COMPENDIUM
OF SCIENTIFIC LITERATURE ON COMPETENCE DEVELOPMENT AND ASSESSMENT

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Erasmus+ Project
COMPASS – In Support of Students' Competence Assessment
Project No. 2023-1-LT01-KA220-SCH-000156521

Thanks to all partners for their precious contributions:
Šiuolaikinių didaktikų centras, LT (project coordinator)
Mokyklų tobulinimo centras, LT
Asociatia Lectura si Scrierea pentru Dezvoltarea Gandirii Critice Romania, RO
Innoline Oy, FI

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Icons Wanicon on Freepick
Cover photo Freepick

April 2024

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Introduction: about this document

This Compendium of scientific literature is prepared for general education teachers to help them better understand the importance of developing and assessing competences in daily school life. Since the term "competence" is itself a confusing one, with several similar meanings, we first attempt to give a clear answer to what is meant by "competence", "competence development" and what are its components. We also provide evidence and arguments for the need for competence development. Finally, we discuss possible ways of assessing competences and the evidence of their effectiveness.

In this publication, we do not attempt to discuss all possible scientific approaches to the development and assessment of competences, but rather to present a synthesis of scientific approaches to these issues.

This Compendium, together with another document – an analysis of relevant educational documents will serve as a support material for teachers trying out the competence assessment model, we are developing within the partnership.

This Compendium was developed with the contribution of four organizations from three European countries: two Lithuanian non-governmental organizations, "Modern Didactics Center" and "School Improvement Center", one Romanian non-governmental organization "Romanian Reading and Writing for Critical Thinking Association" and consultancy company "Innoline" from Finland.

How is the concept of competence defined?

What is the origin of the word?

Competence comes from the Latin word "competentia", which literally means "to go and ask, seek or request together". It has two main meanings: 1) the quality or state of having sufficient knowledge, judgement, skill, or strength for a particular duty or in a particular respect; 2) a sufficiency of means for the necessities and conveniences of life[1]. This multi-layered definition of the word calls for a closer look at what competence is and what its content/structure is. We should point out that the term "competence" tends to be used interchangeably with "competency".

How does science explain it?

The way in which competences are understood and analysed depends on the approach taken to this concept. J. Kubova-Semaka[2] distinguishes seven approaches to competences:

1. The behavioural or personal competence approach, where a person's abilities are linked to perfection of performing complex work activities.

2. The functional competence approach, linking specific skills to defined workplace requirements.

3. The cognitive competence approach, when discussing a person's potential to perform tasks in ideal circumstances.

4. The competence as realised and/or developed capability approach, taking into account a person's capability to cope with problems and achieve goals.

5. The situated or constructivist competence approach, focusing on the ability to perform tasks according to the environment or context.

6. The values-based competence approach, which highlights the importance of values in the acquisition, realisation, and development of competences.

7. The organizational competence approach, where the focus is on the performance of activities in the context of the organisation.

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[1] Competence. (n. d.). In *Merriam-Webster Dictionary.* https://www.merriam-webster.com/dictionary/competence
[2] Kubova-Semaka, J. (2020). An Integral Approach to the Meaning of Competence. *Vilnius University Open Series, 3*, 120–135. doi:10.15388/SRE.2020.11

The scientific literature offers different, sometimes even contradictory, definitions of competence. In their meta-analysis, T. J. Kennedy and C. W. Sundberg[1] emphasise that there is no shared understanding of the definition of the term. Still, there are various definitions stemming from multiple sources, including international organisations, national policies, and academic research, each proposing diverse approaches to integrate various competences into educational curricula and assessment practices. For example, competence is defined as:

1 A set of personal characteristics (e.g., skills, knowledge, attitudes) that an individual possesses or needs to acquire, in order to perform an activity within a specific context, performance may range from the basic level of proficiency to the highest levels of excellence[2].

2 A complex of attributes (knowledge, attitude, values, and abilities) necessary for the interpretation and performance of tasks in specific situations, having in mind the context; incorporating ethics and values as fundamental elements[3].

3 Aptitude to confront efficiently analogous situations, mobilising consciously, pertinently, and creatively multiple cognitive resources: knowledge, ability, values, attitude, evaluation, and reasoning schemes[4].

4 The set of resources (knowledge and skills) that a person needs to have available to effectively engage in a specialised context, and, in general, to pursue one's own personal and professional advancement[5].

5 Overall, effective performance in various activities, which can range from basic mastery to the highest level of mastery[6].

6 The ability of an individual to cope with challenges in different contexts by mobilising both cognitive and non-cognitive capacities. This definition suggests that each competence is based on a system that activates a set of cognitive, motivational, ethical, social and volitional factors that enable performance in different contexts and situations[7].

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[1] Kennedy, T. J., & Sundberg, C. W. (2020). 21st Century Skills. In B. Akpan, & T. J. Kennedy (Eds.), *Science Education in Theory and Practice.* Springer. https://doi.org/10.1007/978-3-030-43620-9_32

[2] Sampson, D., & Fytros, D. (2008). Competence Models in Technology-Enhanced Competence-Based Learning. In H. H. Adelsberger, Kinshuk, J. M. Pawlowski, & D. G. Sampson (Eds.), *Handbook on Information Technologies for Education and Training* (pp. 157–177). Springer Berlin. https://doi.org/10.1007/978-3-540-74155-8

[3] Gonczi, A., & Athanasou, J. (1996). Instrumentación de la educación basada en competencias. In *Perspectiva de la teoría y la práctica en Australia* (pp. 274–275). Limusa.

[4] Gozzi, F., Bordin, R. A., Bacelar A. G., & Urpia, C. (2020). Philippe Perrenoud and the discourse of competence in education. *International Journal of Development Research, 10*(12), 42918–42924. https://www.journalijdr.com/sites/default/files/issue-pdf/20565.pdf

[5] Marzano, A., Vegliante, R., & Iannotta, I. S. (2015). *The Construction of Tools for Competences Assessment.* Proceedings of EDULEARN15 Conference 6th–8th July 2015, Barcelona, Spain. https://www.academia.edu/14204862/THE_CONSTRUCTION_OF_TOOLS_FOR_COMPETENCES_ASSESSMENT

[6] Cheetham, G., & Chivers, G. (1996). Towards a Holistic Model of Professional Competence. *Journal of European Industrial Training, 20*(5), 20–30. https://doi.org/10.1108/03090599610119692

[7] Vainikainen, M-P., & Nilivaara, P. (2022). Laaja-alainen osaaminen uuden vuosituhannen koulutuspoliittisissa keskusteluissa. In N. Hienonen, P. Nilivaara, M. Saarnio, & M-P. Vainikainen (Eds.), *Laaja-alainen osaaminen koulussa: Ajattelijana ja oppijana kehittyminen* (ss. 13–22). Gaudeamus.

