

INTEGRATING ENTREPRENEURSHIP AND WORK EXPERIENCE INTO HIGHER EDUCATION

EU-Level Literature Review





TABLE OF CONTENTS

1. INTRODUCTION: THE LABOUR MARKET CONTEXT.....	3
2. WHAT IS WBL?.....	4
3. WBL CONTEXT IN EUROPE.....	5
4. WBL IMPLEMENTATION.....	8
5. DRIVERS AND BARRIERS	10
6. IMPACTS OF WBL.....	11
7. BIBLIOGRAPHY	13

1. INTRODUCTION: THE LABOUR MARKET CONTEXT

In the last 20 years, the labour market has changed dramatically. The globalization of the economy, the shift from a manufacturing-based to an information-based society, the transition to a 'greener' economy, as well as the development of new media and communication technologies have led to significant shifts in structure of the workplace and in the conditions of work (Kennedy, Lawton, & Walker, 2001 in Baaken et al., 2015). These radical changes are putting immense pressure in the role performed by higher education institutions (HEI). The pre-determined and purely theoretical academic curriculum dissociated with the labour market context no longer meets modern employment demand (Johnson, 2000; Clark and Whitelegg, 1998). As today concepts and theories are wide available for an infamous cost, HEI are no longer the gatekeepers of information. In addition, possessing pure theoretical knowledge is no longer the most critical aspect to determine employability. According to Johnson (2000), both students and employers are recognizing that HEI's curriculum possess failures, such as the lack of practical grounds, learning models that are prescriptive, and out of date content. Yet, at the same time, Cedefop (2016) estimates that, by 2020, 35% of all jobs will require high-level qualifications combined to the capacity to be adaptive, innovative and flexible. Consequently, on the one hand, students and graduates are worried about their future employability and on the other hand, employers are already experiencing increased difficulty in finding graduates with skills to match the demands of the post-industrial age. To Pavlin (2014), 21st-century employers are becoming less concerned with the candidates' level of expertise in disciplinary knowledge and more with the possession of an array of more 'general competences'.

This discussion is also important in the context of the European Union (EU), and the debate over the role of HEI in forming better-prepared graduates is an ongoing issue for almost a decade (Birtwistle et al., 2016). With frameworks established by the Bologna Reform as well as by the European Qualification Framework (EQF), an orientation towards higher education focused not just on disciplinary knowledge, but the development and assessment of skills and competences have gain momentum. Moreover, the broader Europe 2020 plan also puts improved education and training systems as critical steps for the EU to improve its competitiveness and achieve sustainable growth as other nations, such as the USA and Japan are advancing at a faster pace (Cedefop, 2016).

In the light of this 'orientation towards competence development', a call for new teaching and learning approaches has become necessary. Although a shift in the learning paradig demands a broad and holistic change in higher education mentality, ranging from national policies to curriculum design, Zlatkin-Troitschanskaia (2017) and other authors defend that a competence-oriented learning also demands a change in learning design. Learning constellations muss encompass a more active participation of learners, where learning is less a result of 'schooling' and more of the active involvement of the students as central actors of their own learning experiences.

At the same time, the external economic and social forces which have led to transforming the purpose and nature of the university have in turn impacted upon the perspectives and expectations which students bring with them to their undergraduate studies. For many undergraduate students studying for a degree is not just about learning for learning sake's and following a particular discipline in depth but rather as Tomlinson points out: 'It now appears no longer enough just to be a graduate, but instead an employable graduate' (2012: 25). Higher education is now viewed by students, as Tomlinson (2012) asserts as being an investment in their future lives in the labour market. They realise that it is a competitive world out there and that to get the best graduate jobs they need to offer more to employers than just their degree qualification. This process also puts increasing pressure on students to engage in activities other than their degree work in order to gain extra credentials to help them in the graduate labour market.

