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INFORMATION TECHNOLOGY CONTEXT
IN EVIDENCE-BASED APPROACH AT UNIVERSITY

Summary: In this paper author applies an approach named evidence-based practice to university governance. The Bologna process encourages universities to implement the National Qualification Framework and Student Learning Outcomes (SLOs). Author argues that SLOs and Student Progress Outcomes (SPOs) provide the evidence of quality of educational process. The Information Communication Technology (ICT) tools and new media enable the evidence creating, gathering, monitoring and usage. The paper is to support the general thesis that not only every company is a technology organization, but also every person (e.g., student) is a technology organization. The evidence creates ICT context for university learning and university should be evaluated based on that context.

Keywords: evidence-based management, mobile technology, social media, university.

Introduction

For years, evidence-based (EB) approach has been developed in medicine, dentistry and public health. According to Trinder and Reynolds this approach has been adopted also in other fields, i.e., social work, education, social policies and human resources management [2000]. EB practice proponents claim that the EB approach results in the resource usage controlling.

In the paper, author focuses on the applicability of EB approach for university governance support. The article consists of three parts. Firstly, author presents the EB approach and the characteristics of evidence. Next, author considers student learning outcomes according to the Bologna Process and the National Qualification Framework. The third part includes introduction to the context

considerations and the analysis of the survey results on the ICT support of the university learning.

1. Evidence-based practice

Evidenced-based practice is considered as a scientific approach, which is justified in terms of sound evidence based upon a process of methodical research, evaluation and the utilisation of the research findings in decision making.

EB practice necessitates three things. Firstly, it involves decision making based on the facts and on what the professionals know to be true. Secondly, EB practice means a commitment to hearing the truth, getting the data and acting upon it. Thirdly, EB practice means treating social organization as an unfinished prototype – running experiments and learning all the time. So, the approach is identified with the organizational learning. Gathered evidence can be falsified or accepted and it is always understood according to the established scientific criteria of objectivity. Evidence-based practice is a way of distinguishing professional practice grounded in proven science versus very simplistic, unproven approach popularized by many associations and training providers engaged in business management. EB practice is accepted as an approach that helps people make well informed decisions about policies, programmes and projects by putting the best available evidence into the research [Davies, 2004].

Evidence-based practice is based on the brave assumption that it is possible to provide independent and objective evidence to evaluate policy. Evidence is factual knowledge that supports or casts doubts on the hypothesis [Denyer, 2007]. Evidence is facts that allow people to justify their opinions or explain their attitudes, their proposed solutions and answers to questions. Evidence is the object or substance of what is advanced to support a hypothesis that something is true. That is why an evidence is different from information, data or facts [*Evidence Guide*, 2002]. However, evidence is never waiting for the researcher to find it. Rather, it is always necessary to construct evidence in some way, whether it is an ideological, technical or scientific process.

The techniques for gathering evidence include conducting questionnaires, interviewing management, reviewing system documentation and observing activities. During the process, the people collecting evidence must identify the principal exposures and the controls that attempt to reduce these exposures. Having done so, they can proceed with the testing for compliance with pre-established standards and organizational regulations. Evidence-based management at university means making decisions about the management of university

courses, learning outcomes, teaching staff efforts, and administrative staff and students' work through conscientious and explicit use of four sources of evidence: scientific evidence, organizational evidence, experiential evidence, learning outcomes evidence as well as organizational values and stakeholders' concerns. Generally, evidence should always be located within a dialogue among those who seek to reach agreed-upon conclusions [*Evidence Guide*, 2002]. The meaning of evidence should be recognized in the overall context, in which the evidence is presented. The individual pieces of evidence should be interconnected and mutually reinforce one another.

At university, the evidence-based management is an iterative and incremental improvement process. The decision on what is or what is not an evidence requires iteration approach. Using the education consultancy and university operational audit as a basis raises the problems of selectivity of knowledge and expertise. The auditors' and consultants' expertise must be up to date and well grounded in the most recent research evidence.

2. Evidence in educational process

Discussions on applicability of evidence-based approach for university management should include the requirements of the Bologna Process. Therefore, each university ought to implement European Credit Transfer System (ECTS), European Qualification Framework (EQF) and National Qualifications Framework (NQF). NQF is an instrument for the classification of qualifications according to a set of criteria for specified levels of learning achieved, which is developed to integrate and coordinate national qualifications subsystems and improve the transparency, access, progress and quality of qualifications in relation to the demand on the labour market [*First Glossary*, 2010].

The traditional emphasis on factual knowledge provided by universities no longer meets the requirements of a changing society. The word "competence" is more attractive for both educators and employers, because it is easily identified with value capabilities, qualifications and expertise. Competence is defined as knowledge, skills and attitudes. It is the proven ability to use knowledge, skills and personal, social and methodological abilities, in studies and in professional and personal development. In Poland, universities defined the learning outcomes, which are also expressed in terms of knowledge, skills and attitudes (KSAs). Beyond KSAs model, in other European countries, there are some other similar models, e.g., Knowledge, Attitude, Skills and Habits (KASH) model [Czarnecki, 2013], and Knowledge, Experience, Skills, Aptitude and Attitude