Competences are cross-curricular; hence, they are not directly linked to any specific discipline but are relevant across various fields.

What is the difference between competence and competency?

The terms competence and competency in many cases are used synonymously. Some authors use "competence" and some "competency". European Commission documents have adopted the use of "competence". Competence, as well as competency, generally refers to the overall ability or capability to perform a task or a function. It is a broader term that encompasses various skills, knowledge, and attributes required to effectively carry out a particular role or task. Some authors make difference between those two words. According to M. Mulder[1], "competency is an underlying characteristic of competence, an element of competence, and consists of the clusters of knowledge, skills, and attitude that are necessary conditions for effective performance" (p. 5). According to the author, competence is the overall capability, while competency refers to the specific skills and attributes that contribute to that capability.

In connection with competences, other terms that are often used are: capacity, attribute, ability, skill, learning outcomes, etc. All these terms describe what a person can perform or achieve. The most common use of skill/skills is when referring to something that has a narrower meaning than competence/s. Learning outcomes (more commonly used in higher education) are statements describing what a learner should know, understand, and/or be able to demonstrate at the end of a learning process. However, the term "competence" appears in more documents than other terms such as "skills" or "abilities". On the other hand, its use has intensified since 2000, after the Bologna Declaration was signed. In publications of Anglo-Saxon countries, there is a tendency towards the usage of "skills".

In the COMPASS project we will use "competence" and "competences".

How many and what kind of competences?

In their analysis of 18 frameworks, J. Voogt and N. P. Roblin[2] indicated the most prominent competences included in all the models to be collaboration, communication, ICT literacy, social and cultural skills, and citizenship. Critical thinking, creativity and problem-solving were also emphasised in most models. In recent years, the original models from the beginning of the

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[1] Mulder, M. (2000). *Creating Competence: Perspectives and Practices in Organizations*.
https://ris.utwente.nl/ws/portalfiles/portal/6172799/ED442203.pdf
[2] Voogt, J., & Roblin, N. P. (2012). A comparative analysis of international frameworks for 21st century competences: Implications for national curriculum policies. *Journal of Curriculum Studies, 44* (3), 299–321.
https://doi.org/10.1080/00220272.2012.668938

millennium have been updated, especially underlining the impact of technological development and the climate crisis.

What is important to bear in mind?

Competence is not just about knowledge, techniques, or mastery. Rather, it is a system of knowledge and skills that individual needs in order to live and act in a particular context. Competences are built on knowledge and contribute to the ability to process, evaluate and, above all, use knowledge in an ethically meaningful way. It therefore also requires favourable attitudes and the will to use knowledge and skills in a meaningful way in different situations in a complex world[1]. Looking closely at the content of the concept of competence, four aspects of this concept can be identified.

Complexity

Competences involve a mix of interrelated cognitive, interpersonal, and technical skills. In other words, in any field of activity, knowledge, skills, values, and attitudes are required, which act as a complementary, interacting set of components. Even where competences are defined as a broad spectrum of knowledge, their complexity is reflected in the variation of the types of knowledge: knowledge and understanding (theoretical knowledge of a discipline, the ability to know and understand), knowing how to behave (the practical application of existing knowledge to particular situations), knowing how to be (values as part of a way of living and coexisting with others and in social contexts). Competences also include a set of personal attributes (related to knowledge and its application, attitudes, skills, and responsibilities) that describe how well a person can apply that knowledge and those skills. The complexity of competences arises from the need to integrate and balance these components.

Contextuality

Competences refer to the skills, abilities, and knowledge that individuals possess and utilize to navigate and interact effectively within social and cultural context. Competences can vary in complexity based on the specific context or field of expertise. What is considered a crucial competence in one field might not be as important in another. What is recognised as essential in one situation may be of little value or even inappropriate in another. Relationships, traditions, rules, values, and habits determine what is expected of an individual to be recognised as essential. Accordingly, the individual will mobilise his or her efforts to solve a particular problem or perform a task in a particular situation, where the relevant competences will be actualised.

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[1] Luostarinen, A., & Nilivaara, P. (2019). Laaja-alaisen osaamisen arviointi. In A. Luostarinen & J. H. Nieminen (Eds.), *Arvioinnin käsikirja*. PS-kustannus.

Agency

Competence is essentially developed through practice in a given situation. Therefore, competence-oriented activities require personal agency, i.e. adaptability, motivation, mobilisation, and the use of metacognitive strategies. Competence it is to know and be able to use complex set of skills and knowledge in a specific context and situations[1]. Agency in this context could relate to the capacity of individuals to act independently and make their own choices, to take independent action. Competences are not themselves knowledge or attitudes, but they mobilise, integrate, and orchestrate all human resources. Accessing knowledge and building on it to solve problems require active attitudes, mobilisation of relevant capacities, conscious decisions, reflective thinking, and taking responsibility[2].

Dynamism

The dynamic nature of competences is rooted in the idea that they can be developed, adapted, and refined over time through learning and experience. Competences are closely interlinked and are actualised in a combination, i.e. not all competences or their components are equally important in a given task, and their importance may change at different stages of the task. The dynamic nature of competences makes it possible to describe competence as a network influenced by a number of factors, including declarative knowledge ("know-what"), procedural knowledge ("know-how"), and contextual knowledge (how to coordinate the first two) as well as meta-knowledge (knowledge on one's own cognitive processes) and metacognitive regulation strategies[3].

[1] Halimi, K., & Seridi-Bouchelaghem, H. (2021). Students' competencies discovery and assessment using learning analytics and semantic web. *Australasian Journal of Educational Technology, 37*(5), 77–97. https://doi.org/10.14742/ajet.7116

[2] Gozzi, F., Bordin, R. A., Bacelar A. G., & Urpia, C. (2020). Philippe Perrenoud and the discourse of competence in education. *International Journal of Development Research, 10*(12), 42918–42924. https://www.journalijdr.com/sites/default/files/issue-pdf/20565.pdf

[3] Marzano, A., Vegliante, R., & Iannotta, I. S. (2015). *The Construction of Tools for Competences Assessment.* Proceedings of EDULEARN15 Conference 6th–8th July 2015, Barcelona, Spain. https://www.academia.edu/14204862/THE_CONSTRUCTION_OF_TOOLS_FOR_COMPETENCES_ASSESSMENT

What conclusions can be drawn?

Competence has a diversity of approaches and definitions. Each of them points out the complex nature of competence, conceiving of competence as an individual's ability/capability that is manifested in action in a given circumstance or context. In our project, we will use the following definition of competence: Competence is the sum of a person's knowledge, attitudes, skills and values, manifested in concrete actions. It is a person's ability to act in an appropriate way in a situation that requires a specific solution. In the context of learning, a competence denotes a quality acquired by the learner, a potential for reflection and action that he or she maintains.

