Reaping the full benefits of a digital single market*, COM(2016)0180. <https://ec.europa.eu/digital-single-market/en/policies/digitising-european-industry>.

<sup>26</sup>PwC, *Opportunities and Challenges of the industrial internet* (2015), and Boston Consulting Group: *the future of productivity and growth in manufacturing industries* (2015).

<sup>27</sup>Estimates by LIFE + series of studies 2016.

<sup>28</sup>Frey, C.B.; Osborne, M. A: *The Future of Employment: How Susceptible are Jobs to Computerisation?* (Working Paper) Oxford: Oxford Martin School, 2013.

<sup>29</sup>Bowles, J.: "The computerisation of European jobs", 24 July 2014, <http://bruegel.org/2014/07/the-computerisation-of-european-jobs/>.

<sup>30</sup>Neumann, H.: "Eine große Chance für die Arbeit". *Süddeutsche Zeitung*, 6 October, p. 2, 2014.

<sup>31</sup>*Digital Transformation of Industries Demystifying Digital and Securing \$100 Trillion for Society and Industry by 2025*. WORLD ECONOMIC FORUM, 2016. <http://reports.weforum.org/digital-transformation/wp-content/blogs.dir/94/mp/files/pages/files/wef1601-digitaltransformation-1401.pdf>.

<sup>32</sup>Windelband, L. & Dworschak, B.: *Arbeit und Kompetenzen in der Industrie 4.0*. In: Hirsch-Kreinsen, H., Ittermann, P. & Niehaus, J. (Ed.) *Digitalisierung industrieller Arbeit. Die Vision Industrie 4.0 und ihre sozialen Herausforderungen*. Baden-Baden, 2015.

Within the automotive industry more than a quarter of the growth of value added<sup>33</sup> in the sector today comes from the integration of digital innovations in the car and in the design and production of cars. Some analysis<sup>34</sup> suggest that there is a \$0.7 trillion opportunity to create value from the digital transformation of the automotive industry, through initiatives such as channel migration to virtual purchases, value-added subscriptions and next-generation servicing. In addition, it states that the value created for society is likely to be even higher – up to \$3.1 trillion – through reduced crash costs, lower insurance premiums, fewer road casualties and lower carbon emissions. Some data<sup>35</sup> also show that workplace changes have been strongly linked with digitalization: within the space of just two years, considerably more than half of employees have been confronted not only with new computer programmes, but also with new manufacturing or process technologies, and new machines or equipment, which generally also come with new control systems. Specifically, Pfeiffer<sup>36</sup> mentions the following disruptive changes relevant for the development of the automotive industry:

- Changes to the product level: this is most obvious when it comes to electromobility. Decreasing proportions of mechanical elements in mass-produced cars would mean changes to production processes in the main manufacturing companies; reconfiguration of value chains and unforeseeable effects for employment and qualification.
- Changes to materials: graphene is the material that is likely to play the most important role here.
- Changes to the labour supply: demographic development associated with a rapid increase in older people in the workplace, and a shortage of skilled workers. On the other hand, we can observe persistently high rates of youth unemployment. Globalization and digitalization offer companies new opportunities to become even

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<sup>33</sup>Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, *Digitising European Industry Reaping the full benefits of a Digital Single Market*. <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52016DC0180>.

<sup>34</sup>*Digital Transformation of Industries Demystifying Digital and Securing \$100 Trillion for Society and Industry by 2025*. World Economic Forum, 2016. <http://reports.weforum.org/digital-transformation/wp-content/blogs.dir/94/mp/files/pages/files/wef1601-digitaltransformation-1401.pdf>.

<sup>35</sup>Klein, B.; Menez, R.; Oestreicher, E.; et al.: *Chancen und Risiken mobiler und digitaler Kommunikation in der Arbeitswelt. Doppelgutachten für das Büro für Technikfolgenabschätzung beim Deutschen Bundestag (TAB) für die Branchen IKT-Dienstleistung und Automobilproduktion*. Stuttgart: Universität Hohenheim, 2015.

<sup>36</sup>Pfeiffer, S.: *Effects of Industry 4.0 on vocational education and training*. Stuttgart: University of Hohenheim, 2015.

more independent of the local labour supply, be it by means of more extensive offshoring or new models such as crowd working, or the on-demand or sharing economy.

- Climate change, geopolitical conflicts, social inequality and vulnerability of global infrastructures will also have an impact. For instance, qualification and work, which have so far mainly been organized in national contexts, will increasingly be structured by global actors and transnational strategies.

The digital transformation is structurally changing the labour market and the nature of work, affecting employment conditions, levels and income distribution. The gap between the demand for, and availability of digitally skilled workers in Europe is growing. About 40% of EU workers have an insufficient level of digital skills.<sup>37</sup> It will require a massive upskilling of the workforce at all levels: in addition to digital skills and competences (such as combined data analytics and business or engineering skills), there is an increasing demand for other complementary skills, such as entrepreneurial, leadership and engineering skills. Future jobs will require an appropriate mix of basic, soft and technical skills, notably the digital and business-specific ones, which education and training systems are not yet fully addressing. Moreover, the retraining of the existing workforce needs to take place in companies and therefore a strong involvement of businesses and social partners is necessary. Close links with education and training providers at all levels would ensure capitalisation of local innovation by business actors as well as graduates' skills and competences in the local employment context and the availability of locally relevant and cutting-edge training and retraining offers.<sup>38</sup>

As a consequence, it is vital that both vocational and university education and training transmit more meta-knowledge and theoretical knowledge, as well as instill the capacity to find experience-based and practical solutions.<sup>39</sup> The impact on the training of school and company training staff is also obvious: instructors and teachers will have to give space to interdisciplinary as well as IT skills. New working methods, work routines and

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<sup>37</sup>EUROSTAT, digital skills of the labour force 2015.

<sup>38</sup>Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: *A human capital ready for the digital transformation with the necessary skills*. COM(2016) 381 final, 2016.

<sup>39</sup>Pfeiffer, S.: *Effects of Industry 4.0 on vocational education and training*. Stuttgart: University of Hohenheim, 2015.

working strategies are increasingly based on co-operative, competency-based autonomous learning, and teaching arrangement, to ensure sustainable the work ability of future qualified professionals.<sup>40</sup>

### 2.2.3 Future challenges

Some analysis<sup>41</sup> include a number of challenges: the pace of changing customer expectations, cultural transformation, outdated regulation, identifying and accessing the right skills, lack of collaboration for societal gains (at present, incentives primarily focus on meeting profit targets), regulation and protection of consumer interests, and skills for tomorrow's workforce. The need to accelerate the development of common standards, specifications and interoperable solutions has also been identified.<sup>42</sup>

Some significant trends have also been identified<sup>43</sup>: a greater customer focus and more customer-specific adaptation, efforts to reduce lead times, new forms of marketing and distribution channels (especially in the e-commerce area) and greater energy efficiency. Further trends include preventive maintenance, automation of logistics, smart data gathering and miniaturization.

