NEW LEARNING CULTURE? INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT) AND COMPETENCES IN ENGINEERS' HIGHER EDUCATION

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With the emergence of information society and the growing influence of information and communication technology (ICT) there appears the necessity to develop a new conception of learning and teaching culture, especially in the fields of higher education, with the necessity to re-define the competences and final result of technologically mediated educational process. The new technology of telecommunication makes it possible to simulate, to form and to arrange interactive education by using network technology. Therefore network as a medium serves not only as a space of information and knowledge transfer, but it is also a space of establishing new forms – or perhaps new culture – of communication. In the following considerations the question is how to create and moderate the new learning culture basing on the responsible use of the new ICT in form of e-learning. Finally the article presents the new research approaches which try to combine e-learning with the CLIL-method.

Keywords: informational competences, e-learning, content and language integrated learning (CLIL), engineers' higher education

НОВА КУЛЬТУРА УЧІННЯ? ІНФОРМАЦІЙНІ Й КОМУНІКАЦІЙНІ ТЕХНОЛОГІЇ (ІКТ) І КОМПЕТЕНЦІЇ У ВИЩІЙ ОСВІТІ ІНЖЕНЕРІВ

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З виникненням інформаційного суспільства та зростаючим впливом інформаційних і комунікаційних технологій (ІКТ) виникає потреба розвитку нової концепції учіння й культури навчання, особливо в галузі вищої освіти, через необхідність перегляду компетенцій і кінцевого результату технологічно опосередкованого освітнього процесу. Нова технологія телекомунікації дозволяє моделювати, формувати й організовувати інтерактивне навчання шляхом використання мережевої технології. Тому мережа як середовище є простором не тільки для передачі інформації й знань, але й місцем для встановлення нових форм – або, можливо, нової культури – комунікації. Далі у статті розглядаються питання створення й оптимізації нової культури учіння, заснованої на відповідальному використанні нової ІКТ у формі е-учіння. Нарешті, у статті представлені нові дослідницькі підходи, у яких робляться спроби об'єднати е-учіння з методом інтегрованого вивчення змісту і мови (CLIL)

Ключові слова: інформаційні компетенції, е-учіння, інтеграція вивчення змісту і мови (CLIL), вища освіта інженерів.

Introduction. Technologically mediated culture?
The present new configurations of research pose the question about relations between humanities and engineering sciences – together or against, complementary and integrated or separated and divided – as for didactics, research and system of higher education. The aim is to extrapolate the relevant point of junction between humanities and engineering sciences. Furthermore, with the new technologies is joined the question about the possibilities to form a new system of education which are able to attain new competences indispensable in the technologized and transcultural reality. In this manner technologies are no more only artifacts but became also as a medium of the real space of social life, and finally a space of education (Böhme 2008). But, how far these changes could be identified with emergence of a new learning culture? – The last decades are dominated by two slogans of mobility and globalization as expression of the spatial turn (Soja 1989; Soja 2009; Warf and Arias 2009). With the space is connected another constitutive element for social life – the time. Both space and time as social phenomena make out the theory of spacing (Löw et al. 2008; Löw 2009) which generat-

ed demand of new competences, i.e. flexibility and readiness to mobilies and changes in professional life. All these changes are expressed by the metaphors of multidimensional mobility (Urry 2000) as the permanent process of fluctuations and configurations in social life (Elias 2004; Elias 1997). The new design of space and time corresponds to the necessity of flexibility and innovation which are the main characteristic of the informational society (Castells 2001; Christensen 1997). That is also the background of all reforms and modifications in the educational systems as whole in the last decade. Therefore it is necessary to develop a new conception of learning culture based on new technologies, which shall be virtual and interactive, and with technology understanding as a medium and an in-between, e.g. e-learning, but also with multilingual enlargement of the educational processes (CLIL-method).

With regard to the technological development and progress, and then the present diversity of technologies which have changed human existence, we can distinguish the following paradigms characterizing the science but also the world of today. – At first there are paradigms which express and determine our present time such as transculturality, i.e. the fact of the diversity and plurality of cultures and civilizations, and with searching of the possibilities of dialogue. Corresponding to the transculturality we recognize the other phenomenon – transdisciplinarity – as the dominant inclination in the contemporary science and education. But transdisciplinarity means the overcoming the barriers between particular disciplines on the analogy of crossing the cultural borders by preservation of their irreducible scientific characters. The third paradigm – multimediality – with the new communication technologies creates the spaces of exchange and dialogue between different civilizations and disciplines.