What is the meaning of competence development and assessment?

What is the basis for the actuality of competences?

In recent decades, education policies in different countries have been oriented towards a competence-based model of education. Education prioritises competence development to prepare individuals for an unpredictable future, enhance employability, foster critical thinking, promote adaptability, encourage life-long learning, address the global nature of various fields, and integrate technology effectively. Developing competences helps individuals to participate actively in the life of society and to adapt to the ever-changing world of work. Sociologists[1] believe that competences are essential for individuals to actively participate in and contribute to their communities, navigate social structures, and address societal challenges, recognising and understanding social issues that impact individuals and communities, and making choices that consider the moral and ethical implications of actions in a social context.

The importance of developing competences emerged strongly in international education policy debates in the 1990s. The background to this was the perception that the demands of working life were changing, with technological developments reducing the relative share of routine tasks and increasing the proportion of information work requiring the ability to manage large, complex issues, interact with others, solve problems and adapt to unexpected situations. In particular, representatives of business and industry expressed strong concerns that school systems were not necessarily able to provide children and young people with the skills they would need in the future world of work within the framework of traditional subject-based education. However, the desire to update school systems for the new millennium did not come exclusively from the world of work, but was shared by many international organisations, education policy makers, researchers and education practitioners[2].

[1] Serpa, S., & Sá, M. J. (2018). *Exploring Sociology of Education in the Promotion of Sustainability Literacy in Higher Education*. *The Journal of Social Sciences Research, 5*(1), 101–116. https://ideas.repec.org/a/arp/tjssrr/2019p101-116.html

[2] Vainikainen, M-P., & Nilivaara, P. (2022). Laaja-alainen osaaminen uuden vuosituhannen koulutuspoliittisissa keskusteluissa. In N. Hienonen, P. Nilivaara, M. Saarnio, & M-P. Vainikainen (Eds.), Laaja-alainen osaaminen koulussa: Ajattelijana ja oppijana kehittyminen (ss. 13–22). Gaudeamus.

What is the importance of competence development in general education?

Although the idea of competence-based education came from both the labour market and higher education, contemporary schooling has also become focused on competence-based education. To summarise the vast literature on competence development in school, there are three most frequently occurring arguments in favour of this type of education:

Preparation for the Real World: the 21st century school is no longer a citadel of knowledge isolated from the world. Competence-based education aims to prepare learners for the real challenges and scenarios they may face in their personal and professional lives and to be involved in solving future societal problems already at school. Competence-based education helps learners to become flexible and able to navigate different situations, domains and challenges. Schooling is not seen as preparation for life, but as life itself.

Creativity, critical thinking and problem-solving are essential skills for all learners, enabling them to analyse situations, generate ideas, make informed decisions and solve complex problems effectively. These qualities are highly valued in learning, in the workplace and in everyday life.

Personalised Learning: Competence-based education allows for a more individualised and flexible learning experience. Defining competence as a set of knowledge, skills and values that are manifested in a specific situation and context makes it clear that it is difficult to identify universal borders of competence. Students' progress at their own pace, ensuring that they have a solid understanding of each concept before moving on to the next. Competence-based education accommodates diverse learning styles and abilities. It allows students to progress based on their understanding, thus ensuring that each student has the opportunity to succeed.

Traditional educational systems may not always be aligned with the rapidly changing needs. The transition to competence-based education requires new approaches to education, new learning environments, different teaching methodologies and learning models. Given the close relationship between teaching methods, educational objectives, and assessment, it is important to reflect on assessment practices from this new perspective.

Why is it important to assess competences?

Assessment is one of the most important steps in the learning process. The success of the learning process is closely linked to assessment. It helps learners to recognise their own learning outcomes, to be informed about their progress and to adjust their learning, to take greater responsibility for their own learning, and to develop their own individual learning profile. Effective assessment can therefore be seen as a way of developing students' competences in itself[3]. Unfortunately, even the most advanced education systems often have the fundamental flaw that the assessment process is mainly knowledge-based. According to Kimber and Wyatt-Smith[4] , traditional assessment systems are not suitable for multimodal learning environments and the assessment of critical thinking skills, problem solving and creativity, collaboration and teamwork. Given the multi-layered nature of competences, their diversity, and the dependence of their expression on the educational situation or context, the assessment of competences, as well as the development of competences, remains one of the key challenges of competence-based education.

What conclusions can be drawn?

The desire to shift education towards competence-oriented thinking emerged around the turn of the millennium simultaneously from various sources: international organisations, education policy makers as well as educational researchers and practitioners. The importance of competence development rests on the need for an individual's ability to adapt to the demands of an ever-changing environment and to meet the challenges of personal, professional and social life. In short, to be able to "put into practice" one's knowledge and skills in a variety of relevant circumstances and situations.

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[3] Bordas, M. I. & Cabrera, F. A. (2001). Estrategias de evaluación de los aprendizajes centrados en el proceso. *Revista Española de Pedagogía, 59(218)*, 25–48. http://www.jstor.org/stable/23765840

[4] Kimber, K., & Wyatt-Smith, C. (2010). Secondary students' online use and creation of knowledge: Refocusing priorities for quality assessment and learning. *Australasian Journal of Educational Technology, 26*(5), 607–625. http://dx.doi.org/10.14742/ajet.1054

What's "inside"? What are the components of competence?

Is there any agreement on what constitutes competence?

To understand what is "inside" of competence in scientific terms means to take a look at the various research-based frameworks produced by a variety of organisations – universities, scientific institutes, agencies, etc. Unfortunately, there is no one general theoretical model or one widely accepted definition of competences[5].

There are many models and frameworks, which suggest a variety of point views upon the structure of a competence. Most of them present competences as combinations of knowledge, skills and attitudes, some of them include values or/and will. D. Sampson and D. Fytros[6] identify the core dimensions of the term competence: an individual's characteristics (knowledge, skills and attitudes), which manifest themselves to varying levels in different circumstances. Similar components of competence are identified in a variety of educational contexts. The above-mentioned three components are presented in the European Commission's reference document on key competences for lifelong learning[7] . The "inside" of a competence varies depending on the authors' field of interest and the context in which the competences are expressed.

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[5] Vainikainen, M-P., & Nilivaara, P. (2022). Laaja-alainen osaaminen uuden vuosituhannen koulutuspoliittisissa keskusteluissa. In N. Hienonen, P. Nilivaara, M. Saarnio, & M-P. Vainikainen (Eds.), *Laaja-alainen osaaminen koulussa: Ajattelijana ja oppijana kehittyminen* (ss. 13–22). Gaudeamus.