In that context, the past 50 years have witnessed the development of a number of 'active-based pedagogies' where the active participation of the learner is paramount. One of such active pedagogies is called work-based learning (WBL) - the focus of this literature review.

2. WHAT IS WBL?

Academics have defined WBL as a pedagogical structure that provides to students learning experiences oriented for the appreciation of work and practical knowledge (Clark and Whitelegg, 1998). In other words, through WBL, HEIs can foster the preparation of their learners for the labour market through the development of learning instruments that simulate or immerse students in practice environments (Nottingham, 2016).

Under this definition, WBL aims to integrate two normally distinct learning phases; the academic phase and the working phase. The academic phase is oriented towards the critical analysis of theories and methodologies that would be hard to acquire exclusively at the workplace. The workplace phase, on the other hand, is oriented towards on the transfer of a theoretical to a practical experience (Zhang et al., 2016).

Accordingly, WBL creates an environment to stimulate learners to take control of their own learning by promoting the development of skills for lifelong learning such as intellectual, personal, critical and analytical skills that complement the theory being used in practice (Nottingham, 2016). According to Lester and Costley (2010), transferring the traditional programme to a work-based programme can foster personal development as well as the learning of specific skills for the workplace (Overton and Lemanski, 2016). For Bound and Solomon (2001), WBL can promote the proximity between academia, industry and public sector, perhaps closing the gap between them.

Having that considered, the first issue regarding WBL arises already in its definition. Although the most common form of WBL found in HE is probably the internship/placement (Devins, et al. 2016) a wide

range of constellations exist, ranging from work-associated projects with reflective assignments, passing through 'sandwich' in-company training, to fully integrated programs such as dual studies. To make matters worse, in Europe, a list of terms is used interchangeably to define WBL, including workplace learning, work-related learning, vocational learning, experiential learning, competence-based learning and problem-based learning.

However, in the eyes of WEXHE, WBL is defined as: "an educational strategy that provides students with real-life work experiences to apply academic knowledge and understanding as well as subject related and generic skills and competences to develop employability skills and competences." As such, the term 'work-based learning' is used in this project to include, not only WBL that takes place in the traditional workplace, such as apprenticeships, work placements, internships and traineeships, but also entrepreneurship.

3. WBL CONTEXT IN EUROPE

As advocated previously, purely theoretical academic curriculum is giving space for new strategies that incorporate the use of workplace knowledge to achieve a broader range of educational goals (Nottingham, 2016; Overton and Lemanski, 2016). In this context, although still restrained by a number of challenges of varying natures, overall interest in WBL has increased over the last decades (Devins, et al. 2016). Here we will analyse four main aspects of WBL context in Europe: a) its institutional tradition, b) its disciplinary-area tradition, c) its legislative and policy aspects and d) professional training outside of HE.

WBL tradition

According to Cedefop (2012), WBL tradition in Europe is not consistent across borders. At the same time that it has a long tradition in many European countries – especially in northern countries - it is still an emerging concept in others.

In the German-speaking tradition, WBL is strongly associated with different types of vocational education and training (VET), especially the dual study programs implemented in vocational academies and universities of applied sciences. Those programs not only have a long-standing tradition and respected worldwide reputation for its quality but are also supported by various national policies and governmental bodies (Graf, 2016).

In the case of the UK, WBL entails both the provision of a path to integrate higher-level learning with workplace learning, unlocking the potential of students, familiarising them with the workplace environment and enhancing their skills within this sphere, as well as a resource for further developing the skills of those who are already in the workplace environment and in association with life-long learning. Within the frame of WBL one, therefore, encounters the preparation for future employment, training within employment, and training within aspects of life outside of the workplace that serves to

enhance career skills and orientations to the marketplace. A similar notion holds true in The Netherlands, where WBL can be understood as an integration between HE and the world of work as well as life-long learning. Yet, somehow different from the UK, in The Netherlands WBL also carries an important VET component including secondary education.