## 2.3 Education

When we think about the education, first question that we need to ask is what are our aims? What would we like to encourage by young people. Are disciplined and knowledge oriented goals enough? Do we have to think wider? Is enough just to know or we also

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<sup>40</sup>Gebhardt, J., Grimm, A., Neugebauer, L.M.: *Developments 4.0 - Prospects on future requirements and impacts on work and vocational education*, Journal of Technical Education, Band 3, Heft 2, 2015. [www.journal-of-technical-education.de](http://www.journal-of-technical-education.de).

<sup>41</sup>*Digital Transformation of Industries Demystifying Digital and Securing \$100 Trillion for Society and Industry by 2025*. WORLD ECONOMIC FORUM, 2016. <http://reports.weforum.org/digital-transformation/wp-content/blogs.dir/94/mp/files/pages/files/wef1601-digitaltransformation-1401.pdf>.

<sup>42</sup>Communication from the Commission to the European Parliament, the council, the European Economic and Social Committee and the Committee of the Regions: *A Digital Single Market Strategy for Europe*, 2015. <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52015DC0192>.

<sup>43</sup>Deloitte: *Industry 4.0: Challenges and solutions for the digital transformation and use of exponential technologies*, 2015. <https://www2.deloitte.com/content/dam/Deloitte/ch/Documents/manufacturing/ch-en-manufacturing-industry-4-0-24102014.pdf>.

need to think how to know and also how to use knowledge to see (different) and to do (better)?

Before that we also need to ask how do we perceive young people and what possibilities, challenges and response-abilities are we ready to give them?

It is the fact that young people are so called grown up with digital technology and that digitalization is important part of their lives. They are switched on internet every second, they communicate through internet... but are they really capable for living in a digitalized world? Do they aware of risk that internet can bring to them? Do they aware of usefulness from the link digital (isation) and technology. And most important – do teachers aware of this link and involve it in pedagogical process?

According to the trends in literature and practice, we are focusing with different challenges on the field of (secondary) education. First is already mention above – digitalized world that young people are living in; second is insufficiency of discipline and school oriented system of education <sup>44</sup>, third is high level of unemployment between young people on one side and intensive seeking of skilled worker on the other<sup>45</sup>; and the last is also low motivation between young people for school, for learning.

Before we think a bit of what we can do about these challenges, what do we know and how can we get closer, let us as a look some statistic data as a starting point for thinking further.

First statistic surprise: According to the McKinsey, research about readiness for work we find out that there is a big difference about expectations and understanding of the same problem between employers, students and teachers. The results (see Mourshed aoth. Pg. 18) show that fewer than half of youth and employers, for example, believe that new graduates are adequately prepared for entry-level positions. Education providers, however, are much more optimistic: 72 percent of them believe new graduates are ready to work. The same disconnect occurs with regard to education; 39 percent of education providers believe the main reason students drop out is that the course of

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<sup>44</sup>10 Trends – Transforming Education as we know it. European Political Strategy Centre.

<sup>45</sup>Mourshed, M., Farrell, D., Barton, D. (2013). *Education to Employment: Designing a System that Works*. McKinsey Center for Government. <https://www.mckinsey.com/industries/social-sector/our-insights/education-to-employment-designing-a-system-that-works>.

study is too difficult, but only 9 percent of youth say this is the case (they are more apt to blame affordability).

And second statistic surprise: According to PISA result the research was made about correlation between high scores on PISA and level of interest and self-confidence<sup>46</sup>(Collard, P. 2017). The results show that young who have very high score on PISA (mathematical and natural science literacy) do not show high level of interest and self-confidence, which are one of the main characteristics of work success.

Key question is how can we meet together – teachers, students and employers? What do we need to think of on the field of education for make this meeting easier and more operational?

### 2.3.1 10 trends for the future

In the document 10 trends – transforming education as we know it<sup>47</sup>, which was made by European Political Strategy Centre, is presented nine dimensions, which are illustrated below and reflect the cumulative direction, we are or should be moving towards.

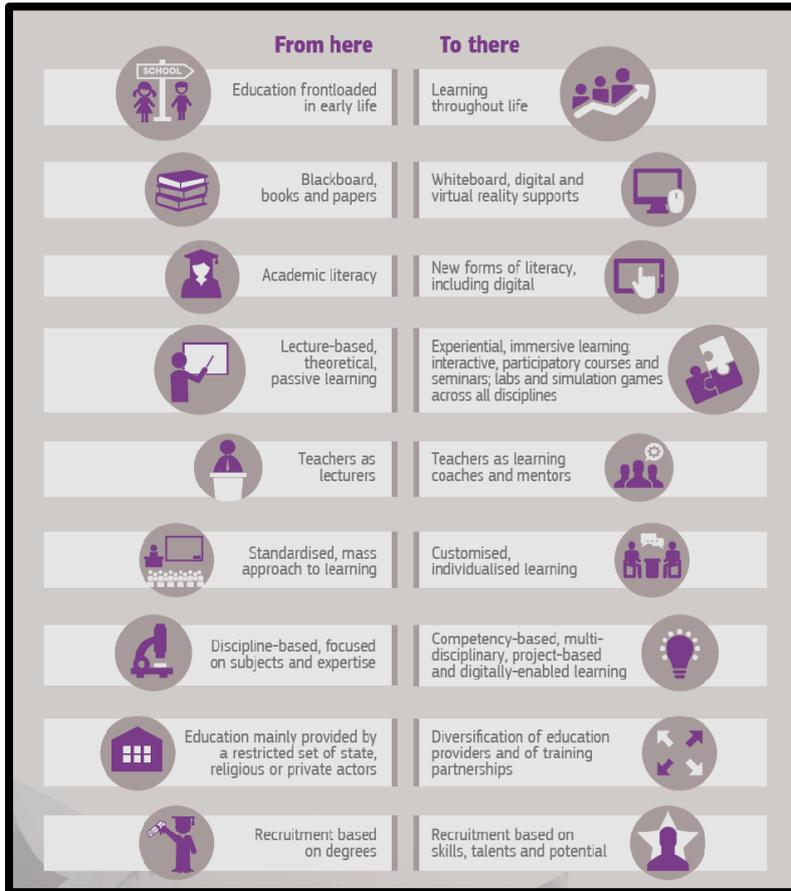
At first glance, we can see that transformation brings more cooperation, more interaction between different actors in education and new forms of literacy and learning related to the use of digital media.

When we read the trends step by step, we find out that some of the trends and principles are not really new, such as *Learning throughout life* and *Personalized learning*. But these already well-known tendencies, which more or less are implemented in a range of European countries, seem to experience an increased urge now, induced by the all overshadowing *Digitalization*(see chapter 3.2).

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<sup>46</sup>P. Collar (2017). *What is creativity and why is important?* Retrieved from: <https://www.youtube.com/watch?v=UCOjnFbjyHs>.

<sup>47</sup>*10 trends - Transforming Education as we know it*", European Political Strategy Centre (European Commission, 2017) [https://ec.europa.eu/epsc/publications/other-publications/10-trends-transforming-education-we-know-it\\_en](https://ec.europa.eu/epsc/publications/other-publications/10-trends-transforming-education-we-know-it_en).



