

STUDENT CENTERED METHODS, SOFT SKILLS AND COMPETENCY BASED LEARNING FROM THE VIEW OF ENGINEERING AND TECHNICAL TEACHER STUDENTS

Ibolya Tomory
Óbuda University
H-1034 Budapest, Hungary

ABSTRACT

In pedagogy, it is often emphasized that we need to go beyond the traditional level of teaching and in addition to professional knowledge to integrate skills that support the acquisition of 21st century skills such as problem-solving, creativity and critical thinking, or social skills and emotional intelligence, which are highlighted in the labor market. These, so-called soft skills, are the hard-to-grasp, non-cognitive skill areas but they are the key to students' later success, the development of which requires the ability to learn competencies and skills and the preparation of future teachers. This study presents a slice of a university example of the integration of student-centered educational practices in the perspective of methods and soft skills in engineering teacher and technical teacher training. As part of a development process, we examined the role of learning-teaching methods in successful learning, in the positive shaping of the teacher's role, and in the acquisition of soft skills. Part of this was the preliminary and subsequent survey connected to the pedagogical subjects, the purpose of which was to map the basic pedagogical/methodological knowledge and the preliminary views of the students. The results of several semesters of development and surveys show that teacher candidates have a positive opinion of competency-based learner-centered approaches, but more pedagogical training and support would be necessary, which has a serious impact on the quality of their own classroom teaching and assessment practices. During the semesters, it also became certain that the necessary skills can be developed and that the students positively evaluate the new approach, learning about student-centered methods.

KEYWORDS

Soft Skills, Competency-Based Learning, Student-Centred Learning, Autoethnography

1. INTRODUCTION

As a result of the technological explosion, there is a rapid and huge change in the skills and competences expected in the labor market, with soft skills at the center. Professional knowledge and higher education no longer ensure successful placement and staying in work, personal and social competences are at least as important. (Handfield-Jones 2007) This shift towards requires the development of key competences without which students, future and already graduated professionals can adapt to the changing world of work with difficulty or not at all (Armstrong-Taylor 2014, Shippman at all 2000)

Hard skills are profession- and job-specific knowledge, while soft skills are non-professional, non-technical skills that can help you operate effectively in a given environment. We can use soft skills not only at work, but in many situations in all areas of life. In essence, they represent a combination of knowledge, how well we know ourselves, how we think and how we interact with the social environment. The development of soft skills at school is necessary because, relying on them, it is easier to work in a team, manage conflicts, express oneself and solve problems. (Penprase, 2018).

Education tries to follow the expectations accordingly curriculum, content and practical renewal is taking place. Researches highlight the need for comprehensive development in schools, which includes process thinking and practical skills that provide students with real-world experience and prepare them for successful work. (Roegiers, 2016). The principle of methodological diversity has been a priority in competency-based education programs for quite some time, which takes into account the development of the student's personal skills as well as the traditionally emphasized professional knowledge. (Rainwater, 2016).

However, some research and dropout rates show that many students in various countries around the world are not prepared for university studies or work (Unesco 2022). This strengthens and urges renewal, a change of attitude, thinking in terms of competence and the integration of the development-based education necessary for this into the daily practice of education. However, in order to develop the skills expected of students, well-trained and prepared teachers with pedagogical competence and commitment are needed. At the same time, many studies point to the lack of well-qualified STEM graduates and the links between learning success, skills gaps and poor teaching quality. (Taylor-Robinson, 2019; Lyche 2010)

In competence-based teaching, it was emphasized that "competency-based approaches to education have the potential for assuring the quality and extent of learning and developing integrated skills that ease learner transitions between school and work". (McClarty and Gaertner 2015:2) The development has different frameworks and approaches, which more or less mention and integrate learner-centered methods into the programs. In Hungary, for example, at the beginning of the 2000s, the definition of different areas of competence and the delineation of related skills appeared in line with and supported by the expectations of the European Union. The area of social competence, which is an important component of soft skills, is outstanding. Curriculum and subject implementation was developed within the framework of a national development program, in which methodologies such as project-based learning or cooperative learning and its methods, project-based learning, and a participation-oriented approach appeared. (Tomory 2008; Kagan 2009)