Now the countries of the so-called eastern bloc (Poland, Slovenia and the Czech Republic in particular) also carry strong historical ties between the universities and industry, with specialized, practice-oriented HEIs focused on vocational and technical schools (secondary school) and a Dual education system (based on the German model). Yet, this cooperation was somehow abandoned at the end of the Communist era. However, although less extensive than in the northwestern countries, a re-emergence can be noticed in the past years.

Finally, in southern European countries, HEIs still have a very traditional approach towards learning, with little space for alternative forms of instruction. Nevertheless, especially in the case of Spain, WBL has gain recent popularity, even though associated with 'simpler' forms of cooperation, such as one-semester internships intermediated by career centres.

Nonetheless, it must be acknowledged that any efforts towards cross-country comparison have faced the challenges of a lack of clear WBL definition, methodological issues in terms of assessment and measurement and the fact that WBL is rarely reported as a distinct learning strategy in national and European reports (Devins, 2013).

Such conclusions were also reinforced by a study called HAPHE (Harmonising Approaches to Professional Higher Education in Europe). Led by the European Association of Institutions in Higher Education (EURASHE), in HAPHE researchers looked into the different levels of provision of professional higher education (PHE) in Europe. Although not necessarily the same as WBL, PHE incorporates WBL in its definition, since it considers PHE as the education provided at tertiary level with a direct connection with the world of work and oriented towards professional needs (Camilleri, et al., 2013). In that context, HAPHE (2016) and PHE (2014) found out that there as a lack of harmonization and transfer of best PHE practices across Europe. For example, the study found out that, around 30% of PHE programmes in Europe do not offer any form of practice-learning phase, even when label as 'applied' courses. Such a lack of common standards is also reflected in aspects such as:

- a. curriculum development: in some countries like Germany the participation of companies is commonplace, whereas in others, like Portugal, there are no differences in the curriculum from universities of applied sciences and research-based universities;
- b. staff requirements: German universities of applied sciences require professors to have at least 5 years of practical experience, whereas most countries in southern Europe practical experience is not required for PHE;
- c. Recognition: In some countries, PHE qualification is fully recognized for post-graduate studies and in other not (Camilleri, et al., 2013).

Disciplinary Tradition

In addition to the form of academic organization and learning tradition, WBL penetration seems to be discipline correlated, with areas such as medicine and primary education, putting WBL as central elements in their programmes, whereas in other disciplinary areas like social and natural sciences, its presence is rare. Additionally, the 'education discourse' also influences WBL penetration (Devins, 2013). It seems that in more 'elitist' institutions, such as old and traditional research universities, as well as countries with a more elitist view towards HE (like France), WBL is often seen as an inferior form of educational delivery. Consequently, WBL is most frequently found in recently formed universities as well as universities of applied sciences.

Policy Context

In terms policy context, there is a general acknowledgement that the development of a workforce more in line with the demands of knowledge age requires a more active role from HEIs as well as different delivery modes, such as WBL. EU Policies such as the Bologna Reform, the European Qualification Framework (EQF), and Europe 2020 have contributed towards this awareness. More than anything, those policies attempt to establish an enhanced cooperation between EU member states to foster vocational training, having the fostering of WBL as one of the strategic pillars.

In more specific terms, initiatives such as the 'The Innovation Union', which aims to increase the rate of success of innovative ideas, are making use of WBL concepts to unite business, HEIs and entrepreneurs. Another example includes the 'Agenda for New Skills and Jobs' whose objective is to have 75% of the working-age EU population employed. That would be achieved through, among other things, the investment in education and training systems such as WBL.

However, despite these trans-national policies pushed by an EU agenda, there is still considerable variation the level of support given by regulatory frameworks throughout the different member states of the EU, with some countries' legislation offering much stronger support for WBL activities than others, such as the case of the Western Europeans in comparison with East-South. It is evident that, in countries where legislation offers more autonomy and flexibility for HEI in terms of curriculum design have shown a higher penetration of WBL activities (Cedefop, 2016).