Hereby it should be underlined the specificity of the engineering sciences and education and its philosophical, cultural and social impacts – such as spaces, mobilities, technical gadgetry and technologies at all – with the final question concerning determination of tendencies in social change and development. That means to elaborate the new methodology which consists on comparison and interdisciplinary orientation as the fundamental paradigms of science towards the new technologies, which is respected and used on all levels and spaces of research and education. It means our parts to make contribution in the process of modification the studies programs and research projects. At the same time there appear new needs like the social trust, the sense of responsibility and professional ethics from the one, and the necessity of new education and learning culture with new competences from the other side.

The technological influence on society and culture concerns also its subsystem – the education. Above all the computer technology changed the classical comprehension of teaching and learning interactions. Nowadays computer technology makes out an increasing part of educational process and becomes the fundament of the educational system as the major instrument but also as the space (cyberspace and net) of knowledge transfer. At the same time the social changes – regionalization in the sense of glocalisation and globalization at once – enforce modification of the educational system concerning the methods and subjects inside the study programs. There appear as the new method the e-learning as completion of the standard courses with certain goals, e.g. transcultural and transdisciplinary formation of educational process with acquirement of advanced competences.

Technology as a medium of education: E-learning

At first both – teaching and learning – are social practice and social acts. Therefore the question is "how the technological transformation of social practice like teaching and learning can be realized and what consequences are associated therewith" (Unger 2007: 213). The new learning culture with ICT contains at the same time the necessity to re-define the competences and final result of teaching and learning process, which is integrated in system of communication (Luhmann 1992). Furthermore, the new technologies of education demand a new methodology, i.e. new order of study programs and new strategy by study planning what means an introduction and dissemination of interdisciplinary programs. With the mentioned new perception of space is connected the new interpretation and formation of the special case of space: the institutionalized space of learning and education. The spatial turn and the new communication technology changed irreversible the process of learning and teaching. The communication technologies have created a new dynamic space of education (e.g. e-learning, blended learning with hybrid real-virtual model of teaching and learning process). The learning and teaching process become really virtual one and is based on virtualization.

But the ambiguity of technologies influences also education itself. The technology and computer are not only machine or infrastructure of education but also the medium, i.e. the specific space of transfer which changes the culture of interaction. The educational process transforms from human-human interaction to human-machine and human-program interaction with the so called 'live on the screen'. The new technology of telecommunication makes it possible to simulate, to form and to arrange interactive learning and teaching processes by using network technology. Therefore network as

a medium serves not only as a space of information and knowledge transfer, but it is also a space of creating and establishing new forms – or perhaps new culture – of communication.

These new forms of communication involve modification of the traditional understanding the bounds and borders as barriers for social interaction and social mobility, which with the technological and spatial turn become more flexible and fluent. In this sense technology as a medium become an in-between in educational process (an in-between of sender and receiver). In this point of view technology as a medium and an in-between can influence and determine the individuals and the society as whole, so that the human relations to the others, to the nature and to the cultures "is largely mediated by technical media" (Unger 2007: 215). But the virtual spaces – cyberspace and the net – are at the same time the new cultural spaces. Concerning education that means "the increasing interfusions of virtual and real spaces also as communities. (...) On the basis of ICT, social practices can be technologically transformed and re-implanted in the virtual space" (Unger 2007: 215). The process of re-implantation is based on the interactivity and virtualization. In this manner the new possibilities of technologies have changed the traditional understanding of teaching-learning process which was till now closely connected with interaction in bodily presence and based on the definition of education as a form of direct social interaction without an in-between and another kind of mediation. With the new technology there appears a new paradigm of education as a new possibility: "the (technological) medium did no longer only serve to support the transfer of information, for example by illustration, but opened up a medial space for interactive learning process without a human controller" (Unger 2007: 218). From the other side technology and education conditioned each other, "the technological transformation of education led to an extended significance of technology and technology based spaces in the context of education" (Unger 2007: 219).