[6] Sampson, D., & Fytros, D. (2008). Competence Models in Technology-Enhanced Competence-Based Learning. In H. H. Adelsberger, Kinshuk, J. M. Pawlowski, & D. G. Sampson (Eds.), *Handbook on Information Technologies for Education and Training* (pp. 157–177). Springer Berlin. https://doi.org/10.1007/978-3-540-74155-8

[7] European Commission, Directorate-General for Education, Youth, Sport and Culture, (2019). *Key competences for lifelong learning*, Publications Office. https://data.europa.eu/doi/10.2766/569540

What is agreed upon?

The classical structure of competences includes knowledge, skills, attitudes and values. **Knowledge** means established concepts, facts and figures, ideas and theories; **skills** – ability to use knowledge for achievement of results; **attitudes** – disposition or mindset to react and act; **values** – beliefs, ethical norms.
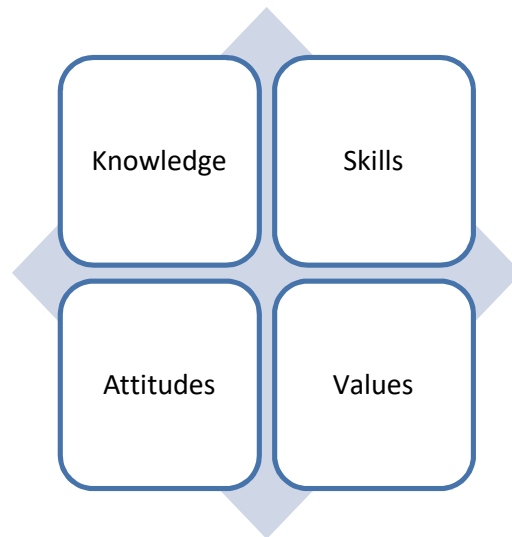
```
            Knowledge        Skills


            Attitudes        Values
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Figure 1. The Four Components of Competence

Knowledge serves as the foundational element of competences[8]. Without knowledge, individuals lack the fundamental understanding required to make informed decisions and take appropriate actions[9]. Skills represent the practical abilities that individuals develop to perform specific tasks or activities. Values encompass the core principles, beliefs, and ethical guidelines that guide an individual's behaviour and decision-making. Attitudes refer to the dispositions, orientations, or mindsets that individuals hold. In Figure 1 above, we present all four elements uniformly, as all of them are of equal importance in the educational context.

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[8] OECD. (2018). *The future of education and skills. Education 2030*. OECD.
https://www.oecd.org/education/2030/E2030%20Position%20Paper%20(05.04.2018).pdf
[9] Marzano, R., & Kendall, J. (2008). *Designing and assessing educational objectives: Applying the new taxonomy*. Corwin Press.
http://dspace.vnbrims.org:13000/jspui/bitstream/123456789/4577/1/Designing%20and%20Assessing%20Educational%20Objectives%20Applying%20the%20New%20Taxonomy.pdf

How does the image of an iceberg help to understand the structure of competence?

L. M. Spencer and S. M. Spencer[10] proposed the use of the iceberg model to identify competences. The Iceberg Model is a useful metaphor for understanding the multifaceted nature of competences and emphasises the importance of recognising and developing both the visible and the hidden aspects of a person's abilities in an educational context.

Visible Part

Skills
Knowledge

Hidden Part

Self Concept
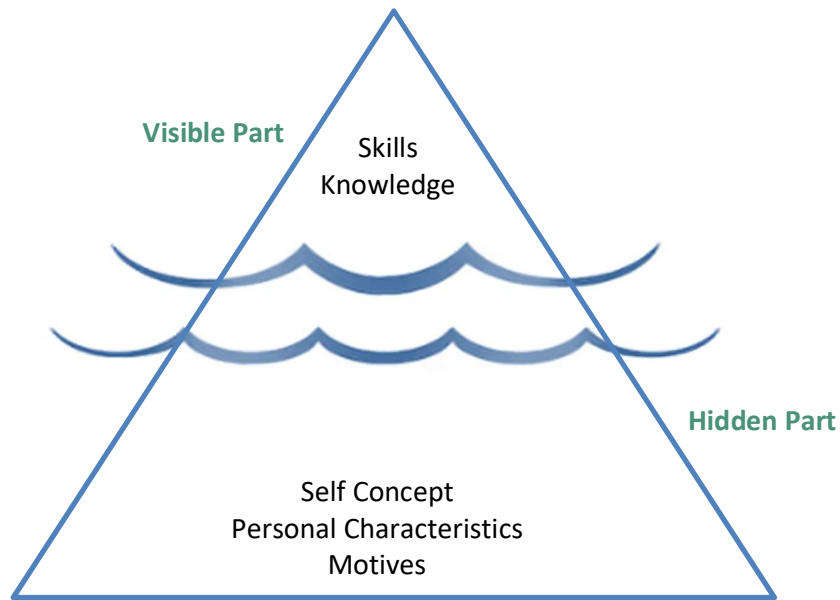Personal Characteristics
Motives

Figure 2. The Iceberg model of competences (Spencer & Spencer, 1993)

The iceberg model of competences is a concept that visualizes the different layers of competences individuals possess, much like an iceberg where only a small portion is visible above the waterline. This model is often used in the context of leadership and human resources. The iceberg model typically consists of two main layers – visible and invisible. The skills and abilities are easily observable and measurable. These are the tangible aspects of an individual's competence that can be easily assessed, such as technical skills, specific knowledge, and job-related expertise. The invisible layer lies beneath the surface and includes the less observable and more subjective aspects of competence. It encompasses qualities such as emotional intelligence, interpersonal skills, adaptability, and other soft skills that may not be immediately apparent but play a crucial role in an individual's overall effectiveness and success. The model highlights the idea that while visible competences are essential, the hidden competences are equally important for personal and professional development.

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[10] Spencer, L. M., & Spencer, S. M. (1993). *Competence at work: Models for superior performance*. John Wiley & Sons, Inc.

What conclusions can be drawn?

Although various authors describe the content of competence differently, the following essential components of competence emerge: knowledge, attitudes, skills and values. These components are found in most definitions of competence. Some of them are hidden, others are clearly visible, but all are complexly important.

Transferable, generic, subject–related or key competences?

Why so many names?

Transferable competences (for example, creativity, collaboration, problem-solving, critical thinking) mean that they might be applied or "transferred" to different academic content areas and interdisciplinary fields, as well as to new and unfamiliar contexts beyond the classroom. In addition, there are "transferable" knowledge and skills that are used in learning within and across content areas. Transferable knowledge is a product of deeper learning, "including content knowledge in a domain and knowledge of how, why, and when to apply this knowledge to answer questions and solve problems[1].

Key competences are understood as a set of essential skills and abilities that are considered fundamental for personal development, social inclusion, and employability[2]. For example, literacy, citizenship, cultural awareness, multilingual, digital abilities, entrepreneurship.

Generic competences are those that are not bound to a specific context bur rather might be applicable in various contexts and across various domains and disciplines. The list of generic competences varies from country to country. The list and content of relevant competences also depend on other variables: the field of activity, the target group for which they are intended, the rules of the job or profession, the cultural context, etc.

Subject–related competences are related to a particular subject or field of study. These competences are often more specific and may include technical skills, domain-specific knowledge, and expertise in a particular subject area. They are considered to be crucial for success in a specific profession or an area of study, e.g., programming languages for a software developer, medical knowledge for a healthcare professional, financial analysis skills for an accountant, or legal expertise for a lawyer.

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[1] Pellegrino, J. W., & Hilton, M. L. (Eds.). (2012). *Education for life and work: Developing transferable knowledge and skills in the 21st century.* National Academies Press. https://hewlett.org/wp-content/uploads/2016/08/Education_for_Life_and_Work.pdf

[2] Council of the European Union. (2018). Council recommendations of 22 May 2018 on key competences for lifelong learning. *Official Journal of the European Union*, C189/1. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018H0604(01)

What is the difference?

Key competences are more connected with real life world and especially with the job market. Generic competences are similar to transferable competences, in the sense that both are treated as applicable to a variety of contents and contexts, and might be developed within diverse academic subjects. Both of them in many cases are used synonymously. Subject-related competences differ from all three types described above, as they pertain to a particular subject or field of study. The distinctions help in understanding the different aspects of competences that individuals may possess or develop in educational settings.

