



# A New Approach to Vocational Education and Training on the Example of JSW Szkolenie i Górnictwo Sp. z o.o.

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## Abstract

*In the era of an open global economy, the importance of human resources in creating intellectual capital is important both for shaping work culture and organisation and the ability to stay ahead of competitors. The determinants of the development of the Capital Group of Jastrzębska Spółka Węglowa S.A. are based on the sustainable development of human resources, as well as on a process-oriented approach in the management of innovation. The growth of innovativeness in the Capital Group allowed to develop a new approach to vocational education and training of adults with the use of visualisation equipment and virtual reality techniques. The new approach extending the existing education process, on the example of newly recruited workers in JSW Szkolenie i Górnictwo, wholly owned by the JSW S.A. Capital Group, enables developing and improving specific professional activities or team cooperation. Developing selected skills can significantly improve occupational health and safety. This creates conditions for developing creativity, as well as increases the understanding of processes occurring during team work at selected workplaces in underground mines.*

*Keywords: vocational education and training of adults, virtual reality.*

## Introduction

In the literature and business practice the concept of vocational education and training of adults is relatively often associated with human resources capable of creating intellectual capital in development processes. Dynamic market changes stimulate actions aimed at the development of human resources, as significant "force" enabling the organisation to function under conditions of fierce competition.

Vocational education and training of adults has for years been the subject of numerous scientific studies, carried out both by representatives of the world of science and practice, in the context of "force" capable of creating intellectual capital.

Intellectual capital is a fundamental casual factor in the organisation's identity, stabilisation as well as technical and organisational progress – which, as a whole, provide a decisive competitive advantage<sup>1</sup>.

## A new approach to adult vocational education in the European Union – including Poland

The analysis of factors determining the effectiveness of functioning people on today's labour market, with particular emphasis on the characteristics of a specific working environment, in the light of the new approach to education of the European Commission, demonstrates the importance of education to stimulate economic growth and competitiveness. EC documents and materials on the "New Approach to Education" present specific methods that Member States can apply, so that employees are able to improve their pro-

fessional qualifications as well as social and civilizational competences, while remaining open to the lifelong learning process<sup>2</sup>. The perspective of lifelong learning is closely related to the assessment and confirmation of learning outcomes in accordance with current requirements and needs of the labour market.

Free movement of workforce, both at the level of various sectors of the economy or between countries of the European Union, is based on education, including vocational education, as well as broadly defined training of adults. The adoption by Poland of the EU 2014–2020 financial perspective was related to the provision of a comprehensive and coherent policy framework for lifelong learning in the field of education<sup>3</sup>.

An example of solving problems of assessment and validation of learning outcomes are works on further sectoral qualifications frameworks. They allow for a consistent and unambiguous description of industry qualifications by specifying the Polish Qualifications Framework<sup>4</sup>.

When analysing the documents and recommendations of the European Parliament and the Council of April 2008 on the establishment of the European Qualifications Framework for lifelong learning, the levels of qualifications described with the use of the characteristics of learning outcomes, so-called descriptors, were defined in terms of knowledge, skills and

<sup>1</sup> T.A. Stewart: Intellectual Capital, London: 1997, p. IX. Za: M. Strojny: Metody i narzędzia pomiaru kapitału intelektualnego w organizacji. W: Pomiar i rozwój kapitału ludzkiego przedsiębiorstwa. Red. D. Dobija. Warszawa: Polska Fundacja Promocji Kadr – Zarząd 2003, p. 102.

<sup>2</sup> www.europa.eu. Dokument roboczy służb Komisji Europejskiej, Nowe podejście do edukacji – analiza krajowa 2012.

<sup>3</sup> www.gov.pl Perspektywa uczenia się przez całe życie. Document of the Inter-ministerial Team for lifelong learning, including the National Qualifications Framework.

<sup>4</sup> K.M. Czarnecki, P. Kowolik.: Profesjologiczne i profesjonalne problemy zarządzania oświatą, Katowice 2018, p. 15.

professional competences<sup>5</sup>. The descriptors defining 8 levels of the European Qualifications Framework constitute a coherent reference system for the EU countries, allowing the recognition of learning outcomes in each of the European Union countries. The system includes both formal, non-formal and informal education in general and vocational education, schools and universities as well as education provided in the form of courses and training. "Considering that each country develops its own model of national qualifications frameworks, and then refers to the EQF in the so-called referencing report, it is responsible for its education system, assessment of qualifications, and therefore also for how the practice will verify the value that will be assigned to its qualifications"<sup>6</sup>.