The process of technological visualization of education is related with the emergence of multimedia and the possibilities of e-learning realization. There can be distinguished between radical virtualization in form of e-learning from the one hand, and the blended-learning as a form of mixed model of virtual and real elements in the educational process from the other hand. The major characteristic and at the same an advantage of multimedia e-learning is the independence from time and space. Consequently, in the educational context, e-learning and multimedia are understood as a new way of learning which is based on the simultaneous activation of different channels of the consciousness and which enables varied and diversified educational programs. Finally the hybrid or mixed model in the educational process invites to elaborate transcultural and even transdisciplinary programs. Therewith following major modifications of technological form of education appeared: (1) The idea of self-determined learning without sequential setting; (2) e-learning in form of exercise based on radical visualization with strong regulative and controlling process and function of teacher as a controller; (3) intelligent tutorial system (ITS) based on freedom of receiver and learner with the tendency to self-determined learning and non-regulated, that means "to automatically create courses from a content pool in dependence to the user's needs. ITS also try to analyze the cognitive process of the user while learning and permanently adapting the created course to the users cognitive development" (Unger 2007: 221). On this background we can distinguish two principal forms of technology-based learning and teaching culture, which is founded on the different meanings of interactivity. On the one hand we have perfect regulation which included and analyzed the user behavior and as a consequence generates automatically controlling and instructional treatment. On the other hand we have an e-learning model which underlines interactivity with the user and considers his degrees of freedom. In this way the user is an active and constructive part in learning process based on the software and network. This e-learning culture is expressed by the idea of open space and at the same time developable system of education focused on self-determined and simultaneously interactive process. Collaboration and interactivity appear as the main goals in this hybrid e-learning model. With this mixed model is expressed the new strategy and tendency towards creation of open and even unregulated spaces in the teaching and learning process which are conditions for appropriation of advanced knowledge and competence within the transcultural and transdisciplinary higher education.

The choice between regulation and freedom that is the principal dilemma concerning e-learning, then the choice between the radical visualization and classical teaching based on social human-human interaction. Here appears an alternative, i.e. a mixed hybrid model. "Both show a certain measure of regulation on one hand and liberty of movement on the other. While a certain amount of regulation seems to be indispensable for intentional processes, only certain openness allows learning as an active and creative process through which (meta-) competences can be acquired. (...) it seems to be an important task to balance regulation and freedom while designing virtual learning environments. (...) Regarding the concept of 'blended learning', another challenge in designing learning environments is the combination of virtual and real (in bodily presence) elements in a hybrid learning environment" (Unger 2007: 223). The main goals coming from the hybrid and mixed model for the e-

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learning culture are: (1) the flexibility of study programs increasing with the level of study from bachelor to doctor degree; (2) generating by students the sense of responsibility and self-organization, self-management; (3) widening professional formation through transdisciplinary modules (4) and increasing chances on the labor market; (5) forming the readiness for mobility and change the job; (6) forming the ability to motion on the different micro- and macroscopic scales. Finally the hybrid model integrates also direct communication in form of the human-human interaction. – Under the postulates and demands concerning education in the information age we can distinguish: (1) the necessity of lifelong, self-regulated and competence-orientated learning; (2) transforming 'live on the screen' into hybrid model of education with e-learning and blended learning, with virtual and real mixed modules as learning on the screen and on the reality and based on transdisciplinary programs of study, especially concerning engineering sciences.

Formation of competences in a technologized, mediatised and transcultural social reality means the attainment of abilities (1) to motion between different professional fields in the sense of transdisciplinarity, (2) to find one's own way in the plurality of cultures and civilizations, (3) to operate with various forms of technology, and (4) finally to change between the different levels of the social spaces from micro- to macro-scales. It seems that in such social and technological reality as the most important are the transcultural competences based on the high professional qualifications form the one, and the transdisciplinary general education from the other part. At the same time this key-competences should be applicable, durable and transferable in each fields, spaces, cultures etc. Such open and transdisciplinary system of education can be realized at the Universities of Technology, where the two different cultures of science – humanities and engineering sciences – have to be put together in the sense of complementarity which includes also transnational cooperation.

In the context of higher education policy one of the most important elements is the correlation between core competences in education and the indicators of ICT. The role of competences as condition of the technological and intellectual leadership results from the acquired competences during the educational period, so that the system of education determines the potentiality of management and leadership in the macro-scale. This concerns at first the level of the primary and secondary education with regard to the indicators of ICT, which express the educational development and progress, and reaches to higher education and the acquired competences by students. The method to analyze the ICT-indicators is the comparative monitoring of education on the international level, understanding also as a part of strategic international cooperation and policy-making in the field of education at all: "While national monitoring provides evidence regarding educational progress in one country, often countries feel the need for international comparisons for better interpretation of the national educational developments"; hence the increased interest for participation in international comparative educational monitoring, these "assessments are intended to assist policy makers to better understand to what extent their educational system are measuring up with developments taking place in other countries" (EC 2009: 1).