What conclusions can be drawn?

Variations of terms largely depend on traditions, contexts, periods of times, as well as grouping and regrouping competences in a variety of clusters. In school education context we mainly use the term "generic" (or "general") competences. They are understood as transferable from one subject or school context to another. But at the same time, they are observed in specific contexts, situations and are assessed accordingly.

What is competence-based education?

Competence based-education or competence-based learning?

The distinction is made when the aim is to emphasise the instrumental value of learning in competence development, while education is given a broader, holistic meaning – development of a whole person. The two terms tend to be used synonymously to mean that education and learning are interconnected and sometimes difficult to separate. The literature does not make a clear distinction between what constitutes competence-based education and what constitutes learning. It is up to the scientists to decide which terms to use and when. In many cases, both terms are used in parallel.

Competence-based education or learning in scientific terms means an educational approach that focuses on students mastering specific competences at their own pace, rather than learning at a predetermined pace from a pre-defined curriculum. According to E. Levine and S. Patric[3], competence-based education is a system in which:

> *Students are empowered daily to make important decisions about their learning experiences, how they will create and apply knowledge, and how they will demonstrate their learning. Assessment is a meaningful, positive, and empowering learning experience for students that yields timely, relevant, and actionable evidence. Students receive timely, differentiated support based on their individual learning needs. Students' progress is based on evidence of mastery, not seat time. Students learn actively using different pathways and varied pacing. Strategies to ensure equity for all students are embedded in the culture, structure, and pedagogy of schools and education systems. Rigorous, common expectations for learning (knowledge, skills, and dispositions) are explicit, transparent, measurable, and transferable* (p. 3).

Competence-based education or learning does not come from a vacuum. It is undergoing a fundamental change with the changing educational paradigm: from content-oriented learning to competence-oriented learning, from time-oriented learning to outcome-oriented learning, from lessons to experiences, from assessment to feedback, from teacher-

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[3] Levine, E., & Patric, S. (2019). *What is competency-based education? An updated definition*. Aurora Institute. https://aurora-institute.org/wp-content/uploads/what-is-competency-based-education-an-updated-definition-web.pdf

designed learning to co-produced learning, from traditional to personalized and competence-based education.

Competence-based education or learning makes a difference at all levels – general education policy, organizational culture, classroom instruction.

TRADITIONAL EDUCATION	VS	PERSONALIZED, COMPETENCE-BASED LEARNING
Learning happens inside a traditional classroom, little to no accommodation of student interests or learning needs.	SCOOL CULTURE	Students have an equitable range of learning experiences at school, online and in the community. Schools foster a sense of belonging, embrace growth mindset and the importance of relationships for meaningful, relevant learning experiences.
Every classroom has one teacher who designs and delivers instructional curriculum with very little differentiation.	INSTRUCTION	Educators work collaboratively with community partners and students to develop a unique learning plan for each student based on interests, learning needs and real time data. Individual learning pathways accommodate student interests and learning needs.
Assessments at set times to evaluate and classify students. One opportunity to take the summative assessment at the end of the year.	ASSESSMENT SYSTEM	A comprehensive assessment system is an essential part of the learning system. Formative assessments guide daily instruction. Students partner with their teachers to decide when and how to show what they've learned, and they have multiple chances to demonstrate mastery.
Students are expected to master grade level college-and career-ready standards.	COLLEGE AND CAREER READINESS	Students are expected to master competences aligned to college-and career-ready standards with clear, transferable learning objectives.
Students advance at educator's pace regardless of mastery or needing additional time.	LEARNING PACE	Students access customized supports both in-school and out-of-school to ensure they get what they need, when they need it.
Grades are norm-referenced, reflect course standards and are typically based on weighted quarters and a final exam.	GRADING POLICIES	Grades reflect the degree of mastery of competences. If students do not earn course credit, records indicate competences that need to be re-learned instead of the entire course.

Figure 3. Traditional VS personalized / competence-based education[4]

[4] *The Difference between Traditional Education and Personalized, Competency-Based Education.* (2022, September 22). KnowledgeWorks. https://knowledgeworks.org/resources/competency-based-versus-traditional/

Figure 3 shows the characteristics of competence-based education according to six dimensions: school culture, instruction, assessment system, college and career readiness, learning pace, grading policy. We can see that competence-based education is likened to personalised education. Competence-based learning and personalized learning both focus on tailoring education to individual student needs. In competence-based learning, students' progress at their own pace, demonstrating mastery of specific skills or knowledge before moving on. Personalized learning also emphasizes individualized instruction and allows students to pursue their interests and learning styles. Both approaches aim to provide a more customized and effective learning experience for students.

Competence-based education or learning puts the learner, not the teacher, at the centre of the learning process. It is they who need to be prepared to live in the real world and to play their role in society to the best of their ability.

Summarising the features of competence-based teaching or learning[5] [6] [7] its essential features could be:

- **Individualised Pace**. Students' progress through the material at their own pace. They can advance once they have demonstrated mastery of the content, regardless of how much time it takes.

- **Clear Learning Objectives**. Competences are clearly defined, outlining what a student is expected to know or be able to do. These learning objectives guide the learning process.