Adaptations of this are still present in schools today, but strengthening, renewing and placing them in new perspectives is essential. It should focus on learning that supports the ability to create new knowledge and engage students in independent learning, provide opportunities to experience collaboration, interactivity, and allow students to demonstrate their competencies, skills, and attitudes. (McClarty and Gaertner, 2015). A suitable methodological basis for this is research-, problem- and project-based learning, as well as the provision of methodological variety that encourages the development of activity, attitude and attributes, such as student presentations, discussion and debate, cooperative small group work, metacognitive tasks, analysis-research-planning, etc. The integration of modern technological tools, digital learning and blended learning must also become natural in the learning process. (Curry and Docherty 2017; Dilmore-Moore, 2011).

The development of soft skills is not easy to measure, but individual skills are developed in diverse learning environments. Learning contexts include the factors and tools that teachers can influence. To facilitate skill development, for example, in teacher training, interaction patterns can be provided that inform teachers about teaching cognitive, social and emotional skills. The development of soft skills can be identified by what someone thinks about teaching, the role of a teacher, how they reflect on certain questions, problems, and situations. Opinion formation can be tracked, as was the case in this development. (OECD 2015a)

2. METHODOLOGY

The informants are university students who participated in several semesters in a semester-long group project and in a learning process using student-centered methods within the framework of several pedagogical subjects. In order to develop content, methodology and soft skills, we monitored their activity and asked their opinion on the experience and applicability of the joint development of student-centered methods and soft skills.

Data collection was carried out using mixed methods. Using a combination of qualitative classroom observations and autoethnography, and quantitatively, using a questionnaire at the end of the semester. Autoethnography is based on self-observation and the identification of one's own experiences, emotions, and thoughts, on the other hand, it helps to identify the intellectual and emotional state of others. Its greatest value is that it can explain how people interpret their own actions, what meaning and intention they ascribe to them, and it supports self-reflection and self-expression through thought, criticism, and emotion. (Reed-Danahey 2017; Kottak 2002) Autoethnography was applied through self-observation, the students were prepared for this at the beginning of the semester. The significance of this is that the success of the lessons was not evaluated on the basis of external (educator/researcher) observations, reflections and impressions (like traditional observation), but on the basis of student feedback. The purpose of this is to

provide and interpret realistic feedback. The real effect and results of learning with student-centered methods became more visible, as it was clearer, for example, what intention, meaning, and experience the participants associate with their activities. The focus of data collected using autoethnography are summarized in Table 1.

Table 1. Focuses of autoethnographic data collection

	Cognitive side	Emotional site
Reflections on an individual, on oneself	Reflections, expressions about own, individual investment of time and energy	Reflections, expressions about personal experiences and feelings during learning
	Reflections, expressions about individual task solutions for the group's learning success	Reflections and expressions about the development of their own soft skills (empathy, relation to others, openness, etc.)
	Reflections, expressions about the instrumental difficulties of distance and contact with others	Reflections, expressions about the coordination of contact with others and own work in the extracurricular project
Reflections on the group and on yourself as a group member	Reflections, expressions about the group's time management, joint efforts	Reflections, expressions about common learning experiences and feelings
	Reflections and expressions about group learning and task sharing	Reflections, expressions about individual roles and responsibility contribution
	Reflections, expressions about sharing roles and responsibilities in the group	Reflections, expressions about the formation and changes of cohesion between group members
Reflections on learning effectiveness	Reflections, expressions about the effectiveness of the group's task performance	Reflections, expressions about what was difficult and what was interesting
	Reflections, expressions about changes in their own methodological approach	Reflections, expressions about the perception of the connections between their own soft skills and the learned methods
	Reflections, expressions about the furthering and utilization of what has been learned	Reflections, expressions about cooperation and acceptance each other in order to complete a task

We monitored and evaluated the students' performance during individual activities and tasks, as well as in the light of their reflections. It was possible to observe, for example, at what level a person performs his tasks during group work and independent project work, to what level he developed his behavioral and communication skills during his studies. The process could also be made data-like, how much they dealt with a topic or task, how much time they spent on a question, how many times they tried to give the right answer, or how complex the individual project product was.