Some of the trends, mentioned in this document, are briefly presented here, supplemented with other sources and directed towards the purpose of RAY:

The trend *Digital is the new literacy* belongs to the wider-described *21<sup>st</sup> century's skills*. These skills are highlighted in different ways by different education-political organs and pedagogical research institutes. Summarized at Wikipedia and referring to different approaches<sup>48</sup>:

- *Digital literacy skills*: information literacy, media literacy, information and communication technologies (ICT) literacy.
- *Learning and innovation skills*: critical thinking and problem solving, communications and collaboration, creativity and innovation.
- *Career and life skills*: flexibility and adaptability, initiative and self-direction, social and cross-cultural interaction, productivity and accountability.

More specifically and advanced than the above mentioned general digital skills, coding and programming are rushing into education these days. Not to foster only ICT experts,

<sup>48</sup> Wikipedia, 27<sup>th</sup> Dec. 2017 [https://en.wikipedia.org/wiki/21st\\_century\\_skills](https://en.wikipedia.org/wiki/21st_century_skills).

but to supply all (young) people with a critical insight into the new technologies and devices. More and more countries are taking coding into their curricula<sup>49</sup>, down to grade 1 and even kindergarten. To this context also belongs the trend *Humans are not the only ones learning*, referring to artificial intelligence, machine learning and robots. In the future, humans will be expected to a far higher degree to interact personally with these technologies.

*Digital literacy* not only means that citizens should master the technical skills, which are necessary for them personally and professionally. Digital literacy also alludes to achieving a “Capableness for living in a digitalized world”<sup>50</sup>. This includes processes such as social interaction in Cyberspace, reason and awareness of data security and relating to new technologies as coming up. Common education is required.

The beneath lying meta-skill *Computational Thinking*<sup>51</sup> refers to several of the 21<sup>st</sup> century skills and is already integrated into education in USA and UK, and on its way in, among other countries.

Over the last two decades, teaching has become more digital, and a wide range of digital and virtual tools have been added to or replaced traditional offline tools. Also distance teaching and e-learning have become common and are now a more or less integrated parts of ordinary education, with MOOCs<sup>52</sup> as one of the latest phenomena’s. Over the years, many pedagogical experiments and projects have successfully resulted into new methods, where students collaboratively develop in virtual spaces, also in social media, and produce new digital types of learning products, such as videos, sound productions, robots, e-portfolios, animations or websites.

All in all, a huge progression, but in practice there are still many colleges and many teachers, who may have “added electricity to their teaching”, but not undertaken the final mind-shift. First during the last years, VET colleges have started working broadly and systematically with own digitalization strategies, and The European Commission's Science and Knowledge Service has first recently published a Digital Competence

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<sup>49</sup> “Computing our future - Computer programming and coding, Priorities, school curricula and initiatives across Europe”, European Schoolnet, 2015.

<sup>50</sup> Expression directly translated from Danish Ministry of Education, 5<sup>th</sup> Dec. 2017, presentation Vejle.

<sup>51</sup> Caspersen, Novak “Computational Thinking and Practice— A Generic Approach to Computing in Danish High Schools”, Proceedings of the Fifteenth Australasian Computing Education Conference (ACE2013), Adelaide, Australia, (2013).

<sup>52</sup> Massive Open Online Courses; See Coursera or Khan Academy.

Framework for Educators<sup>53</sup>. This framework allows to assess teachers' digital competences and to identify needs for empowerment.

Also the trend *From standardization to customization* influences teachers' pedagogical approaches. The industrial-era mass education "same-size fits all" with its content-based curricula is getting outdated. As a conclusion, also educational design and teachers' didactic and pedagogy must adapt to the personalized approach. This customization, combined with the many new media, forces a radical change of the teacher role. Teachers "delivering knowledge" as "experts" are not any more sufficient, not even when this is undertaken in new digitalized and exciting ways. *Personalized learning* needs facilitation and promotion of learning and innovation skills (21<sup>st</sup> century skills). Colleges must reorganize their educational programs, especially when WBL models cause that students during their program spread out to each their training company for in-the-job learning and then return to college with new (and possibly unknown) competences to build on.

This reorganization and redesign of teaching also encompasses the trend *From silos to mash-ups*. The local and global challenges, such as climate change, food necessities, water and energy security, aging societies and cultural pluralities, are increasingly complex and require interdisciplinarity. Students and skilled workers must learn to cross subjects, sections and sectors, already at school.

Finally, the trend *Transition* directly pushes RAY's goals. While formal education previously used to be a guarantee for a job, this is no longer the case today. In Europe, a quarter of youth do not make a smooth transition to work. This transition from education to job is even weaker in systems, where education providers do not engage sufficiently with employers. At the same time and in many countries, the employers themselves or their trade organizations rarely interact with education providers or policy makers, so their skill demands have a low chance of being translated into curricula.

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<sup>53</sup> "DigCompEdu framework", 27th Dec. 2017 <https://ec.europa.eu/jrc/en/digcompedu>.

### 2.3.2 Future skills or key competences

Before we think which are the future skill or key competences, we should introduce the differences between these terms and emphasize our perception of meaning.

According to the OECD definition, competency is more than just knowledge or skills. »It involves the ability to meet complex demands, by drawing on and mobilising psychosocial resources (including skills and attitudes) in a particular context. For example, the ability to communicate effectively is a competence that may draw on an individual's knowledge of language, practical IT skills and attitudes towards those with whom he or she is communicating.«<sup>54</sup>

*Skill* means ability to perform and solve problems<sup>55</sup>. Skills define specific learned activities, and they range widely in terms of complexity. Knowing which skills a person possesses helps us determine whether their training and experience has prepared them for a specific type of workplace activity. In other words, skills give us the "*what*." They tell us *what* types of abilities a person needs to perform a specific activity or job.<sup>56</sup>

*Competence* take "skills" and incorporate them into on-the-job *behaviors*. Those behaviors demonstrate the ability to perform the job requirements competently.<sup>57</sup>It is seen as the ability to apply learning outcomes adequately in a defined context (education, work, personal or professional development). A competency is not limited to cognitive elements (involving the use of theory, concepts, or tacit knowledge); it also encompasses functional aspects (involving technical skills) as well as interpersonal attributes (e.g., social or organizational skills) and ethical values. A competency is therefore a broader concept that may actually comprise skills (as well as attitudes, knowledge, etc.)<sup>58</sup>

According to the introduced definition, thinking *what* types of abilities students need to perform a specific activity or job is or should be core of school focus and implemented in the way, how teachers are organising the lessons, what they support with students, how

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<sup>54</sup>OECD, 2003, p. 4.

<sup>55</sup><https://resources.hrsg.ca/blog/what-s-the-difference-between-skills-and-competencies>.

<sup>56</sup>The European Commission's Cedefop glossary (Cedefop, 2014).

<sup>57</sup><https://resources.hrsg.ca/blog/what-s-the-difference-between-skills-and-competencies>.