- **Flexible Learning Paths**. Students may take different paths to reach the same competence. This allows for a more personalised learning experience, tailored to individual strengths and needs.

- **Assessment of Mastery**. Assessment is focused on determining whether a student has mastered the specified competences. This often involves various forms of assessment, such as examinations, projects, or practical demonstrations.

- **Feedback and Support**. Continuous feedback is provided to help students understand their progress and areas that need improvement. Support mechanisms are in place to assist students in reaching their learning goals.

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[5] Colby, R. L. (2017). *Competency-Based Education: A New Architecture for K-12 Schooling.* Harvard Education Press.
[6] Gervais, J. (2016). The operational definition of competency-based education. *The Journal of Competency-Based Education*, *1*(2), 98–106. https://doi.org/10.1002/cbe2.1011
[7] Curry, L., & Docherty, M. (2017). Implementing competency-based education. *Collected Essays on Learning and Teaching*, *10*, 61–73. http://dx.doi.org/10.22329/celt.v10i0.4716

Competence-based education or learning also requires a new generation of educators who can assess learning, build collaborative communities, cultivate belonging, foster student-led learning, and rethink time and space[1].

1

Assess for learning

Evidence of learning demonstrates students' application (and transfer) of content knowledge and skills.

2

Build collaborative communities

Communities built on trust, care, collaboration, and high expectations connect and empower students.

3

Cultivate belonging

Equitable learning experiences affirm who students are and prioritize their psychological safety.

4

Foster student-led learning

Students learn deeply when learning experiences are designed to develop ownership over their own learning.

5

Rethink time and space

Students learn deeply when we use technology to expand our notion of when and where learning happens.

Figure 4. GOA's[2] educator competences

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[1] *Global Online Academy*. (n. d.). https://globalonlineacademy.org/

[2] Cummings, J., & Tahir, S. (2022, November 01). *Educator Competencies: Shifting Teacher Practice*. Global Online Academy. https://globalonlineacademy.org/insights/articles/educator-competencies-shifting-teacher-practice

In a competence-based educational setting, teachers should possess a strong understanding of the competences that students are expected to acquire. They should be able to assess student progress based on these competences and provide targeted support to help students reach their learning goals. Teachers should also be skilled in personalized learning approaches. This means they should be able to tailor their instruction to meet the individual needs and learning styles of each student. They should be able to provide differentiated instruction, offer personalized feedback, and create opportunities for students to demonstrate their understanding in various ways.

Overall, teachers in a competence-based educational setting should be knowledgeable, flexible, and student-centered. They should be able to adapt their teaching strategies to meet the diverse needs of their students and help them develop the competences necessary for success in their academic and professional lives.

Competence-based curriculum and competence-enriched curriculum?

In fact, very often the two terms are used interchangeably, without thinking about their differences. To summarise the extensive and complex literature on the subject, it can be said that:

competence-based curriculum is a coherent totality of elements leading to competence-based learning and assessment. A competence-based curriculum includes principles, aims, competences and indicators, curriculum structure, learning units, learning process, learning resources, and guidelines for learning assessment.

competence-enriched curriculum refers to competences but does not necessarily specify how to develop or/and assess them.

What conclusions can be drawn?

Competence-based education or learning is a broad concept, characterised by different aspects of teaching, learning and environmental variables: school culture, instruction, assessment system, learning pace, grading policy, etc. Competence-based education or learning is close in nature to modern, personalised learning approach.

How to assess?

What is called "competence assessment"?

Competence-based assessment is a form of assessment that is directly linked to the specification of a set of outcomes – general and specific – about which all interested parties involved in the assessment process can make reasonably objective judgements in terms of student outcomes or/and progress demonstrated.

Competence-based assessment refers to an approach in evaluating an individual's skills, knowledge, and abilities based on specific competences required for a particular role or task. Instead of traditional methods that focus solely on academic achievements or general knowledge, competence-based assessment centres on practical, real-world skills and performance.

What is special about competence assessment?

Assessing competences is complex as they are far more difficult to measure compared to lower-order thinking skills such as memorization. One of the characteristics of competence-based education is that the learning process can be designed individually by learners and teachers to assure flexibility. Consequently, assessment procedures cannot be restricted to one standard method, but must provide a range of different methods that can be applied according to the needs and potentials of learners and assessors. Assessment can be conducted as an observation of processes or products, as a skills test in which a certain practical sample of a skill must be demonstrated or as a simulation of activities. Competences can be assessed through the provision of evidence of these competences. Furthermore, more traditional forms of assessment such as oral or written tasks can be applied, especially with regard to assessment of underpinning theoretical knowledge. It is a significant challenge that requires innovative approaches and tools. Both formative and summative assessments are crucial for evaluating transversal or generic competences.

What are main principles of good competence assessment?

Four principles, namely validity, reliability, flexibility and fairness, are essential features of good competences assessment[1].

Validity requires that assessments actually assess what they claim to assess. Assessment of competence should be a process which integrates knowledge and skills with their practical application. During assessment, judgements to determine a learner's competence should, wherever practicable, be made on evidence gathered on a number of occasions and in a variety of contexts or situations.

Reliability calls for methods and procedures that consistently measure the achievements of different learners over time. Assessment practices should be monitored and reviewed to ensure that there is consistency in the collection and interpretation of evidence.