When analysing the implemented NQF solutions, the results of the Educational Research Institute of the works on five sectoral qualifications frameworks for banking, IT, telecommunications, sport and tourism are worthy of mention.

Currently, in the opinion of the Polish Agency for Enterprise Development (PARP), among the submitted proposals in the scope of implementation of projects aimed at the establishment and operation of sector councils on skills - competition no. POWER 02.12.00-IP.09-00-006/18, there is a project submitted by a consortium:

1. Project leader: JSW Szkolenie i Górnictwo Sp. z o.o. in Jastrzębie-Zdrój;
2. Partner 1: AGH University of Science and Technology in Kraków;
3. Partner 2: Polish Mining Chamber of Industry and Commerce in Katowice (Górnicza Izba Przemysłowa – Handlowa w Katowicach).

The submitted proposal – under the Operational Programme Knowledge, Education, Development 2014-2020, Priority Axis II Effective public policies for the labour market, economy and education, measure 2.12 Increasing the knowledge about qualification and professional needs – is the only proposal submitted for the competition for the development of a sectoral qualifications framework for the mining industry in Poland.

The effectiveness of vocational education and training, including competence vocational courses, has a significant impact on the quality of human resources that stimulate economic growth and innovation as well as have a major impact on building a broad spectrum of intellectual capital. On the basis of EU forecasts for 2020, the demand for people with higher education entering the labour market will increase, at a level of around 34% of all participants in the education process. In the same period, it is predicted that the number of people with relatively low or obsolete professional skills and competences will decrease<sup>7</sup>. The developed model of methods of anticipating the demand for professional skills and competences should also be noted.

<sup>5</sup> Słownik podstawowych terminów dotyczących krajowego systemu kwalifikacji, pod red. Stanisława Sławińskiego, Warszawa 2013, p. 41.

<sup>6</sup> Europejskie ramy kwalifikacji dla uczenia się przez całe życie, Urząd Oficjalnych Publikacji Wspólnot Europejskich, 2009, DOI: 10.2766/25471, ISBN 978-92-79-08486-7

<sup>7</sup> Ministerstwo Pracy i Polityki Społecznej, Departament Rynku Pracy: Diagnozowanie zapotrzebowania na kwalifikacje i umiejętności na lokalnych i regionalnych rynkach pracy. Przegląd rozwiązań w wybranych krajach UE i w Polsce, Warszawa 2009, pp. 5-12.

## Identification of educational and training needs of the employees of JSW Szkolenie i Górnictwo

Modern hard coal mining, due to exceptionally difficult and complex geological conditions as well as environmental working conditions in underground mines, introduces more and more automation and remote diagnostics systems – which have been present in the daily life of the miners of Jastrzębska Spółka Węglowa S.A. for a long time.

JSW Szkolenie i Górnictwo needs employees with skills and knowledge – obtained in the process of formal as well as informal education. Skilled employees improve the level of occupational health and safety as well as work effectiveness. In addition, they have higher motivational awareness and the level of work culture<sup>8</sup>.

Employees' competences and ability to learn are a capital that cannot be overestimated. In accordance with its mission, JSW Szkolenie i Górnictwo provides candidates for work in Jastrzębska Spółka Węglowa with the opportunity to acquire knowledge and improve professional competences necessary in a company that focuses on work safety, innovation and efficiency of technological processes.

Theory combined with practice, work under the guidance of outstanding professionals, the opportunity to actively participate in solving everyday problems related to work at a specific position constitute a unique school preparing for performing responsible tasks in JSW S.A.

JSW Szkolenie i Górnictwo was established on 4 February 2014 as a subsidiary of Jastrzębska Spółka Węglowa SA. From the beginning of its operation, the company undertakes activities aimed at preparing and adapting employees to work in the mines of the JSW S.A. Capital Group. In addition, organising vocational training and courses gives opportunity to acquire new professional skills and competences.

The activities of JSW SiG are compliant with the strategy of Jastrzębska Spółka Węglowa. One of the most important elements from our point of view is employment policy.

Therefore, considering long-term employee needs of the entire group, JSW Szkolenie i Górnictwo pursued a supplementary recruitment policy in 2017 and 2018. This resulted in recruiting 3344 employees who, successively, in accordance with needs, were transferred to the mines of the JSW S.A. Capital Group in the period mentioned above.

In the HR Management Office, supervised by the Vice-President of Work on behalf of the Management Board, works on a strategy of employing miners in the several years' perspective were carried out. They were attended by mine work directors, JSW SA management board members, as well as representatives of trade unions. The structure of employment and qualifications needed at specialist positions were analysed and a simulation regarding miners leaving for retirement or other benefits resulting from mining privileges was carried out.