<sup>58</sup>The European Commission's Cedefop glossary (Cedefop, 2014).

they cooperate, what kind of didactical methods they use. And what is also important that school, pedagogical staff are following the trends of modern labor market, which shows that prediction about the skills are changing (see below<sup>59</sup>).



## Top 10 skills

### in 2020

1. Complex Problem Solving
2. Critical Thinking
3. Creativity
4. People Management
5. Coordinating with Others
6. Emotional Intelligence
7. Judgment and Decision Making
8. Service Orientation
9. Negotiation
10. Cognitive Flexibility

### in 2015

1. Complex Problem Solving
2. Coordinating with Others
3. People Management
4. Critical Thinking
5. Negotiation
6. Quality Control
7. Service Orientation
8. Judgment and Decision Making
9. Active Listening
10. Creativity



Source: Future of Jobs Report, World Economic Forum

As is shown, in five years, over one-third of skills (35%) that are considered important in today's workforce will have changed.

By 2020, the Fourth Industrial Revolution will have brought us advanced robotics and autonomous transport, artificial intelligence and machine learning, advanced materials, biotechnology and genomics. These developments will transform the way we live, and the way we work. Some jobs will disappear, others will grow and jobs that don't even exist today will become commonplace. What is certain is that the future workforce will need to align its skill set to keep pace. And as it is pointed up, the creativity (we will talk about it in next paragraph) will become one of the top three skills workers will need.

<sup>59</sup> World economic forum, The 10 skills you need to thrive in the Fourth Industrial Revolution. Retrieved from: <https://www.weforum.org/agenda/2016/01/the-10-skills-you-need-to-thrive-in-the-fourth-industrial-revolution/>.

With the avalanche of new products, new technologies and new ways of working, workers are going to have to become more creative in order to benefit from these changes.

And the other also important difference is that new skill – emotional intelligence is predicted to be on the list in 2020 while active listening as separated and considered as a core skill today, suppose to disappear completely from the top 10.

Is school ready to develop or support students to recognize their own emotions and those of others discern between different feelings and label them appropriately, use emotional information to guide thinking and behaviour, and manage and/or adjust emotions to adapt to environments or achieve one's goal(s). Do teacher give students opportunities to develop their own minds, to solve the problems with lateral (divergent) instead of (convergent) linear thinking<sup>60</sup>, which support creativity, complex problem solving and critical thinking?

According to the answers from our questionnaire (see first deliverable), we can see that Slovenian student miss opportunities to participate, to develop their own ideas in school process and also on job training and we also see that companies are answering that student should develop more soft skills.

And if we think further with the connection to competences which include more than what and know how, but also use of theory, silent knowledge, functional aspect using technical skills; also interpersonal features or social and organizational skills and values, it is urged to provide students with different experiences through which they can practice, test different knowledge, get to know each other in different situations, learn about what important them and for others, for the environment in which they work and thus develop values and have possibility to grow.

As is written in *21st Century Competencies*<sup>61</sup> that competencies are associated with growth in the cognitive, interpersonal, and intrapersonal domains. Traditionally, cognitive competencies in critical thinking, analysis, and problem solving have been regarded as key indicators for success. However, changing economic, technological, and social contexts in the 21st century mean that interpersonal and intrapersonal

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<sup>60</sup>De Bono, E. (2006). *Lateralno razmišljanje*, New Moment: Ljubljana.

<sup>61</sup>*21st Century Competencies*. Ontario Publish Service. 2016  
[http://www.edugains.ca/resources21CL/About21stCentury/21CL\\_21stCenturyCompetencies.pdf](http://www.edugains.ca/resources21CL/About21stCentury/21CL_21stCenturyCompetencies.pdf)

competencies have become much more important than in the past. Pellegrino and Hilton<sup>62</sup> (p. 55) cite evidence that “people skills” are “an important determinant of occupations and wages”, concluding that young people’s social skills affect their job prospects in adulthood. Studies in health and well-being have found that characteristics such as perseverance, grit, and tenacity are sometimes a more accurate predictor of success than IQ scores. For example, among intrapersonal competencies, the characteristic of conscientiousness (a tendency to be organized, responsible, and hardworking) is “most highly correlated with desirable educational, career, and health outcomes” (Pellegrino & Hilton, p. 4–5).

Intrapersonal competencies such as perseverance, grit, tenacity, and a growth mindset have a strong relationship with an individual’s capacity to overcome challenges and achieve long-term success. According to Tough’s<sup>63</sup> research on how children succeed, helping children at a young age to learn how to manage failure (in “child-sized adversity”) is important to building the self-confidence, self-regulation skills, sense of efficacy, and resilience that enable children to persist and overcome challenging circumstances. Research in the areas of innovation, entrepreneurship, and leadership also notes the importance of cultivating workforce capacities for risk-taking, perseverance, and managing for failure. Research is under way to improve our understanding of how learning environments can more effectively support the development of competencies in the intrapersonal domain. Motivation and emotion play a central role in the development of intrapersonal competencies, and are also recognized as important determinants of thinking and learning. An understanding of the factors that influence motivation and emotion is therefore essential to providing a learning environment that promotes student success. An OECD report found that “students’ learning goals and goals in life, their thoughts about their own competence . . . their attributions of academic success or failure on various potential causes, and their interests and hobbies all contribute to the complex interplay of cognition and motivation” (Schneider & Stern, 2010, p. 82). Research by Professor Carol Dweck (2010) shows that “students’ mind-sets have a direct influence on their grades and that teaching

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<sup>62</sup>Pellegrino, J.W., & Hilton, M.L. (2012). *Education for life and work: Developing transferable knowledge and skills in the 21st century*. National Research Council. Committee on Defining Deeper Learning and 21st Century Skills, Board on Testing and Assessment and Board on Science Education, Division of Behavioral and Social Sciences and Education. Washington: The National Academies Press.

<sup>63</sup>See in *21st Century Competencies*. Ontario Publish Service. 2016, p. 14, 15.

students to have a growth mind-set raises their grades and achievement test scores significantly” (p. 26). Understanding the growth mindset is key to addressing the needs of the whole child. Stepping Stones, Ontario’s resource on positive youth development (Ontario Ministry of Children and Youth Services, 2012), highlights the interrelated and interdependent nature of human development through the cognitive, emotional, social, and physical domains. These domains are affected by the environment or context in which the student lives, and all reflect the core sense of self/spirit.

The competences<sup>64</sup> that involve upper list skills and are important to be supported and developed also through WBL model are:

- *Competencies in the intrapersonal domain*

This competence contribute significantly to students’ well-being, character development, and success. Motivation and emotion play a central role in the development of intrapersonal competencies, and are also recognized as important determinants of thinking and learning. An understanding of the factors that influence motivation and emotion is therefore essential to providing a learning environment that promotes student success.

- *Competencies associated with metacognition and a growth*

This competence includes awareness of one’s learning process and needs, identifying available opportunities, and the ability to overcome obstacles in order to learn successfully. This competence means gaining, processing and assimilating new knowledge and skills as well as seeking and making use of guidance. Learning to learn engages learners to build on prior learning and life experiences in order to use and apply knowledge and skills in a variety of contexts: at home, at work, in education and training.