The new information and communication technologies are the skills to modernize the process of learning and teaching. The process of policy-making in the field of education takes place at different levels reaching from local (school and universities) to international cooperation. In this context is argued in the EACEA-Report that "the core areas for monitoring educational progress concern the skills and attitudes of students as well as the opportunities to learn these skills at school and outside school"; the necessity of monitoring the ICT-indicators results hereby form the communication technologies which are "not just an instructional tool, but THE backbone of the information society, which touches upon almost every aspect of private and professional life. Just like reading and writing are traditional competencies transmitted through education, the effective use of ICT for learning, communication and cooperation is one of the basic competencies which schools need to care for. Monitors are needed in order to determine to what extent education systems realize these competencies and in which areas improvements are needed" (EC 2009:1).

The use, dissemination and implementation of ICT in teaching and learning process, for instance in form of e-learning or blended-learning, underlines the importance and necessity of reforms in the educational system. In this context the authors of EACEA-Report notice: "A currently common notion is that educational reforms can only take place if assessment practices are changed (…) that, the core of monitoring ICT in education should be the competencies of students to use ICT for learning in a variety of domains. Conditional factors are of interest for exploring to what extent they have a potential positive impact on these competencies" (EC 2009: 2). – The monitoring of ICT-indicators is focused on the following categories: 1) infrastructure with the attainability to hard- and software and access to the Internet; 2) curriculum with pedagogical approach, e.g. autonomous learning, content with methods development, and assessment with a portfolio or digital license; 3) outcomes and attitudes express by competences or digital literacy; 4) leadership and managing potentiality; 5) connectedness with the

intensity of international cooperation and strategic public-private partnership; and finally 6) teachers' competences.

The opportunities for the students to learn with ICT and to acquire the ICT-competences are recognized as the core areas and the most influential comparative indicators by monitoring of ICT dissemination, use and implementation in form of the education policy. The EACEA-Report stresses that on "the long term a modern system for educational monitoring is needed (…). Designing and implementing such a system is a complex process, in which the engagement of multi-disciplinary development teams is needed. This is a big challenge, but not impossible. Just as mankind is able to build sophisticated telescopes to observe far distant planets, it is certainly possible to create a system of permanent observation of educational progress" (EC 2009: 5).

Interfaces between E-learning and CLIL-method

In the last time the e-learning method is increasingly completed by the developed method of content and language integrated learning. The background of the Content and Language Integrated Learning (CLIL) as a new method of learning and didactics on all level of education is even the multilingual process of globalization and internationalization in the fields of education, research and science from the one, and in the social, cultural, economic and political dimensions from the other side. The increasing degree of bilingualism and multilingualism – especially in Europe and in the member-state of the EU – express also the need of changes in the space of language and content learning, in the acquisition of competences and professional knowledge, e.g. in the engineers education in foreign language. Concerning the classroom-based CLIL research there appear at first 1) the questions of implementation, good practice and learning outcomes involved in this new method, then 2) the questions relating to the bilingual or multilingual reality of education, and finally 3) the question concerning the European context of CLIL, and its political support on the European level, with bilingualism and multilingualism as priorities concerning political integration and social cohesion of the European nations.

The content and language integrated learning (CLIL) characterizes a bilingual or multilingual social and educational environment, and "can be described as an educational approach where subjects such as geography or biology are taught through the medium of a foreign language" (Dalton-Puffer et al. 2011: 1). This definition corresponds to the other forms of bilingual education (e.g. content-based instruction, immersion education) which are developed in North America, above all in Canada with learning of two national languages English and French. This understanding changes in the reality of European practice of CLIL, because it is a matter to use a foreign and not a second language. The foreign language appears in the educational process and does not belong to the everyday social life. It is only a part of education or research activities. In this manner the process of bilingual implementation changes, the accent is shifting to the content, and its transfer from mother tongue to the foreign language is limited by the disciplines or professions: "It also means that the teachers imparting CLIL lessons will normally not be native speakers of the target language. Neither are they, in most cases, foreign-language experts but content experts. Furthermore, CLIL is usually implemented once learners have already acquired literacy skills in their mother tongue, i.e. students rarely learn to read and write through a foreign language but can transfer already existing literacy skills to the foreign language" (Dalton-Puffer et al. 2011: 1). At the moment the aim is to put together content and language learning in form of CLIL understanding as "a dual-focused" and integrated approach in education. The question concerning CLIL is "how much foreign language exposure do students get?", and in the reality of the lifelong learning: "CLIL programs may be short-term or long-term, ranging from a sequence of lessons spanning a few weeks to entire school-years to entire school-careers" or the whole professional life (Dalton-Puffer et al. 2011: 2).