Despite the fact that the company is still an attractive employer for the residents of our region, or Śląskie Voivodeship, a reduced employee supply on the labour market affects also the mining industry. The days when a number of vocational or tech-

<sup>8</sup> M. Guzik: Pomiar wartości intelektualnych i zarządzania wiedzą. W. A. Błaszczuk, J.J. Brdulak, M. Guzik, A. Pawluczuk: Zarządzanie wiedzą w polskich przedsiębiorstwach, Warszawa: Szkoła Główna Handlowa – Oficyna Wydawnicza 2003, p.74.

Model 1. Metody (modele) przewidywania zapotrzebowania na umiejętności i kompetencje zawodowe

FORMAL METHODS - functional analysis, quantitative research allowing generalisation of results, conference models (e.g. scenario); Econometric models; Trends exploration; Survey research.
Methods for political decisions: Combined (quantitative-qualitative) methods; Working groups consisting of practitioners. INFORMAL METHODS
Technocratic methods: qualitative methods (experts, delphi, literature analysis, INFORMAL METHODS

nical school graduates dreamed of working at one of the mines of the JSW S.A. Capital Group are long gone. Young people are less and less willing to study in mining schools. A similar trend is also observed at universities with mining faculties.

In this complex situation, the Management Board of JSW Szkolenie i Górnictwo, made a decision – October 2017 – regarding the commencement of actions aimed at creating conditions for the participation of potential employees of the Company in competence vocational courses.

In addition, stages of implementation of visualization devices and virtual reality techniques with 3D applications in the system of vocational training and courses for newly recruited young workers were planned. The above decisions were made on the basis of identification of educational and training needs for 2018–2020. Implemented solutions allow to pursue a safe education and employment policy for the needs of Jastrzębska Spółka Węglowa mines, which is essential for increasing the level of occupational health and safety, as well as the efficiency and quality of work of underground mine employees.

Free competence vocational courses are organised in cycles of 6 to 8 months. Knowledge and skills are verified by the Regional Examination Board in Jaworzno. In subsequent cycles, the number of the Company's employees as well as employees of the JSW SA Capital Group, who sat exams before the Regional Examination Board – by April 2019, exceeded 1000. At present, the fourth cycle of recruitment to participate in competence vocational courses is in progress, and examinations are scheduled for January 2020.

### **The use of devices for visualization and virtual reality techniques together with 3D applications – in the process of vocational education and training in the Company**

Digitisation and multimedia in the last decade developed dynamically. The technological advancement of equipment for communication as well as for obtaining information, including knowledge, with the use of VR techniques, is currently available to a significant part of the society. The main element of using the mentioned resources will be appropriate preparation of people for aggregation and processing of IT data. Visualization equipment and virtual reality techniques enable reaching recipients in an effective manner by using, for example, four basic senses, such as sight, hearing, touch and smell<sup>9</sup>.

Numerous scientific studies confirm that the use of new technologies, including virtual reality techniques, increases learning effectiveness, because it activates both cerebral hemispheres equally: the left hemisphere, which absorbs verbal information and is responsible for analytical thinking and counting, whereas the right hemisphere receives emotions

and images, and is responsible for creativity, spatial imagination and abstract thinking<sup>10</sup>. According to studies, the level of memorising during training with VR techniques is around 70 percent, and in the case of a traditional lecture only 10 percent is memorised<sup>11</sup>.

On the example of JSW Szkolenie i Górnictwo, which implements, in particular, tasks related to development activity, among others, responsible for the processes of adaptation and vocational training of newly recruited employees. After an adaptation period, lasting from 6 to 12 months, employees have the opportunity to work for an indefinite period in the mines of the JSW SA Capital Group.

Due to numerous accident hazards underground, in particular at specific positions and workplaces with the highest risk of occupational health and safety as well as natural hazards, a decision to extend traditional educational methods by using VR technology was made. The main objective of these course and training education implementations was to develop optimal desirable behaviour through the use of 3D VR tools and software in combination with traditional models of vocational education. Young age of the Company's new employees is worthy of mention - the average age of newly recruited employees in 2016, 2017 and 2018 did not exceed 30 years. In addition, newly recruited employees had relatively low professional qualifications at the level of vocational and general secondary schools. In total, they constituted 66% of personnel employed in the Company. Equipping labs with VR equipment and 3D applications, along with their implementation was possible thanks to the cooperation with the Central Institute for Labour Protection – National Research Institute (CIOP – PIB) in Warsaw and an operator of competence vocational courses, i.e. Centrum Kształcenia Ustawicznego AWANS (AWANS Lifelong Learning Centre) in Katowice, operating in this area on the basis of an agreement with JSW Szkolenie i Górnictwo.