- *Competencies related to local, global, and digital citizenship*

This competence enhance individuals’ ability to respond constructively in changing or challenging circumstances. The important role here has Technology which changing the shape of civic education and allows an individual to become the “agent” rather than merely the “recipient” of or “participant” in knowledge, democracy, and civic action.

- *Competencies associated with creativity and innovation*

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<sup>64</sup>See there, p. 64

This competence is important elements in entrepreneurial activity. The European Commission included a “sense of initiative and entrepreneurship” in its recommended key competencies. In this framework, “entrepreneurship” refers to: an individual’s ability to turn ideas into action. It includes creativity, innovation and risk-taking, as well as the ability to plan and manage projects in order to achieve objectives. This supports individuals, not only in their everyday lives at home and in society, but also in the workplace in being aware of the context of their work and being able to seize opportunities and is a foundation for more specific skills and knowledge needed by those establishing or contributing to social or commercial activity. This should include awareness of ethical values and promote good governance.<sup>65</sup>

An entrepreneurial mindset requires not only entrepreneurial skills developed by formal education but also a culture in which real-world organizations welcome entrepreneurship and change and a culture of lifelong learning. It is important for educational institutions, in particular, to model this welcoming of entrepreneurship by both students and educators.

### **2.3.3 Creativity**

Many studies demonstrate the importance of creativity for social development, the ability to compete in business, and the ability to generate economic growth. PISA 2012 results<sup>66</sup> note the connection between high academic achievement, problem solving, and creativity. Creativity is often described as the pursuit of new ideas, concepts, or products that meet a need in the world. Innovation contains elements of creativity and is often described as the realization of a new idea in order to make a useful contribution to a particular field.

Supporting the creativity in schools means giving student’s experiences with situations in which there is no known answer, where there are multiple solutions, where the

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<sup>65</sup>European Commission, Directorate-General for Education and Culture, European Reference Framework. (2007). *Key competences for lifelong learning – a European framework*, p.11. Luxembourg: Office for Official Publications of the European Communities. Retrieved from: <file:///C:/Users/Petra/Downloads/YiA%20Key%20Competences%20for%20Lifelong%20Learning%20-%20European%20Reference%20Framework.pdf>.

<sup>66</sup>OECD (Organisation for Economic Co-operation and Development). (2014a). Beyond PISA 2015: A longer-term strategy of PISA. Retrieved April 13, 2015 from: [www.oecd.org/pisa/pisaproducts/Longer-term-strategy-of-PISA.pdf](http://www.oecd.org/pisa/pisaproducts/Longer-term-strategy-of-PISA.pdf).

tension of ambiguity is appreciated as fertile ground, and where imagination is honoured over rote knowledge.

As Ken Robinson<sup>67</sup> is pointing out “If you are not to be wrong, you can never find something new interesting”. And what he is recognizing in our school systems is that we are educated out of creativity where the winners are the ones who know how to use cognition, who 'live in their head' and who are disembodied with real life situations.

Paul Collar<sup>68</sup> is talking about 4 Pillars of education where first pillar is learn to know, second pillar is learn to do, third pillar is learn to be, and fourth pillar is learn to live together. He is also saying that nowadays school is mostly supporting first pillar, less second and almost no third and fourth pillar which are on his opinion and as we saw also from above mentioned documents (21st Century Competencies, Education for life and work etc.) very, even most important.

What P. Collar is saying is that developing creativity is something that fills the gap that drops out between these four pillars. Supporting creativity is connected with developing *inquisitiveness* (wondering and questioning, exploring and investigating, challenging and assumptions), *persistence* (tolerating uncertainty, sticking with difficulty, doing to be different), *imaginativeness* (playing with different possibilities, making connections, using intuitions), *discipline* (creation and improving, developing techniques, reflecting critically) and *collaboration* (cooperating appropriately, giving and receiving feedback, sharing the product).

These are all properties that are connected with key skills and competences and which employees want to be developed with young's as future working force. As P. Collar is saying, we do not know what are future jobs because 60% of them does not really exist yet, but we know that we need job creators, not job seekers and creativity includes concepts of “economic and social entrepreneurialism . . . and leadership for action”<sup>69</sup>.

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<sup>67</sup> Robinson, K. (2006). *Schools kill creativity*. Retrieved from: [https://www.ted.com/talks/ken\\_robinson\\_says\\_schools\\_kill\\_creativity?language=sl](https://www.ted.com/talks/ken_robinson_says_schools_kill_creativity?language=sl).

<sup>68</sup>P. Collar (2017). *What is creativity and why is it important?* Retrieved from: <https://www.youtube.com/watch?v=UCOjnFbjyHs>.

<sup>69</sup> Fullan, M. (2013). Great to excellent: Launching the next stage of Ontario's education agenda. In *21st Century Competencies*. Ontario Publish Service. 2016, p. 13.

### 2.3.4 Teacher role and role of students

So, what we can sum up from 21st Century Competencies Discussion Document is that students need to engage in “deeper learning” – or learning that allows students to take what is learned in one situation and apply it to new situations. Deeper learning involves the interplay of the cognitive (thinking/reasoning), intrapersonal (behaviour/emotions), and interpersonal (communication/collaboration). Through the process of deeper learning, students develop 21<sup>st</sup> century competencies, which can be defined as knowledge and skills that are transferable. And Educators play an important role in providing the context for deeper learning, which is supported through new teaching practices that include the following elements<sup>70</sup> (Fullan & Langworthy, 2014):

- The creation and use of new knowledge in the real world.
- Learning partnerships between and among students and teachers that focus on the process of learning.
- Access to digital tools and resources both inside and outside of school.

Technology is playing more of a role in society as well as in the classroom and can be a powerful tool in enabling deeper learning. However, technology is only effective when used to provide access to richer content, develop stronger teaching practices, make links between classrooms and life, and enable assessments that align with new teaching practices.

P. Collar<sup>71</sup> (2017) is suggesting that the most important thing to develop deeper learning and encourage creativity is through so called “highly productive classroom”. He defined it through eleven attributes:

- role of the teacher;
- nature of activities;
- organisation of time;
- organisation of space;
- approaches to tasks;
- visibility of the process;

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<sup>70</sup>Fullan, M., & Langworthy, M. (2014). A rich seam: How new pedagogies find deep learning in *21th Century Competencies*, p. 32 and 55.

<sup>71</sup>P. Collar (2017). *What is creativy and why is important?* Retrieved from: <https://www.youtube.com/watch?v=UCOjnFbjyHs>.

- location of activities;
- self as learning resource;
- inclusiveness;
- role of learner;
- reflection.

He point out that teacher in highly productive classroom need to be as to tutor whose role is more to give challenge to students that to guide them and gives them right answer. Activities should be exercise in authentic environment (theory observed and exercised in real environment). Time in the class should be more flexible and should follow the need of the process, place should be organised as workshops where student can collaborate, exchange the ideas, thing and do together. So also approaches to takes are common, in a group instead of individual.