In Europe the CLIL-basing and content orientated programs and curriculums appear as the main innovation in the European educational system in the last two decades. This results also from the dissemination of the study programs in English, where language learning is connected with and determinate through content learning, i.e. certain discipline or profession such as civil engineering in the engineering sciences. This innovation is a result of the process of globalization with English as the new lingua franca, as a language of instruction and learning across the world. The background of the development and dissemination of CLIL is the present European policy of education, research, and science. First of all CLIL is involved and integrated institutionally in the language policy on national and European level. But real source of the turn to CLIL as learning method is the individual reaction of parents and teachers confronted with the effects and results of the post-industrial society which has changed the aims of education, the spatialisation and globalization of economy has entailed the spatialisation and globalization (internationalization) of education, because 1) "an economy becoming increasingly internationally interwoven and requiring ever better educated employees", 2) "the presence

of an international workforce in higher level jobs", 3) "the knowledge of certain languages being crucial on the job market" (Dalton-Puffer et al. 2011: 4). In this sense CLIL appears as a strategic educational element above all in the competition for employment.

From the other side the policy-agents on European-level (European Commission and the Council of Europe) started programs popularizing the CLIL, the content and language learning on all educational level. European Union with 28 member-states and 23 official languages is the multilingual system and organization of policy, culture and society, so that "language policy has a crucial role in implementing the EU's unity in diversity principle" (Dalton-Puffer et al. 2011: 4). In consequence the multilingualism is one of the most important principles of the EU, a strategic factor of the European integration: 1) "for reasons of professional and personal mobility", 2) "as a force for cross-cultural contacts and mutual understanding", 3) as "a desirable life-skill for all European citizens", so that learning and speaking other languages "improves cognitive skills and strengthens learners' mother tongue skills; it enables us to take advantage of the freedom to work or study in another Member State" (Dalton-Puffer et al. 2011: 4; EC 2008). Concerning the language policy of EU we can distinguish the following main stages: 1) the propagation of training in two foreign languages of the Community with learning the first foreign language on the secondary-level of education in the 1990s; 2) CLIL is recognized for the main method and program to learn two foreign languages (EC 2003); 3) the complement of the language policy on EU-level by the cross-national programs with the worked out and developed models and new curriculums; 4) nowadays all the countries of the EU apply to the calls for CLIL (EU-Program Eurydice). Following to this, the language policy of EU expresses a development from educational bilingualism to multilingualism.

Hereby CLIL as an "umbrella term" (Dalton-Puffer et al. 2011: 23) denotes models of bilingual education from the one, and serves as background for the multiple learning scenarios from the other hand. This concerns especially higher education, where the learning of content in a foreign language, above all in English, is completed by research topics, i.e. the didactics and research subjects and objectives are overlapping in an interdisciplinary perspective. In this manner the courses basing on the CLIL-method integrate: 1) the language learning and 'thinking' the content in a foreign language; 2) the acquisition of objective knowledge in a foreign language, and 3) the attempt to formulate or to develop the concept of research in a foreign language. In this context the foreign language appears as the means and not as the object of study and research, "that one of the key characteristics of linguistic development within bilingual learning relates to the fact that it implies vehicular use of language as a tool for the gathering and sharing of knowledge: Language as the means of study rather than the object of study", and above all with the CLIL method students are not regarded as "deficient novices" concerning language but as "efficient users" of the language (Dalton-Puffer et al. 2011: 24). In consequence the accent in didactics process is shifted or switched to the content (the main objective) of learning process. The aim of such approach is the development of the mother tongue in tandem with the foreign language regarding to the main objective of study and research in form of "inter-language development" (Dalton-Puffer et al. 2011: 27). CLIL as a teaching and learning cycle integrates three main stages (Dalton-Puffer et al. 2011: 84-85): 1) deconstruction, where "students' awareness is raised of the purposes, stages and linguistic features of the genre"; 2) joint construction, where "student and teacher together build a representative example of the genre in question (…) are jointly building field knowledge"; 3) independent construction which is focused on the genre preparation by students.