Flexibility requires that a range of assessment methods, referring to a range of delivery modes, learning sites and needs, is provided. Assessment procedures should provide for the recognition of competences no matter how, where or when they have been acquired. Assessment procedures should be made accessible to learners so that learners can proceed readily from one competence standard to another.

Fairness is granted when assessment is equitable, accessible, transparent and participatory for all, i.e. individual learners must not be disadvantaged. Assessment practices and methods must be equitable to all groups of learners. Assessment procedures and the criteria for judging performance must be made clear to all learners seeking assessment. There should be a participatory approach to assessment. The process of assessment should be jointly developed/agreed between assessor and the assessed. Opportunities must be provided to allow learners to challenge assessments and provision must be made for re-assessment.

What are the main challenges?

Several challenges are highlighted in developing assessments for transversal or generic competences. These include the need for assessments to be multifaceted to accurately measure complex skills such as creativity, innovation, leadership, and teamwork. It is suggested that while designing effective assessments for these skills is challenging, it is not impossible. Some examples of current assessments that successfully measure complex skills are the PISA tests, which require students to apply their understanding in novel situations, and the IB Diploma Program, which assesses students through in-depth, analytical tasks.

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[1] Harris, R., Hugh, G., Barry, H., & David, L. (1995). *Competency-based Education and Training: between a rock and a whirlpool*. Macmillan Education Australia.

Also, the potential of technology to facilitate the assessment process is discussed widely, including real-time feedback and the use of artificial intelligence for evaluating open-ended responses. Artificial intelligence will probably open new visions for teaching, learning and assessing transversal competences.

The competence assessment problem is connected to the difficulty of providing a "complex", "ill-defined", or "specific" environment in which student can demonstrate competence. Additionally, the problem concerns the high cost of assessment procedures[2]. In the traditional learning, assessment is usually based on knowledge verifiable through objective evidence or in an essay. In competence-based learning, assessment could be based on agreed competence assessment rules if any, but mainly in the evidence testing through demonstrations, product design, simulations, and portfolios. Competence-based assessment is "a form of assessment based on the specification of a set of outcomes, which is so clear that both generic and specific outcomes are specified. We refer to competence-based assessment as a process of gathering evidence and forming judgements about whether competences have been achieved. The purpose of such assessment is to verify that the individual can perform to the standard expected and expressed in the competence standards.

Competence-based assessment refers to an approach in evaluating an individual's skills, knowledge, and abilities based on specific competences required for a particular role or task. Instead of traditional methods that focus solely on academic achievements or general knowledge, competence-based assessment centres on practical, real-world skills and performance.

What are key features of competence-based assessment?

They include:

clear definition and understanding of a competence that is going to be developed and assessed	performance-based evaluation, that involves practical exercises, simulations, or real-life scenarios
assessment criteria to ensure that all students are aware how they are going to be assessed	assessments tailored to task requirements to ensure that students possess the necessary skills to perform effectively
feedback and development in terms of receiving constructive feedback on students' performance, as well as clear guidance for further personal development	flexibility of an assessments in terms of possibility to adapt to various situations

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[2] Kubova-Semaka, J. (2020). An Integral Approach to the Meaning of Competence. *Scientific Research in Education, 3*, 120–135. http://dx.doi.org/10.15388/SRE.2020.11
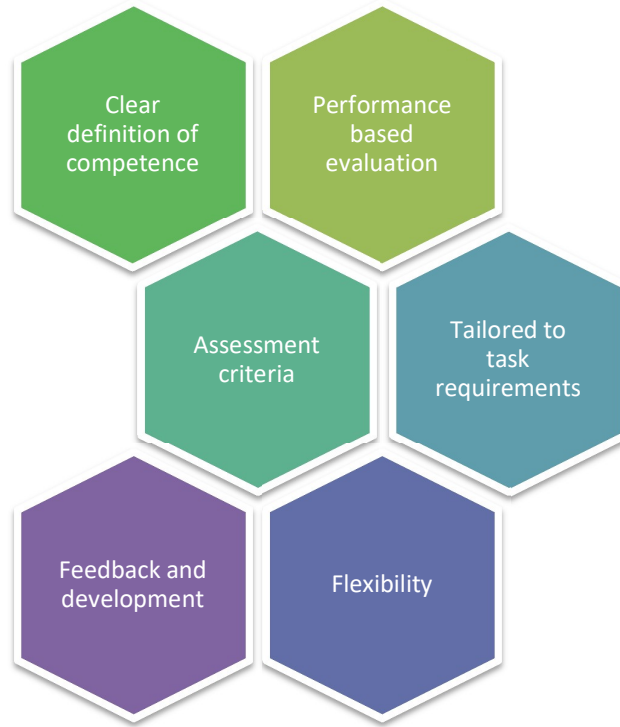
Figure 5. Key features of competence-based assessment

Competence–based assessment provides insight in: what the student knows, still needs to learn, has learned, and what has to be improved. There are three categories of assessments: prior learning assessments, summative assessments, and formative assessments.

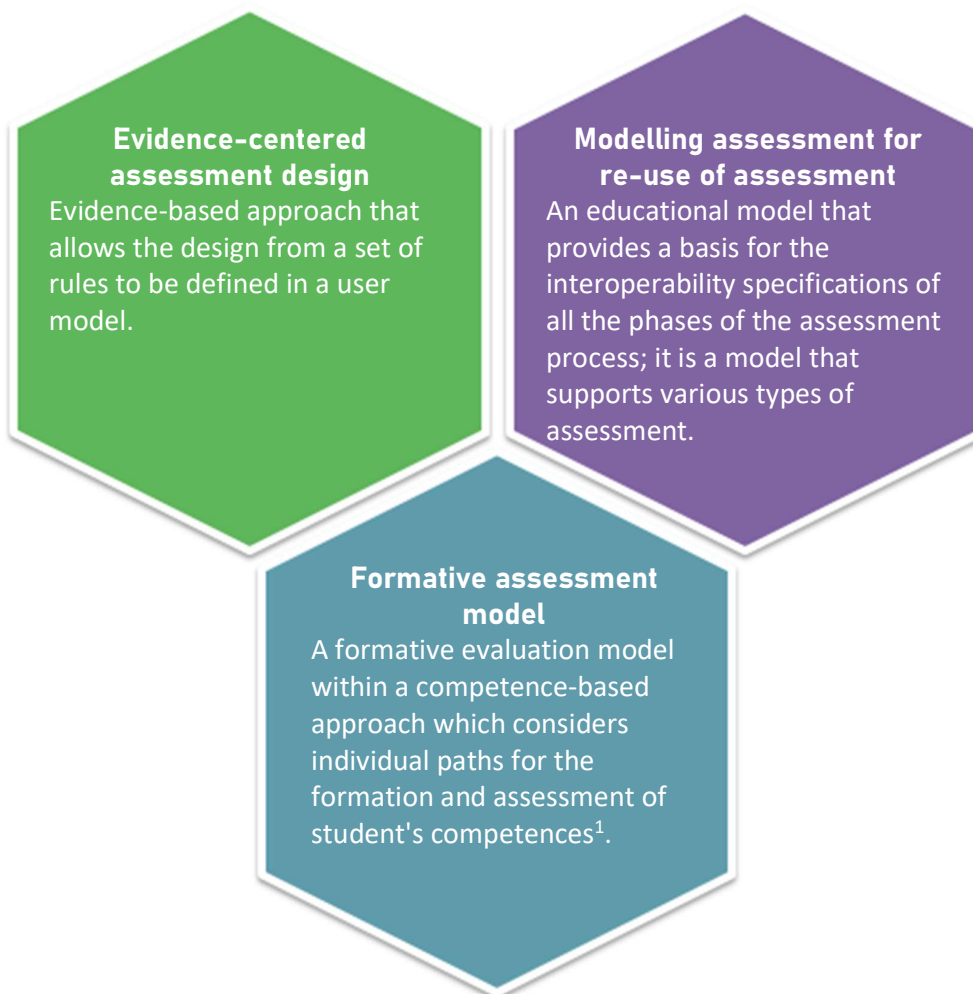# What are the major categories of competence assessment?

Formative assessment. This type of assessment refers to providing continuous, actionable feedback that guides both teaching and learning processes. It supports a learning environment where students are encouraged to reflect on their learning, practice self-assessment, and engage deeply with content.

Benefits of formative assessment:

1. Supports learning progress: identifies gaps between the learner's current status and learning goals, providing a roadmap for achieving them.

2. Informs instruction: by acting on the evidence gathered through formative assessment, educators can tailor subsequent instruction to meet the identified needs of their students, ensuring that teaching strategies are responsive and targeted.

3. Enhances the learning process: helps students confront misconceptions, refine their understandings, and progress to more sophisticated levels of expertise.

4. Builds transfer capability: helps students connect new knowledge with their existing knowledge structures, and promotes the ability to apply learning in varied situations.

5. Promotes metacognition and self-assessment: encourages learners to take charge of their own learning process, and enhances motivation and autonomy and fosters metacognition—thinking about one's own thinking.

6. Increases student motivation: involves students in the learning process, and the constructive feedback they receive through formative assessment can significantly boost their motivation and engagement in learning.

Summative assessment. It aims to assess students' learning at the end of a learning period, for example – at the end of a learning unit, course or programme. Summative assessment can be used alongside and in combination with formative assessment, and teachers might find a variety of ways of combining these two approaches to assessment.

What are assessment models?

Evidence-centered assessment design
Evidence-based approach that allows the design from a set of rules to be defined in a user model.

Modelling assessment for re-use of assessment
An educational model that provides a basis for the interoperability specifications of all the phases of the assessment process; it is a model that supports various types of assessment.

Formative assessment model
A formative evaluation model within a competence-based approach which considers individual paths for the formation and assessment of student's competences[1].