What is also important is that there should be high visibility of the process – so that student through process see and learn step by step how to come to the final product. And that student see themselves as important part of learning resource (they develop ideas, research, teach also teacher, innovate...) and their role is more self managing that directed by teacher. And last attribute which on our opinion is very important and is often lost in the process is continuous reflection – what is going on, what does student have from some activity, what can we do different...

And if we thing this also in the manner of WBL, also there we should aware of these attributions and try to implement them in the process of learning. As P. Collar conclude: High functioning is depend on how much are we physically engaged, socially engaged, emotionally engaged and intellectually engaged. This is also parallel to definition that Gardner and other<sup>72</sup> develop through longitudinal study about Good work: it is excellent, ethical and committed.

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<sup>72</sup>Gardner, H., Csikszentmihalyi, M., Damon, W. (2002). *Good Work: When Excellence and Ethics Meet*. New York: Basic Book.

## 3 Best practices collection

### 3.1 Choosing the best practices

According to the theoretical review and review from needs and demands from the questionnaire (next chapter) we collected some cases of good practice that has been already implemented on different levels (teacher education, teachers and company cooperation, actively involved student in the process of learning, innovative way of learning etc.). The purpose of collected practices is to see what is already happening on the field of vocational education on the level of cooperation and get some ideas for developing new WBL/APP model.

The good practices are presented from CPI, SC Nova Gorica, Company Mahle (dodali bomo še en Finski primer, a še nimam dovolj inf.) and two foreign practices.

### 3.2 Description of chosen practices

#### 3.2.1 Good cases from CPI

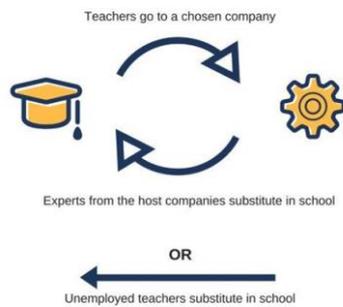
##### *Case1: Improving the vocational competences of teachers<sup>73</sup>*

“Improving the vocational competences of teachers« is a programme to provide training directly within the work process for teachers of professional modules and other professional staff from secondary vocational and technical schools, and in this way help refresh their knowledge, skills and competences and increase the quality of the pedagogical process in vocational education and training.

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<sup>73</sup>Available on:

[http://www.mizs.gov.si/fileadmin/mizs.gov.si/pageuploads/podrocje/vs/Gradiva\\_ESS/DPKU/DPKU\\_Porocilo.pdf](http://www.mizs.gov.si/fileadmin/mizs.gov.si/pageuploads/podrocje/vs/Gradiva_ESS/DPKU/DPKU_Porocilo.pdf).



The competence and skill levels of education providers are of key importance in ensuring the quality of education. It is therefore important that teachers constantly build on, supplement and update their knowledge. In the context of vocational education this not only means pedagogical knowledge but also knowledge within a specific professional field. Training in a real working environment is an opportunity that enables them to keep pace more easily with the development of technology and other changes in their professional field. This enables them to respond more quickly to the needs of the labour market and adapt their teaching accordingly. The advantages of this form of connection are also clear to the companies that accept teachers for training, since teachers are able to transmit new developments in their professional field directly to students, who on completion of their education will enter the labour market with the knowledge and skills that employers expect. In the 2014/15 academic year, the Institute of the Republic of Slovenia for Vocational Education and Training (CPI) ran the pilot programme „Improving the vocational competences of teachers“, which was designed to provide training directly within the work process for teachers of professional modules and other professional staff from secondary vocational and technical schools, and in this way help refresh their knowledge, skills and competences and increase the quality of the pedagogical process. The programme was implemented within the context of the Operational Programme for Human Resources Development 2007–2013. Funding was provided by the European Social Fund and the Ministry of Education, Science and Sport. The programme was based on a form of job rotation. Teachers of professional modules and organisers of practical on-the-job training spent a concentrated two-month period of training at a chosen company, updating their knowledge in a practical context and supplementing it with new trends, technologies and methods of work. During training

they were substituted at their schools by suitably qualified and trained experts from the host companies or by previously unemployed persons.

The programme consisted of two main activities, to which the results of the programme were tied:

1. Public call to secondary vocational and technical schools to participate in the programme.

In the second half of September 2014 secondary vocational and technical schools were invited, via a public call, to participate in the „Improving the vocational competences of teachers“ programme and prepare proposals for job rotation programmes. An information day was also held for schools that expressed an interest in taking part. A single public institution or organisational unit thereof was entitled to submit a maximum of two applications for funding. The public call attracted responses from 20 schools, with 27 applications to implement job rotation programmes. The schools selected the host company to which they planned to send their teachers, and also the method of substitution.

1. Job rotation

Over the course of a four-month period (1 November 2014 to 31 March 2015), 27 job rotations were carried out, involving 54 individuals: the 27 teachers/professional staff who underwent training and the 27 people who substituted them – 19 unemployed persons and 8 experts from a host company. The programme involved the cooperation of 26 different companies, which accepted teachers or other professional staff for training. The staff from schools were incorporated into the companies' regular work process and in the majority of cases were inducted and monitored by mentors. Some companies played a dual role, since as well as providing in-company mentoring they also provided substitute staff at a school. On completion of the training, the job rotation participants wrote a training report containing a description of the tasks they had carried out, an assessment of implementation and an assessment of the achievement of the objectives set. Once the job rotations were complete, we at the CPI carried out an evaluation in order to arrive at an overall assessment of the „Improving the vocational competence of teachers“ programme. This evaluation included all participating stakeholders: school managements, the teachers/professional staff who took part in training, the host companies and the people who substituted staff at the schools. The

results of the programme confirmed the fundamental hypothesis of the evaluation, namely that teachers at vocational and technical schools need and want more opportunities for professional training. The findings of the evaluation and the reports of participants show that all stakeholders rate the programme positively and would like activities of this kind to continue in the future. The key priorities identified by teachers are the acquisition of new knowledge, the exchange of experiences and the establishing of direct contacts between the school and the business enterprise sector. The opinions of the participating companies are also very positive. They underlined the mutual benefits for both the school and the employer, the good opportunity to exchange practical knowledge between companies and schools, and the opportunity to deal with real-world issues. The great majority of respondents would participate in a programme again (including for a longer period) and in the light of their positive experiences would recommend it to others. Most of the schools that did not respond to the public call indicated that the programme appeared to be well designed and that they would have taken part in it if they had been given more time to apply. In the course of ongoing communication with school managements, contact persons and coordinators, and during the evaluation itself, we received a large number of good solutions and proposals that will serve us as a guide when planning in-company teacher training programmes of this type in future years. In particular it will be necessary to consider the suitability of the publication dates of the public call and the period of implementation of the programme. We will also need to think about more flexible forms of training, substitution possibilities and a number of other issues. We consider that the „Improving the vocational competences of teachers“ programme has achieved its purpose and the objectives set. We are particularly encouraged by the fact that schools and teachers have recognised the opportunity and advantages offered by this form of job rotation, and have expressed their need for training with the work process. It is also encouraging to note that support for programmes of this type from the Ministry of Education, Science and Sport will also be guaranteed in the future.