Professional Training outside of HE

Although not exactly the focus of WEXHE, the role of WBL at work (professional training) is also relevant. In that respect, again, east-west and north-south differences were noticed. According to Cedefop (2016), northern and western European countries showed the highest level of enterprises providing continuing training (in Austria, 78% of companies have some form of continued training),

followed by east (Poland with 29%) and south (Greece with 21%). Although the share of enterprises providing training was, in general, lower in Eastern Europe, companies especially the newer Member States' had shown significant improvement.

4. WBL IMPLEMENTATION

For the WBL to be successfully implemented it demands a modernization in HEI mentality, with a focus on student-centred learning, new strategies of learning and teaching, and changes in the guidance structure and curriculum (Birtwistle et al. 2016). In addition, it demands a self-managed process supported by learning contracts (Johnson, 2000). That means that the HEIs need a set of management parameters that impacts all HE resources (i.e. human, financial and physical); involves all HE levels (i.e. strategic, tactic and operational) and the environment that surrounds it including the community and the national policies.

The demands for such holistic approach were analysed in three important studies conducted at European level and funded with EU resources: 1) WBL as an Integrated Curriculum (WBLIC, 2016); 2) the already mentioned HAPHE (2016) and 3) Apprenticeship and Traineeship Schemes in EU27. All three studies focus on producing a framework for WBL implementation and design which assist decision-makers in both strategic planning and curriculum development.

WBL as an Integrated Curriculum (WBLIC)

Based on the analysis of a series of case studies in 7 different EU countries, as well as secondary sources drawn from similar projects, WBLIC produced a framework for WBL implementation, designed to assist HEIs' decision-makers and employers in the incorporation of WBL into the curriculum, regarding both strategic planning and curriculum development.

The framework divides the process of WBL implementation in four stages: 1) market need, 2) curriculum planning, 3) delivery, and 4) evaluation. It also establishes 3 key pillars sustaining the success of this process: a) partnership, b) organization and c) people.

- I. *Market Need:* the framework sustains that a successful WBL initiative should be driven to meet a market demand, which might be identified either by a forecast of professional/skill shortage in a certain industry, or more specific demands of a company or group of companies.
- II. *Curriculum planning:* the research found out that successful cases of WBL practice are marked by a strong contribution from employers in the design of the curriculum. Furthermore, flexible national regulatory frameworks also play an influential role.
- III. *Delivery phase:* again, a close partnership between the HEIs and partner organization is key; not only in terms of access to company resources but also in the design of WBL activities. In addition, effective delivery is largely associated with the quality of the teaching staff, which

demands a wider range of skills than those commonly found in traditional teaching environments. Furthermore, the pedagogical and administrative support offered by the HEIs also needs to be considered. That often means a need to adopt administrative systems to become more dynamic as well as emotional concealing and supportive for students.

- IV. *Evaluation*: demands a wider scope of activities and people involved in comparison with the traditional classroom model. First, it should involve employers in the assessment process, giving more emphasis in the input from employers in the evaluation. Second, the evaluation process should be mediated by a process of careful reflection on the action in order to build double-loop learning. Last but not least, evaluation should also consider the students' feedback.

Researchers also noticed that 3 important elements must be aligned in order for the framework to work. First, WBL development requires strong collaboration between the HEIs and the partner organization on multiple levels, as described earlier. Also, a strong commitment from HEIs, as a whole, is needed. It cannot depend solely on the initiative of a small group of academics but requires the support of administrative, pedagogical and regulatory systems. Finally, the development of the capabilities of academics and support staff also contributes significantly for the success of the model.