Considering the accompanying questionnaire survey, the open-ended questions were analyzed using thematic analysis, and the results of the structured questions were analyzed using percentages. 280 students from different semesters responded (between 2018-2023), most of them study technical specialization (96.4%), and only a small proportion (3.6%) study the service specialization. 35.7% of students work in a vocational school and an equal proportion in a corporate environment in education-related or non-educational positions (21.4-21.4%)

We used the experience diary as a tool, which is available in electronic form and feedback can also be sent from a mobile phone. In connection with this, the content analysis of photos, video recordings, student independent video messages, Moodle forum and chat interface supplemented the questionnaires.

This study present some of the results along the following main questions:

- What kind of methodological knowledge do engineering teachers and vocational education students have and to what extent does this change through practical knowledge of student-centered methods?
- How do the teacher candidates see the joint development possibilities of the applied learning methods and soft skills in their own learning and teaching practice?

3. RESULTS

3.1 Educational Methodological Foundations and Changes

First, we examined the previously known methods, as well as the methods learned during the university course and applied as a result, and their popularity. Figure 1 illustrates the percentage of popularity of previously known methods and methods learned in pedagogic classes or applied as a result of them. The answers show that some of the learner-centered methods were known, but the student teacher candidates never incorporated them into their own teaching, and a significant percentage only applied them as a result of the pedagogic classes. Not surprisingly, everyone indicated lecture and explanation as the method used in their teaching so far. Some of them were not familiar with the student lecture (7.1%), the quiz questions (7.4%), but an even greater proportion were not familiar with the mind map (21.4%) and the flipped classroom method (42.8%). The project and cooperative small group learning were also unknown to many (14.2% and 32.1%), while others had already worked with it.

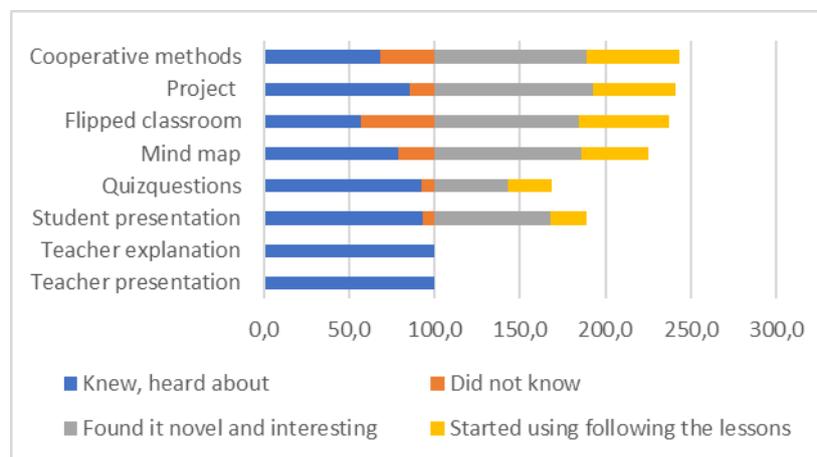


Figure 1. Familiarity and popularity of teacher- and student-centered methods

Regarding the cooperative methods, it should be noted that the students often worked with the Kagan methods during the classroom activities, which we could assume that at least some of them are already familiar with based on the method knowledge answers. However, with the autoethnographic reflections, they said that they did not know these things. They heard about it and believed that when students are divided into groups for a workshop, for example, it is learning using cooperative methods. This was also evident from the class observations, because except for two students, no one knew the terms, tools and methods of group organization and the basic, frequently used cooperative methods such as mosaics or task sending. It also happened that a student introduced a cooperative method from Kagan's methodology in his own school, in the class of his professional subject, and then reported that, unfortunately, it did not work, he failed to organize the small groups themselves, and the students did not want to work in small groups. In other cases, this was not a problem, but the vocational student teacher felt that, as a teacher, control slipped out of his hands and chaos ensued.