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[1] Cardona, S., Velez, J., & Tobónm, S. (2014). Towards a Model for the Development and Assessment of Competences through Formative Projects. *CLEI Electronic Journal, 17*(3). http://www.scielo.edu.uy/pdf/cleiej/v17n3/v17n3a09.pdf

What are some types of assessment?

360 degrees
All the people involved in the competence formation process evaluate the person's performance.

Self-assessment
It occurs when a person assesses his/her own competences in accordance to some criteria and evidence.

Rubrics and Checklists
These provide specific criteria for evaluating a student's performance on a task. Rubrics are often used in conjunction with other assessment methods, like projects or presentations, to provide clear standards for what constitutes mastery of a particular competence.

Peer Assessment
Students evaluate the work of their peers. This method encourages reflection and critical thinking, as students have to consider criteria for quality and effectiveness in their own and others' work.

Interviews or Oral Examinations
These involve direct conversation between a student and an assessor, allowing for a deep exploration of the student's understanding and competences. They can be particularly effective for assessing communication skills and depth of understanding.

Performance-Based Assessments
These involve students completing tasks or projects that demonstrate their ability to apply knowledge and skills. For example, students might work on a group project that requires collaborative problem-solving and then present their findings.

Digital Simulations and Game-Based Assessments
The ATC21S project[2] utilizes digital tools for assessing skills like critical thinking and problem-solving. These can include interactive simulations where students navigate complex scenarios requiring decision-making and strategic thinking.

Expert assessment
Performed by an expert in the area.

Reflective Journals or Logs
Students keep regular records of their learning experiences, reflecting on what they have learned, challenges they faced, and how they applied their skills. This method is particularly useful for assessing metacognitive skills and attitudes.

Portfolio
The collection of work evidence that allows students and teachers to monitor the progress, difficulties, and success in competence formation[3]. Portfolio can include various types of work, such as essays, projects, and other creative outputs, providing a comprehensive view of a student's abilities.

Standardized Tests
While traditional tests are often criticized for their limitations in assessing complex competences, some standardized tests are being developed to evaluate transversal skills, especially in areas like critical thinking and problem-solving[4].

Observational Assessments
Teachers or evaluators observe students in a natural setting, like a classroom or workshop, to assess how they apply skills in real-time. This can be particularly useful for assessing interpersonal and intrapersonal competences.

[2] *Assessment & Teaching of 21st Century Skills.* (2010). Cisco Systems. https://www.cisco.com/c/dam/en_us/about/citizenship/socio-economic/docs/assessment_teaching_21s_skills.pdf
[3] Joosten-ten Brinke, D., van Bruggen, J., Hermans, H., Burgers, J., Giesbers, B., Koper, R., & Latour, I. (2007). Modeling assessment for re-use of traditional and new types of assessment. *Computers Human Behavior, 23*(6), 2721–2741. https://doi.org/10.1016/j.chb.2006.08.009
[4] Lavonen, J. & Korhonen, T. (2017). Towards Twenty-First Century Education: Success Factors, Challenges, and the Renewal of Finnish Education. In S. Choo, D. Sawch, A. Willanueva, & R. Vinz (Eds.), *Educating for the 21st Century: Perspectives, Policies and Practices from Around the World* (pp. 243–264). Springer.

What conclusions can be drawn?

Despite the good practices and educational research on competence assessment, it has to be admitted that this is still a major challenge. Many schools use various creative means of formative assessment. But assessment of generic competences is the subject of very few reliable instrumented devices. Generic competences are still often assessed based on a subjective appreciation of a teacher. On the other hand, in the school context, it is most important to create a favourable and supportive environment to practise competence-based teaching and learning. Teachers are not expected to grade general competences on a daily basis in the same way as subject knowledge. "Seeing" the generic competences requires a longer period, work on complex tasks in a variety of situations.

Concluding notes

The definition of competence is both very clear, as it refers to the ability of a person to demonstrate his or her knowledge, skills and values through concrete action, and quite confusing, because definitions vary according to the field in which they are provided – vocational, academic, general, non-formal education. Each context brings its own nuances to the definition, as do cultural, economic and, of course, educational policy contexts, scientific approaches and trends. In short, context matters.

The need for competence-based education and competence assessment is primarily linked to the needs of the labour market and the requirements for professions, especially in vocational education. In the general school context, this is associated with the aspiration to not only acquire knowledge, but also to be able to apply it in various contexts and situations, demonstrating personal growth and achievements.

In the context of general education, scientists discuss subject-specific competences, i.e. academic competences, as well as transferable or generic competences, at the level of a specific discipline, as well as in interdisciplinary or cross-curricular contexts.

Assessing competences is complex, especially in general education. Most scholars writing on the assessment of competences emphasise its complexity and thus the difficulty of "seeing", "recognising" and assessing the expression of competences in non-academic formal education structures.

Evidence of competence is often linked to complex, cross-curricular tasks and project-based, research activities that allow students' abilities to emerge and become visible.

The assessment of competences is inseparable from the development of competences, because it is rather a "checkpoint", but not "end point" of education, as well as learning.

The COMPASS project team defines competence as a set of a person's knowledge, attitudes, skills and values, manifested in concrete actions. Competence is a person's ability to act in an appropriate way or give an adequate response in a situation that requires a specific solution. In the context of learning, a competence denotes a quality acquired by the learner, manifested in reflection and action.

The COMPASS project team defines competence assessment as collecting and using evidence of a noticeable achievement of an individual student's progress over a period of time, recognized by both teacher and student, and manifested in a complex task or series of tasks, with the purpose of individual development. Competence assessment goes hand in hand with competence development and planning of competence development.