Harmonising Approaches to Professional Higher Education in Europe (HAPHE)

Another interesting framework for the implementation of WBL activities was offered by the HAPHE study. The objective of the framework is to ensure that all institutions which call themselves PHE are guided by minimum criteria. Like WBLIC, the HAPHE framework suggests that:

- I. *the curriculum* should be developed by a common effort from academia, the world of work and local government, taking into account the future needs of the practice and employment;
- II. *the learning outcomes* should reflect knowledge, skills and competences who attend to specific professional requirements;
- III. *the learning content* is offered through an integration of theory and practice in the form of complex problem-solving from real work situations;
- IV. the work experiences serve to *reflect upon theory* in a practical context and not to 'work for work sake' and finally
- V. *teaching staff* must show a combination of academic background and relevant work experience.

Apprenticeship and Traineeship Schemes in EU27

This study written in 2013 by the European Commission portrays the status of WBL (the report calls it traineeship) activity in the 27 EU member states, raising key success factors for its implementation. Similar to both studies mentioned already, the European Commission highlighted:

- I. *Robust Institutional and Regulatory Framework*: one of the critical success factors for a wider and efficient implementation of WBL passes through a well-defined set of regulatory frameworks at national or regional level. Such regulations should stipulate: the main training and skills development requirements; a list of the rights, roles and responsibilities of all involved parties; the duration of the placement and the distribution of academic and in-company time, etc.
- II. *Close Partnerships between Employers and HEI*: the closer companies and HEI cooperate in the design and delivery of WBL, the better the experience is for both students, HEI and company. This level of integration could vary from the offering of semester internship at the end of the program to joint curriculum design and delivery;
- III. *Alignment with the Labour Market Needs*: WBL offering should be aligned to the socio-economic interest of the national, regional or local labour market needs. By attending a market need, the WBL to full employment transfer rates can be dramatically increased.
- IV. *Quality Assurance*: quality assurance procedures, preferably administered by an external single body attends multiple purposes, but typically to: assure that the activities performed by students are relevant and in line with learning objectives (and not a source of cheap labour), that students receive support from the organization, that work conditions are adequate, and that work and study times are respected.
- V. *Guidance, Support and Mentoring*: provision of adequate support, guidance and mentoring to the participants, both at the workplace and at the HEI. One should not assume that lecturers or managers/supervisors at the host organization already possess the skills to be mentors. Possibly it would require special training (train the trainer).

A summary of the recommendation given by the 3 studies is summarized in the checklist below:

- Robust national/regional regulatory framework;
- Alignment with market needs;
- Close collaboration between HEI and the world of work (design and delivery);
- Support to tutors and mentors (train the trainer)
- Quality assurance (learning objectives, work conditions, support to learners)

5. DRIVERS AND BARRIERS

As expected, the implementation of the suggested frameworks can be highly influenced by drivers and barriers. According to Devins, et al. (2016), 3 elements play a critical role as drivers: i) the positive national and EU-level policy context; ii) the level of flexibility given to HEIs (and professors) regarding to program development and iii) history of close collaboration between industry and HEIs.

In respect to policy context, EU projects such as Europe 2020 and the Bologna Reform have put pressure in local governments to acknowledge that HE needs to accompany the rapid changes in

market conditions. Such pressure is producing a fruitful environment for the spread of WBL, at least in the transnational sphere. The issue seems to be that national policies might work for or against these established EU frameworks. Regarding flexibility given to HEI and professors, countries where WBL is seen as a more legit form of instruction, like in most northern European countries, the implementation of WBL is more common and, to some measure, more successful (Devins et al., 2016). Moreover, having a 'richer' curriculum, meaning one that addresses more issues than the simple transfer of propositional knowledge, seems to also promote WBL. Finally, as previously mentioned, a history of close collaboration between industry and HEIs, as is the case of German-speaking countries and the UK (Graf, 2014), also is an important driver supporting WBL.