The lesson of this is that certain methods cannot be separated from the framework of the approach, because it is not certain that they work automatically by themselves. Some methodological systems must be handled in their context and applied gradually, and the teacher must clearly see and accept the necessary foundations for successful application. The importance of this lies in the correction of methodological mistakes and the laying of the appropriate basic knowledge, conceptual clarification and foundation of approach, and in the teacher's conviction.

With regard to the first main question, it can be concluded that the methodological knowledge of engineering teachers and vocational education students is incomplete and needs improvement. It can also be seen that the methods declared new and interesting by the students in the questionnaire really had the effect

of an experience. This means that the practical knowledge of student-centered methods not only expands methodological knowledge, but also encourages students to be open and innovative, which also helps them to rethink their role as teachers and students.

This does not happen overnight and perhaps it is not surprising that at first the effectiveness of the newly learned methods was considered questionable and only as the semester progressed or with method learning aimed at further practice in the following semester did the process start in the direction of student openness.

3.2 Joint Development Possibilities of the Applied Learning Methods and Soft Skills

Qualitative research methods such as autoethnography make it possible to bring the aforementioned hidden deficiencies to the surface, raise awareness and develop them voluntarily. In this case, by using auto-ethnography, the students were encouraged to express how they experience the process, what they find difficult and interesting. Table 2 outlines some nodes based on the autoethnographic reflections and open-ended questions based on the analysis and summary of the frequency of similar content and similar expressions, and Table 3 cites some examples from the reflective self-expressions, comments, forum messages and open-ended questions.

Table 2. Indicators of changes in learning and role interpretation

Effects on individual learning	Effects on new learning material
supporting independent thinking	supporting, encouraging in different ways
focus, concentration	getting and holding attention
self-confidence, trusting their own abilities	supporting understanding
logical thinking, rational thinking	recognizing connections
increased motivation	increasing the changing of information
experimental learning	experimental learning

The nodes of the changes show the efficiency-enhancing effect of student-centered methods, highlighting the understanding of the curriculum, learning activity and more effective learning. The items referring to the support of individual learning and the attitude to the new curriculum, which can be interpreted as indicators, also indicate the parallel development of the cognitive and emotional side. This confirms the developmental effect of student-centered methods on students' soft skills and learning motivation.

Table 3. Changes in cognitive and soft skill areas as a result of student-centered methods

Change in understanding of the new curriculum	Changing views on cooperation and shared responsibility
I had a better understanding of my own competencies, I learned where and how to improve.	The project, videos and cooperative group work were especially effective for understanding other perspectives.
The more methods we used to familiarize ourselves with the learning material, the more effective knowledge is generated.	The greatest experience was that we did not learn the methods to be learned from a book but were able to try them ourselves and be a part of them. This made it much easier for me to incorporate it into my own teaching lessons.

It's easier for me to filter out the essence.	Even before, I thought cooperation was important, but I didn't think we could really work responsibly as a group. Sometimes there was "social hanging out", but in the end everything and everyone fell into place. So it is worth alternating the methods.
I had to make sure that I knew well what was my task and part of the lesson/topic.	The bond, relationship between us got stronger! The different methods have changed my learning techniques, now I'm not finishing this university cramping, I'm finally FEELING GOOD!
I'm not as insecure as before, I'm more confident that I can...	Lessons at the university are more effective by working together! It's easier to learn that I'm not the only one responsible for something and I'm not the only one responsible if things don't go well.
I can remember longer and more complicated expressions.	The practical learning units highlighted how to do a good job. It is not sure that one method will work, but we can always look for another one that works better for a given group.
I can concentrate better on the essentials. I try to apply learning methods. I became more motivated.	I don't think I would have understood before that there are so many possibilities and methods for teaching, and if I find the right key to the lock of students' learning, then I can have an easier job in the profession.
I was never good at studying, so I didn't expect a huge change, but I think it helped a lot that the lessons involved discussions about the topics and activities instead of lectures.	It pushed me out of my comfort zone, because I had to comment on, had to cooperate and be an active part of a situation in a specific role and then in different aspects.
I learned to study and select, to focus on the important, i.e. actually important, things.	This can be incorporated into workplace communities, educational areas, etc. but even in the life of a family.