## **Case 2: SEE THE GOAL**

### **Description**

In recent years, apprenticeship has become recognized as a very valuable element of vocational education and training (VET), as it strengthens cooperation between schools and companies and links labor market with educational system. Apprenticeship equips students with relevant labor market skills and competencies, significantly lowers youth unemployment and costs for new employment. Although making education more efficient and relevant to the labor market needs is obviously a part of the solution, VET is falling short of this goal in many EU countries. This occurs even in the countries where work-based learning (WBL) is a mandatory part of VET. Besides the high youth unemployment (December 2015: EU 19,7%, SI 15%, DK 10,3%, PT 31%, FI 22,1%) for instance in Slovenia industry, craft and trade sectors constantly complain that VET schools do not provide sufficiently qualified graduates ready to work in the companies. Upper secondary VET programs have also poor reputation and majority of students that are academically successful choose not to enroll.

Countries with previously mainly school-based VET are striving to implement or expand in-company WBL (SI, PT), and countries with a well-established dual system (DK, FI) work ambitiously on quality improvements to strengthen competitiveness of their economies. Therefore, the quality of WBL is one of the key challenges and one of the steps forward is to design and assess in-company learning outcomes better. These outcomes are the competencies students should achieve during their WBL training. Learning outcomes are - or should be - quality keys for the interaction between VET college, training company and student or apprentice, if they are in line with the competencies to be achieved in formal VET.

The descriptions of the formal learning outcomes prepared by the country authorities vary and typically, the learning outcomes are included in regulations or guidelines. There are differences between the trades, different interpretations and local variations in each country. In Slovenia evaluations showed (see Annex3, Literature), that in-company learning outcomes are usually either not defined at all, not properly defined, or in-company mentors and students do not read and follow them.

Thus, there is a general need to or define in-company learning outcomes and/or make them more transparent and to create examples of good practice. This is goes for both

type of countries, with a well-established dual system and countries in the process of implementing in-company training periods into formal VET programs. A welcome approach to address the challenge of setting clear and company-tailored learning outcomes in the digital era is - the video!

Transparent learning outcomes can assure an efficient design and implementation of the students' educational plans, ease the assessment of WBL and support transnational mobility activities for all involved parties. Video presentations of in-company learning outcomes was developed as an innovative method, which will be tested in a line with the EQAVET Guidelines for quality assurance. See-the-goal project will therefore implement this Guidelines, particularly its Building Blocks:

- Design: define in-company learning outcomes,
- Communicate: improve communication between student, mentor and teacher,
- Assess: review the WBL and assess learner's achievement,
- Train: video as learning and teaching material.

Video will improve effectiveness of the student's skills and competencies presentation to potential employers during the job search. This will be especially suitable for students inexperienced in how to present their competencies properly and will support the students with visual learning style.

Besides improving transparency of learning outcomes, making them sustainable and easily accessible via interactive online applications, we also want to support the promotion of WBL in VET, which is especially important in countries with traditionally school-based VET system (SI, PT).

Digital revolution offers VET student access to free, open and high-quality educational resources, and offers VET teachers an opportunity to use new learning channels as well. According to the national evaluations, the level of digitalization e.g. in Slovenia has been falling behind for the past 15 years. In 2016 the national strategy for digital development was signed (Digital Slovenia 2020), defining priorities and goals for various areas, including education. The need for open and innovative education is also detected on EU level (Opening up Education), particularly in Finland and Denmark. By developing free video based learning and teaching materials in the See-the-goal project, we would like to encourage schools to include digital content and Open educational resources, in the recommended educational materials for VET students and apprentices.

### *Cooperation*

ŠC Celje decided to make videos in a company, where their students practice WBL. In a first phase CPI, ŠC Celje and company agreed on learning outcomes for prepared videos. They also discussed it with students. Teachers, students and in-company mentors prepared a detailed plan for making a video, and then in the afternoon, when company does not work anymore, they were making videos, using their equipment. As a result, there were seven videos, filmed in company in cooperation with teachers from school, students and in-company mentors.

### *Expected impact on target groups*

The intended project results and outputs will illustrate learning outcomes and thus enable the companies to understand them better. At the same time, they will ensure a far smoother interaction between the employer and VET school. Students will use videos for self-assessment.

b) The videos will become a part of teacher and trainer education, preferably in virtual training arenas (such as MOOCs, freely accessible virtual resources from social partners, steering bodies, publishing companies, etc.).

c) To support the training of company trainers for planning and monitoring work of students in companies. To support the individual learners in the self-directed learning during in-company training using the virtual channels for learning and for teaching to promote the quality and attractiveness of in-company training.

d) The involved training companies will be able to identify their students' learning outcomes with the taxonomies in the set of videos. The involved trainers will be able to apply the videos for introduction and feedback to students.

e) These target groups are the primary users of in-company learning outcomes and will benefit directly from the new method, in form of performing more transparent training and facilitating more targeted learning processes.

### **3.2.2 Good practice from School center Nova Gorica**

#### ***Case 1: Collaboration with Mahle Company***

The good practice of School centre Nova Gorica is definitely the collaboration with Mahle, which is the biggest employer of our students in our region. The collaboration has already a long tradition but in the best way, it has been developed mostly in the last three years. Four years ago, Letrika was bought by German automotive industry Mahle. Both parts, Slovenian and German are actively involved in the collaboration, especially it is strongly supported by the German leadership. The collaboration started quite spontaneously, on the occasion of one very important SCNG international event, when the SCNG leadership met Mahle German leadership. It was in the frame of non-formal socializing, November 2014. Mahle and SCNG both expressed strong interest for mutual collaboration. The German leadership made two additional visits to our centre, followed by the visits of Slovenian Mahle leadership. We decided together that we want to put our collaboration on a higher level and put it in the legal form, the memorandum of understanding that was signed in January 2016. In the memorandum we defined the general goal of collaboration:

“It aims to establish a reliable and sustainable education partnership to support MAHLE with qualified, creative and skilled employees in order to secure the company’s future by achieving high level of sustainable growth and to support innovations by taking full advantage of the skills and talents of future employees.”

And main themes of interests, which may be upgraded anytime:

- Education and practical training for students (VET students and short cycle higher education students) based on apprenticeships and work-based learning which highlights the following benefits:
  - Combine study and work, allowing individuals to acquire work experience while improving their skills in close alignment with the employers’ requirements.
  - Help to reduce skills mismatch by being responsive to labour market changes.
  - Offer a stepping stone into the labour market; apprentices receive a recognized qualification for an occupation, valid across workplaces and certifying possession of a full set of competences to perform their job.

- May result in a job offer from the company where the training was completed.
- Trainings for MAHLE aftermarket staff and end users including promotion of MAHLE products and services.
  - Training for MAHLE employees based on MAHLE products, services, trends and needs.
  - Establishing and equipping learning platforms and laboratories for successful training and education on the agreed sectors.