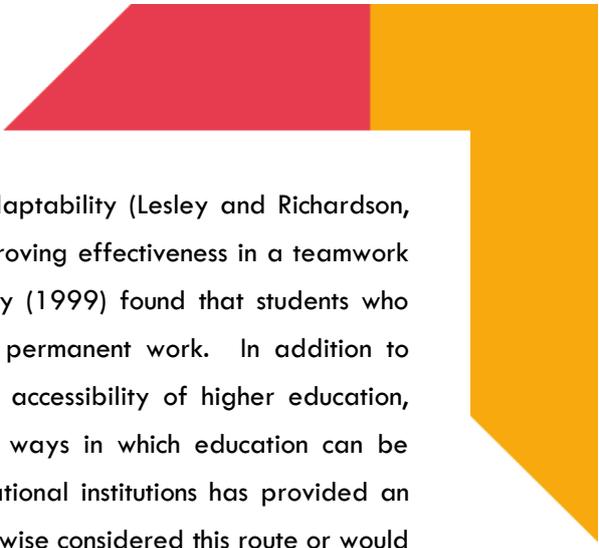
Regarding barriers, past research cited a number of issues. The lack of a common understanding of the term WBL makes it harder for policymakers to report it in policy documents. Also, some countries impose strong regulation in respect to the level of partnership that can be established between HEI and companies, as education is often state-funded yet employers are beneficiaries of cheap, qualified labour force and in some cases, also incurring in intellectual property benefits (Sweet, 2014). On the other hand, companies also pose barriers to WBL considering that they are assuming a number of risks related to the integration often unskilled learners into a production process which is normally complex. Last but not least, as Cedefop and HAPHE researches found out, the lack of harmonization in program organization, curricular development, staff qualification and integration of practical activities in professional higher education institutions across Europe is an obstacle for the transfer of best practices and development of a more concise research base. For instance, the cross-border adoption of minimum standards proposed by the HAPHE framework would help in achieving the goals established in the Bologna Reform, the European Qualification Framework, and Europe 2020.

6. IMPACTS OF WBL

There are not many EU-level studies detailing the impact of WBL on employability and on the development of soft skills, nor mechanisms for quality assurance. The main reason behind this lack of documentation refers to the great variety of existing WBL activities, making it difficult to map. Moreover, employability surveys are specially time-consuming and costly.

Nevertheless, two EU-wide assessment studies gave an indication of the positive impacts of WBL on employability. EU-wide REFLEX (2007) survey suggests that WBL increases a graduate's likelihood of finding a job immediately upon graduation by 44%, lessens the probability of over-qualification by 15%, and reduces the occurrence of skills mismatch by 26%. Similarly, a 2011 Eurobarometer survey showed that 44% of those who had completed some form of WBL thought that it had helped them secure permanent employment.

Particularly in the UK, where the investigation of the outcomes of WBL is more advanced, positive impacts identified by literature include increased job satisfaction and salary (Blasco et al., 2002),



workplace performance (Harvey et al., 2003), commitment and adaptability (Lesley and Richardson, 2000), superior transferable skills (Davidson et al., 1993), and improving effectiveness in a teamwork environment (Hall et al., 2009). Furthermore, Blackwell and Harvey (1999) found that students who have experienced work-based learning are more likely to have permanent work. In addition to knowledge and skills, WBL in the UK had also an impact on the accessibility of higher education, changing perceptions of the role of university education and the ways in which education can be accredited. The promotion of work-based learning in higher educational institutions has provided an entry point for many into higher education who would not have otherwise considered this route or would have been put off by due to lack of confidence or aversion to the classroom environment.