In the examples of the table, based on the reflections on the understanding of the new curriculum and the changes in the social skills area of soft skills, it can be established that it is implicit in the expressions and keywords that ensuring student activity is also a way to strengthen learning awareness, managing relationships and belief in one's own abilities. For the most part, the effect on cooperation is indicated as positive, parallel to the positive effect on learning. What can also be counted as a success is that there are also some negative, critical signs that draw attention to the fact that "There are students who find it more difficult to understand the course material this way. It has to be explained to him separately and requires more attention." According to another reflection: "To me, group work is somewhat doubtful. Of course, I can see that over time the students will get better and better and help them. On the other hand, it is also true that it cannot be used continuously with all students. A student with social anxiety will never be able to fulfill themselves if they are forced into a situation where they feel uncomfortable. It would definitely be useful for them if the members of the groups did not change, so that he gets used to the group members better and can participate in the work more openly." Although one casts doubt on the effectiveness and rightly refers to the well-known phenomenon of social stimulation and inhibition, this honest expression also indicates that the student dares to take on and express his opinion, i.e. the pedagogical lessons affected this soft skill component. On the other hand, it also indicates that there is still a lot to learn, which needs to be put in place, since cooperative small group learning helps to solve the mentioned problem step by step, with patiently built, non-forced role exercises. (Kagan 2002; 2018)

With regard to questions regarding the joint development of knowledge, thinking and soft skills, the majority of respondents believe that teachers have the opportunities and tools for these and that their parallel development is feasible. According to the grades given from 1 to 5, a third of the students believe that there are many and good tools available (33.32%), a little less believe that the opportunities are quite good

(30.65%), a smaller proportion think that the conditions can only be ensured moderately (14.63%), but more than that see weak conditions (21.4%), however, no one thinks that they do not have the tools or the opportunity for complex development. (see Figure 2.)

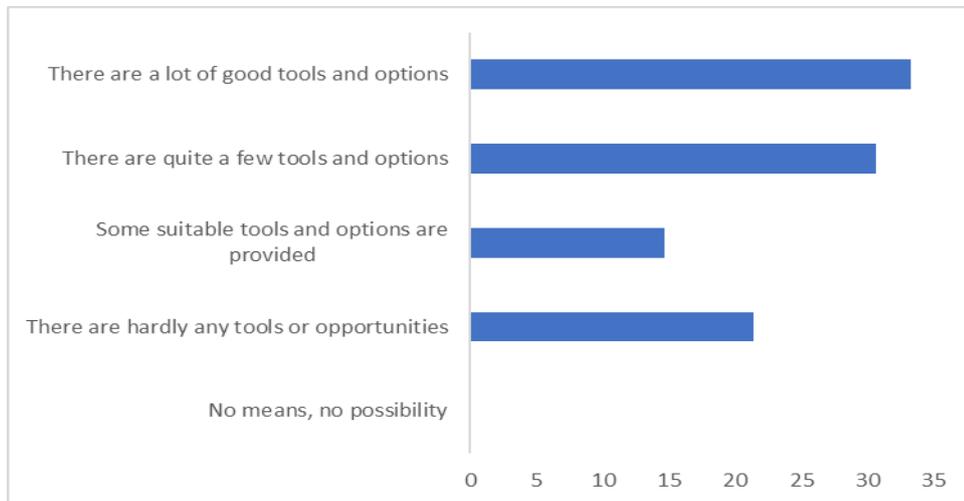


Figure 2. Possibilities for the joint development of knowledge, thinking and soft skills