The CLIL-method is characterized with the so called 4Cs approach (content, communication, cognition and culture). Concerning the content by implementation of CLIL method there disappear the distinction or artificial separation between content and language. "Functional descriptions of genre and register portray a rich picture of how meaning is made in social situations, and of how language is the main symbolic tool for learning" (Dalton-Puffer et al. 2011: 97). In the case of communication the learning and teaching practice focus on the distinction between written and oral communication and the content. Regarding to the cognition the accent is shifted to the thinking process and knowledge structures "associated with different subjects". Finally in the case of culture as a CLIL component we can mention, "that incorporating a focus on intercultural competence in CLIL is 'not an option, it is a necessity'" (Dalton-Puffer et al. 2011: 99). – The 4 Cs express the characteristic of CLIL as an educational approach to teach and learn a subject in a foreign language. This is an approach characteristic for the systemic functional theory with the distinction of three levels: 1) content-presented semantics level, 2) discourse level with content typical textual conventions, 3) the level on language production oral and written. The CLIL method is enlarged hereby through method "how to study and learn the academic language of content" (Dalton-Puffer et al. 2011: 147), and the systemic functional theory is oriented on three main aspects: 1) the development of grammatical metaphor, 2) syntactic intricacy, 3) thematic organization (cf. Dalton-Puffer et al. 2011: 150).

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The CLIL-method has an important European dimension with respect of a common system of education. 1) First of all it is the dimension of culture, the cultural significance of CLIL in the process of creating European intercultural knowledge, which is orientated multilingual from the one, and based on the intercultural communication skills on the other hand. The aim of the widening intercultural context is to learn the national cultures, countries, regions and minorities as the integral part of European Union. 2) The building of an integrated system of education in Europe basing among others on CLIL method concerning the acquisition of the language competence with the internationalization of the European education and research. 3) The dimension of content plays the major role concerning the educational process which becomes intercultural, interdisciplinary and inter-language. This means a widening of the learning and study perspectives basing on comparison of the content. 4) With language acquisition the aim is to improve and acquire a deepening awareness of the mother tongue and target language.

The special case of CLIL is the studies programs with English as the participants' lingua franca and as the integral part of the higher education in form of the English-medium courses, where non-language subjects are learned and thought in English. The aim of CLIL on the tertiary education level is above all the development and construction of knowledge by the introduction: 1) the foreign language perspective, and 2) an interdisciplinary perspective, e.g. in the case of the significance of humanities in the engineering higher education. According to the natural learning approach the acquisition of language is contextual and as social phenomenon it is above all social distributed: "Consequently, its acquisition can be conceived of as a process which is socially construed" (Dalton-Puffer et al. 2011: 8). Within the CLIL as a method of learning in general is a process of social and cultural encounters. The main subjects in CLIL-research concern: 1) the outcomes of language learning, 2) the cognitive aspects of learning in CLIL, and 3) the complexity of factors as characteristic of the CLIL learning process. In this manner CLIL as learning method is a three dimensional research space integrating language and content, process and product, micro and macro measure (cf. Dalton-Puffer et al. 2011: 10). The new question is how far there are possibilities to transfer the CLIL-method into the e-learning based on the model of the CLIL-classroom with multimedia and written performance, and integrating language and content (Stępień et al. 2013).

Conclusion

The presented analyses extrapolate the questions with respect to the changes and challenges emerging in the present educational systems with focusing on the new methods of learning and teaching. With any doubts we can observe in the last two decades the process of shaping and establishing of a new learning culture as a result of mass dissemination of the mew information and communication technologies, which have changed the existing hitherto learning and teaching practices. Above all the development and implementation of e-learning method has radically questioned the traditional educational process, which became independent from time, space and bodily presence. Corresponding to this appear today the efforts to expand or to combine the e-learning with the CLIL-method, i.e. to construct educational process independently also from the language of instruction. The e-learning and CLIL methods basing on information and communication technologies allow to prepare curses and to establish an educational platform which would be characterized by open access and above all multilingual aligned, where the restrictions of time, space and language would be abrogated and neutralized. Such new implementation of e-learning and CLIL could be realized by engineers' higher education.

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