Currently, in the vocational education process, three 3D applications are used, made available free of charge by the Central Institute for Labour Protection – National Research Institute, covering the following topics:

1. blasting works;
2. empathy towards the patient in the medical environment;
3. escape routes and fire protection actions.

A film entitled "360 degrees" is currently being prepared, presenting personnel movement from the shaft, through the cross heading, to the face with an active coal shearer and various means of transport, with particular emphasis on places

<sup>9</sup> M. Żmigrodzka, Techniki wirtualnej rzeczywistości w procesie edukacji, Warszawa 2017, marketing instytucji naukowych i badawczych nr 4(26)2017, pp. 112-199.

<sup>10</sup> Umysł i Osobowość w procesie uczenia się a efektywne wykorzystanie potencjału ucznia, PWN 2013. Materiały konferencyjne – uczyć łatwiej, więcej wiedzieć. Salonik metodyczny kreatywnych nauczycieli, pp. 3-6.

<sup>11</sup> www. [https://www.jswsig.pl/o-nas/aktualnosci/wydarzenie/?tx\\_ttnews%5Btt\\_news%5D=191&cHash=57ad716afb794873e17f8c439daf60cc](https://www.jswsig.pl/o-nas/aktualnosci/wydarzenie/?tx_ttnews%5Btt_news%5D=191&cHash=57ad716afb794873e17f8c439daf60cc)

where accidents at work occur most frequently. Currently, the film is being shot underground in the Combined Mine, Borynia Plant.

The film is produced by the EPIC VR agency from Kraków in cooperation with the Mine's OHS services. The film is planned to be implemented in the process of education of newly recruited employees in June this year.

Another material concerns a 3D application, covering selected first aid issues, laid down in the rules of initial training for new underground employees. The work is carried out by the Central Institute for Labour Protection – National Research Institute from Warsaw. The application is planned to be implemented in the process of education of newly recruited employees in September this year.

### Summary

Due to the introduction of innovative training tools, the process of conducting courses and training changes, because

many operations are automated. In particular, apart from the training process itself, the course of which is verified by properly designed computer software based on virtual reality techniques, tools enabling interactive simulation to verify the knowledge and skills of trainees are used. These tools may also be used for examination purposes, which makes positive educational effects credible. The main element of the process change is that all training applications implemented in the form of interactive VR simulations will be integrated with an ICT tool that aggregates information about the course and effects of training. Data visualisation will be accessed through a web browser, and built-in mechanisms of statistical analysis of the aggregated data will make it easier to identify places that require changes or improvements in subsequent courses and training. A built-in questionnaire system that facilitates the process of collecting data on the self-perceived education process both by participants and trainers, using traditional methods as well as VR techniques, will also be helpful.

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*Nowe podejście do kształcenia i szkolenia zawodowego na przykładzie JSW Szkolenie i Górnictwo Sp. z o.o. W dobie otwartej globalnej gospodarki znaczenie zasobów ludzkich w tworzeniu kapitału intelektualnego jest ważne zarówno dla kształtowania kultury pracy i organizacji jak i dla zdolności wyprzedzania konkurencji. Uwarunkowania rozwoju Grupy Kapitałowej Jastrzębskiej Spółki Węglowej S.A. opierają się na zrównoważonym rozwoju zasobów ludzkich, a także na podejściu procesowym w zarządzaniu innowacjami. Wzrost innowacyjności w Grupie Kapitałowej pozwolił wypracować nowe podejście do kształcenia i szkolenia zawodowego dorosłych z wykorzystaniem sprzętu do wizualizacji i technik rzeczywistości wirtualnej. Nowe podejście rozszerzające istniejący proces edukacji na przykładzie nowo zatrudnionych pracowników w JSW Szkolenie i Górnictwo, które w całości należy do Grupy Kapitałowej JSW S.A., umożliwia rozwój i poprawę konkretnych działań zawodowych lub współpracy zespołowej. Rozwijanie wybranych umiejętności może znacznie poprawić bezpieczeństwo i higienę pracy. Stwarza to warunki do rozwijania kreatywności, a także zwiększa zrozumienie procesów zachodzących podczas pracy zespołowej w wybranych miejscach pracy w podziemnych kopalniach.*

Słowa kluczowe: kształcenie i szkolenie zawodowe dorosłych, rzeczywistość wirtualna