After signing the Memorandum, the activities started to implement and new ones were initiated by all possible sides: students, teachers, members of the leadership (school/business), HR staff, company experts, due to promotion of Memorandum at all level at schools of SCNG at departments of Mahle. Here are some implemented activities in the last two years:

- simplification of administrative support for WBL process
- networking and exchanging experiences on WBL between Mahle HR staff and VET teachers
- introducing annual WBL process evaluation
- working on improvements of WBL contents: enable students developing his/her own potential
- introducing annual networking meetings for students, in-company trainers, HR staff, VET teachers
- workshops on automobile industry development & innovation for students, VET teachers, regional car mechanic workshops
- implementing individual professional classes in Mahle company by Mahle experts
- international mobility/on the job training for students in Mahle Germany
- professional training for VET teachers by Mahle experts in Mahle Slovenia and Germany
- real, work related and innovative projects based on Mahle products and services for students, involving teacher tutors and in-company trainers
- networking meetings “Future of the work”
- sponsorship of technological equipment and learning materials

- trainings for Mahle employees
- evaluating skills needs of Mahle employees, developing tailor made trainings
- other networking events (also Mahle and ŠCNG leadership).

The activities are being constantly upgraded according to both-sided needs and interests.

In which direction we are moving together or which are our common milestones:

- teamwork in real, demand driven projects
- developing new, innovative work-based learning models, as well as educational models in general
- students' interests, needs, potentials; labor market demands; future trends; stimulating innovation, interdisciplinarity; creativity, team work.

### ***Case 2:UIL- the interdisciplinary lab***

**UIL-** the interdisciplinary lab for innovative, work related and demand driven projects, implemented in teamwork, supported by tutors and digital tools.

The project was built upon the initiative suggested by our students and a group of companies in the field of renewable resources of energy. The students wanted to work on interesting projects where they could test their theoretical knowledge in practice and work with company experts. At the same time similar suggestion came by the companies, where the background was a little bit different – to develop together with the educational institutions talented future working force who is the driving force of the industry and economy, at all. Somehow the idea was merged together and the interest for collaboration was strongly expressed also by the teachers to be involved.

How does it work?

- the idea for the project can be initiated by the student, company or the VET teacher (e.g. to develop an app that will control the availability of the food in the fridge)
- the implementation of the project must be tutored (teacher or company tutor)
- it must be done in the teamwork- the student is stimulated to look for teammates
- for the project implementation it is used the digital platform (platform is at the moment in the phase of finalization)

- it is not important that the project is implemented successfully with the product or service realization; important is that the student gets the experience, although unsuccessful experience-any experience is welcome; we try to imitate life experiences which are not always easy or with a happy ending, to prepared the students for the real-life situations.
- The lab is included in the network of national similar labs which are slowly being established in the last year and will continue. In one-year time we are going to be included in the international network, as well. The students will be able to collaborate with team mates on similar projects all around the world via digital platform.
- At the moment they are working on the model of sustainability and integration of such project work into the curricula. But the point is to offer the students, teachers and companies such possibilities that must be built on each person own motivation that is not necessarily in the frame of the curricula, but anytime out of school time. Butthey would like that kind of work done by students to be valued and recognized as their skills, knowledge etc.

In both cases they've created the network<sup>74</sup> where all the time something is happening and does not depend on fixed time or place, activities, but on initiatives and motivations which are happening all the time.

### 3.2.3 Choosing good practice from company Mahle

#### Case 1:

One company (Danfoss Trata) prepared a competition. Students gathered into groups and applied for competition. At the beginning, someone from the company explained, what kind of product they need and what they want and expect from the students and

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<sup>74</sup>School comment that “networking represents: people, information, knowledge skills, experience. In many educational systems they stimulate networking as one of the key processes in gaining knowledge and personal development. Just imagine, you build a network of people and suddenly your network counts over 100 people. These people are workers, managers, young, adult, pensioners, public sector workers, welders etc. All together they represent enormous collection of knowledge, skills, expertise, experiences, insights, opinions – a huge data collection. Huge network for exchanging big data collection. One of those people could be your future boss, worker, co-worker etc.”

then they gave the students 2 or 3 months to work on the assignment. At the end, the group that had the best outcome, got a financial award.

*Case 2:*

“Creative way to knowledge” is a program that enhances cooperation between faculties and companies. The state provides financial funds (through a public tender) for few projects, that last from 3 to 5 months and demand the cooperation of students (they work in groups) and mentors in the company and at the faculty. The purpose of this public tender is to use innovative, problematic and common approach to solving practical problems to support students in the development of competences and acquirement of practical knowledge and experiences, by collaborating in projects that are implemented in the partnership of higher education institutions with the economy. With the help of mentors from the educational and economic sphere, students can develop innovative, creative thinking and other competences in the framework of project activities (which will be carried out as a complement to the regular learning process) that will enable students to transit more easily from education to employment.

*Case 3:*

Public scholarship, development, disability and alimony fund of the Republic of Slovenia co-finances the projects for companies or individual entrepreneurs. The projects are carried out by students under the mentorship of a work mentor (expert from a company or individual entrepreneur) and a pedagogical mentor (higher education teacher or assistant with a doctorate). The project must include at least 3 and maximum 10 students of higher education and the participation of one company. The project should involve the participation of one pedagogical and one work mentor- In addition, a work mentor from organizations from the economic or social field can also cooperate in the project.

The public tender offers the direct participation of undergraduate students and post-graduate students of higher education, higher education institutions and the economy.

### **3.2.4 Choosing good practices in Europe**

*Case 1: The ETHAZI model*

The project could (and should) benefit from the lessons learned of other VET actors in the EU. As a model of example, we can refer to the ETHAZI model<sup>[1]</sup>, a **pilot project** in the 2013/2014 academic year in 5 vocational training centres in the **Basque Country** (Spain), involving 100 students and 25 teachers from 5 different cycles.

The ETHAZI learning model is articulated on the so-called **collaborative learning based on challenges**. In general, the characteristics of the module include the following elements:

- **Intermodularity:** Challenges should be as close as possible to the situations of performance in the work reality of each training cycle.
- **Self-managed cycle teaching teams:** Promoting teamwork and responsibility from the teaching team, through a high degree of self-management, adjustment of schedules, the use of spaces, guards and substitutions, etc.
- **Evaluation based on competency development:** The evaluation is integrated as a key element in the students' own learning process, providing frequent feedback on their acquisition of the required professional competences.
- **Adaptation of learning spaces:** new methodologies require different classrooms, equipment, furniture and specific spaces. Their design should address the need of flexible, open and interconnected spaces that foster environmental situations that favour active-collaborative work.

The Tknika centre<sup>75</sup> offers an array of pedagogical tools available in e-platforms (e-blackboards, e-Moodles), the use of a skills evolution tool, the development of self-management skills, the creation of innovative learning spaces, the use of collaborative and active learning methods, etc.

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<sup>75</sup> More info at: <https://www.tknika.eus/en/materials/>

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