3.3 The Change of the Teacher's Role and Attitude

In addition to the above, by assigning statements, we asked the teacher candidates how they selected the teaching methods included in a lesson planning task and used during their teaching practice and what pedagogical aspects they considered important. According to the teacher candidate students, the selected elements have a high percentage of support for competence-based learning, which emphasizes complex problem- and research-based thinking (58.7%), and a high percentage of support for social skills, especially cooperation (87.4%). Therefore, the priority is to select the appropriate effective methods (94.3%) and to ensure that understanding can be followed with relevant methods (88.4%). (see Table 4.)

Table 4. Standpoints/Aspects for method selection and knowledge/skill development

Aspect, approach	Statements	Choices%
Selection of optimally effective teaching methods	Very important	94,3
	Pretty important	5,7
	Not very important	0
	Not important at all	0
Traceability of understanding	Very important	24,7
	Pretty important	65,7
	Not very important	9,6
	Not important at all	0
Support for complex research and a problem-based approach	Very important	19,5
	Pretty important	58,7
	Not very important	21,8
	Not important at all	0
Approaches and methods supporting social skills	Very important	88,4
	Pretty important	11,6
	Not very important	0
	Not important at all	0

3.4 Some Elements of Soft Skills

Thinking about soft skills and the changes in individual components were identified with several open questions and we looked at their frequency in the autoethnographic vocabulary and in the related audiovisual materials. The group project products and lesson plans also reflected the strengthening of various soft skill areas and the intention to develop them. A preference order was obtained by ranking the evaluations given on the competence list (5-point Likert scale). (Figure 3.) Collaboration with others and empathy were defined as the most important skills. This is followed by problem-solving skills and communication, then the recognition of one's own emotions and the emotions of others, the handling of interpersonal conflicts, the need to assume responsibility, then work independently, and learn. Leadership skills, the ability to manage and proficiency in the sciences are less preferred. The same order was created for the order of changes and development of one's own skills. (Figure 3.)

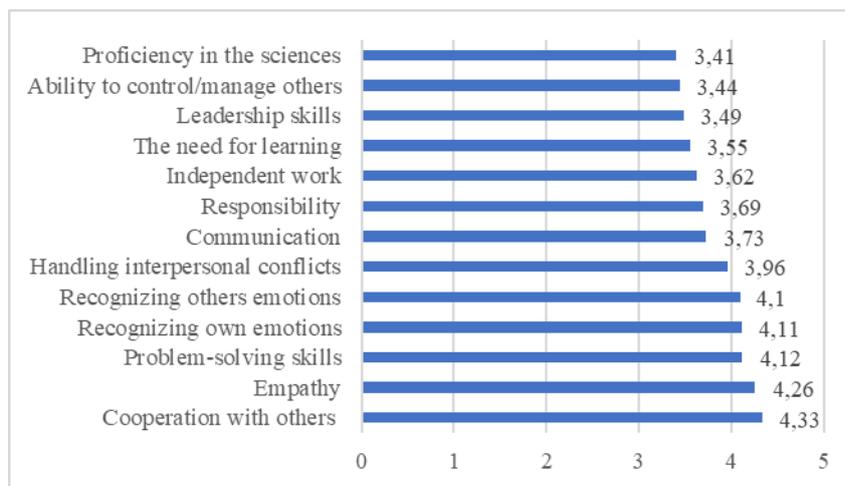


Figure 3. The most important soft skills

The results here also show that the students think more consciously about the connections between soft skills and cognitive subject knowledge.

4. SUMMARY

Based on the development and questioning that accompanied several school years and semesters, it can be concluded that teacher and vocational training candidates see the connection between labor market expectations and the educational methods used in the learning-teaching process, understand the role of student-centered methods and realize that we need to go beyond traditional teacher-centered education. However, they do not have sufficient and appropriate methodological preparation for student-centered, competence-based teaching and implementation, and they do not have enough knowledge to interpret and develop soft skills.