7. BIBLIOGRAPHY

- Baaken, T., Kiel, B. and Kliewe, T. (2015). Real World Projects with Companies Supporting Competence Development in Higher Education. *International Journal of Higher Education*, vol.4(3).
- Birtwistle, T., Brown, C, and Wagenaar, R., (2016) A long way to go... A study on the implementation of learning-outcomes based approach in the EU. *Tuning Journal for Higher Education*. Vol.3(2), pp. 429-463
- Boud, D. and Solomon, N. (2001). *Work-based Learning: a new higher education*. Buckingham: Society for Research into Higher Education / Open University Press.
- Cedefop (2016) *On the way to 2020: data for vocational education and training policies Country statistical overviews 2016 update*. Luxembourg: Publications Office of the European Union.
- Chapman, L., Howkins, E. (2003), Work-based learning: Making a difference in practice. *Nursing Standard*, Vol.17(34), pp. 39–42.
- Clark, G. and J. Whitelegg (1998). Maximising the Benefits from Work-based Learning: the effectiveness of environmental audits. *Journal of Geography in Higher Education*. Vol.22(3), pp. 325-334.
- Camilleri, A. F., Delplace, S., Frankowicz, M. and Hudak, R., (2013), *Profile of Professional Higher Education in Europe*. Knowledge Innovation Centre (Malta)
- Costley C. and Armsby, P. (2007) Methodologies for undergraduates doing practitioner investigations at work. *Journal of Workplace Learning*, Vol.19(3), pp.131-145
- Devins, D; Ferrández-Berruero, R; Kekale, T. (2016) A framework for work-based learning: basic pillars and the interactions between them. *Higher Education, Skills and Work-Based Learning*, Vol.6(1), pp. 35-54.
- Graf, L., et al. (2014), *Duale Studiengänge im globalen Kontext: Internationalisierung in Deutschland und Transfer nach Brasilien, Frankreich, Katar, Mexiko und in die USA* [Dual studies in a global context: internacionalization in Germany and transfer to Brasil, France, Qatar, Mexico and the USA], German Academic Exchange Service, Bonn.
- Graf, L. (2015). The rise of work-based academic education in Austria, Germany and Switzerland. *Journal of Vocational Education & Training*, vol.68(1), pp.1-16.
- HAPHE (2016) Harmonising Approaches to Professional Higher Education in Europe: definition and characteristics of professional higher education. European Commission Life-long Learning Programme. Available at: <https://www.eurashe.eu/projects/haphe/>
- PHE (2014): Professional Higher Education In Europe: Characteristics, Practice Examples And National Differences. European Commission Life-long Learning Programme. Available at: <https://www.eurashe.eu/policy/mission-phe/>
- Johnson, D. (2000) *The use of learning theories in the design of a work-based learning course at masters level*. Innovations in Education and Training International. 37(2): p. 129-133.
- Lester, S. and Costley, C. (2010). Work-based learning at higher education level: Value, practice and critique. *Studies in Higher Education* vol.35, pp.561-575
- Nottingham, P. (2016) *The use of work-based learning pedagogical perspectives to inform flexible practice within higher education*. Teaching in Higher Education. Vol.21(7) p. 790-806.
- Overton, T. and T. Lemanski (2016) *The industry champion approach to developing work-based learning*. Higher Education Skills and Work-Based Learning. Vol.6(2), pp. 120-130.
- REFLEX (2007) The Flexible Professional in the Knowledge Society: General Results of the REFLEX Project. Research Centre for Education and the Labour Market Maastricht University, The Netherlands. Available at: http://roa.sbe.maastrichtuniversity.nl/roanew/wp-content/uploads/2014/02/reflex_book_eu.pdf.pdf



Sweet R. (2014) *Work-based learning: A handbook for policy makers and social partners in ETF partner countries*. The European Training Foundation.

Tomlinson, M. (2012) Graduate Employability: A Review of Conceptual and Empirical Themes. *High Education Policy*, Vol.25(4), pp.407-431.

WBLIC (2016). *Work-Based Learning as an Integrated Curriculum: A Framework for Good Practice*. European Commission Life-long Learning Programme. Available at: <http://www.wblic.org.uk/>

Zhang, B.X., et al. (2016) Facilitating professionals' work-based learning with context-aware mobile system. *Science of Computer Programming* Vol.129, pp. 3-19.