The experiences of the semesters and the student opinions show that all of this can be developed and that it is possible to achieve student openness towards competency-based education starting from student-centered methods. In education we have to overcome difficulties, go beyond the ineffective teacher-centered and cognitive-only approach and instead create a new teacher and student role.

The results indicate that mixed-method education promotes the joint development of the students' soft skills and learning skills, and their effectiveness, which they then bring into the school's daily practice. It is recommended the joint planning and implementation of methodological diversity and skill development in higher education.

REFERENCES

- Armstrong, M., Taylor, S. (2014). *Armstrong's handbook of human resource management practice*. Kogan Page, Philadelphia, USA
- Curry, L. & Docherty, M. (2017). Implementing Competency-Based Education. In *Collected Essays on Learning and Teaching, vol. X.*, pp.61-73.
- Dilmore, T. C., Moore, D. W., & Bjork, Z. J. (2011). *Implementing competency-based education: A process workbook 2009 – 2011*. Universidad de Pittsburgh., USA
- Dr. Kagan, Spencer Miguel Kagan (2009). *Kagan kooperatív tanulás*. Önkonet, Budapest, Hungary
- Dr. Kagan, Spencer Miguel Kagan, Laurie Kagan (2018). *60 Kagan Structures More Proven Engagement Strategies*. Kagan Australia
- Handfield-Jones, H. (2007). Fától az erdőt: a küzdés módjai a munkaerőért folytatott háborúban. In: Gandossy, R.P., Tucker, E., Verma, N. (szerk.): *Gazdálkodj okosan a tehetséggel*. HVG Könyvek, Budapest, Hungary
- Kottak, C. P. (2002). *Cultural Anthropology*. McGraw-Hill Higher Education, Boston, USA
- Lyche, C. (2010). "Taking on the Completion Challenge: A Literature Review on Policies to Prevent Dropout and Early School Leaving. *OECD Education Working Paper No. 53*. OECD, Paris
- McClarty, K. L. & Gaertner, M. N. (2015). *Measuring mastery: Best practices for assessment in competency-based education*. AEI, NW Washington, USA
- OECD (2015a). Skills For Social Progress: The Power Of Social And Emotional Skills, OECD. Paris. http://www.keepeek.com/Digital-Asset-Management/oeed/education/skills-for-social-progress_9789264226159-.
- Penprase, B. E. (2018). The fourth industrial revolution and higher education. Higher education in the era of the fourth industrial revolution, In: Nancy G. (edit) *Higher Education in the Era of the Fourth Industrial Revolution*. Palgrave macmillan, Singapore, pp.207-229.
- Rainwater, T. S. M. (2016). Teaching and learning in competency-based education courses and programs: faculty and student perspectives. *The journal of competency-based education*, 1: 42- 47
- Reed-Danahay, D. (2017). "Bourdieu and Critical Autoethnography: Implications for Research, Writing, and Teaching," *International Journal of Multicultural Education*. 19 (1) pp.144-154.
- Roegiers, X. (2016). *A conceptual framework for competencies assessment*. Unesco International Buro of Education, Paris, France
- Shippman, J. S., et al. (2000). The practice of competency modeling. In *Personnel Psychology*, Vol. 53., No. 3., pp. 703-740.
- Taylor, N. & Robinson, N. (2019). *Secondary education in Sub-Saharan Africa. Teacher preparation and support: Literature Review*. Mastercard Foundation, Toronto, Canada
- Tomory, I. (2008). A résztvevő megfigyelés és a terepmunka: szemlélet és módszer összefonódása. In: *Tanári kézikönyv a szociális kompetenciák fejlesztéséhez 1-12. évfolyam*. Educatio Társadalmi Szolgáltató Közhasznú Társaság , Budapest pp.136-140.
- Unesco (2022). *Transforming Technical and Vocational Education and Training for successful and just transition. Unesco Strategy 2022-2029*. Unesco, Paris, France