(KESAA) model [*Service Quality Division*, 2010]. In KSAs model, knowledge should not be identified only with understanding. Understanding represents the intellectual capability to use information in a sensible and meaningful way. The information from observations, personal experiences, believes and prejudices in everyday life are also referred to as knowledge. Skills are associated with activities like problem solving, reasoning, assessing, concluding and they include the mental process of analysis, synthesis and evaluation. The cognitive skills are observable in practice, but social competences, i.e., attitudes, are revealed in student behaviours. In EB approach to the university education management, the learning outcomes are the most important drivers of the educational process and as such they require evidence. The KSAs learning outcomes are specified in university program of studies as well as in the individual course description cards. The meta data in course description card and the relationships among them are presented in Fig. 1.
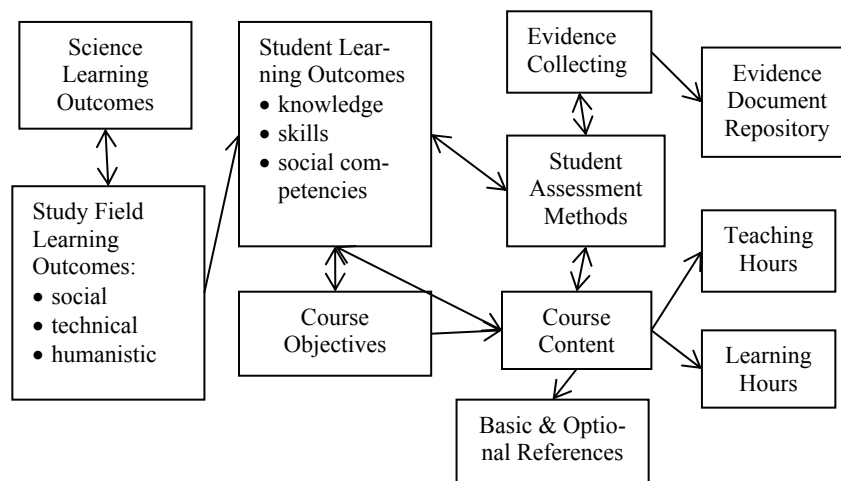

Fig. 1. Course Description Card Metadata Structure

Source: Own.

The science learning outcomes determine the discipline, i.e., field of study, learning outcomes, which are the premise to further specification of student learning outcomes (SLOs) that are included in the course description card. Taking into account the SLOs, the teacher formulates the course objectives, course contents, references and methods of student work assessment. Course contents determine teaching hours and student individual work, i.e., learning hours. Beyond the SLOs and data provided by teacher for the course, the evidence concerns the student work assessment.

Student learning outcomes must be monitored, registered, evaluated and stored in a documentation computerized system. The student learning outcomes are an evidence of education process realization [Cartwright et al., 2009]. The simplified process of student learning outcomes realization includes the following phases:
– defining the program and plan of studies, and simultaneously defining the student learning outcomes,
– aligning course components with learning outcomes,
– selection and implementation of assessment methods,
– evaluation of evidence gathered in the assessment activities.

The student learning outcomes are defined as specific, observable behaviours evidence by students who have achieved the educational objectives. Student learning outcomes are established operationally by teacher and they describe the observable evidence of student's knowledge, skills and social competence. The student learning outcomes are evidencing educational objectives. The course curricula and programs of studies should be designed to meet university strategy, program goals, and educational objectives. Course assessment methods and instruments are selected by teachers and university administrative staff for gathering evidence to show whether students have achieved the expected learning outcomes related to program objectives. The frequently used assessment methods are as follows:
– case study analyses involving a systematic inquiry into a specific phenomenon, e.g., individual, event, program or process,
– portfolios of student projects developed during the studies, particularly during the last year of studies,
– reports based on interviews and observations,
– reflective essays on topics related to identified learning outcomes,
– scoring rubrics for evaluation of essays, portfolios, recitals, oral exams, research reports etc.,
– tests and self-testing aligned to specific course learning outcomes.

Development of an appropriate typology of KSAs is important in promoting student mobility as well as labour mobility in three senses: vertical as in career progression, horizontal as in movement between sectors or among university specializations, and spatial, as in mobility in the enlarged European Union [Winterton et al., 2006]. Therefore, the process of collecting educational evidence seems to be necessary.

Sometimes, the evidence collecting process is difficult to realize. Nowadays, information communication technology (ICT) allows for the registration of

course papers, projects' reports, students' software applications, final theses. Beyond that, registration of student emotions during presentations and oral exams is also possible. Nowadays, university teachers have access online to students' protocols and class room reservation systems. They are communicating with students through email or e-learning systems, therefore, the transferred information can be registered as the evidence of student and teacher activity. Teachers are obliged to insert course syllabi to the computerized systems. In case of e-learning or m-learning they provide course contents online. The course contents are stored on local servers or in private clouds. The educational processes are more transparent than some years ago, when access to ICT systems was not so comprehensive. The universities should ensure the necessary technical tools and consultancy to simplify assembling different items of assignment works and to enable the integration of student works in a coherent personal portfolio. Students usually complete and submit their portfolios during their studies, particularly during the Master studies. Evaluation and scoring of the portfolio can be done by a team of faculty teachers working as a commission. Simultaneously, they participate in faculty strategy development and campus discussion. A portfolio includes works demonstrating: 1) critical thinking and writing, 2) interdisciplinary thinking, 3) historical analysis, 4) creative work and reflection. Students can be requested to present the most personally satisfying works and add to the portfolio the cover letter as well as the learning experience questionnaire. Student portfolio could be used in at least three different ways [Pfeffer, 2012]:

– prospectively, to plan the future course of studies,
– retrospectively, to get a course overview and to find relations between distinct educational activities,
– representatively, to demonstrate competences to potential employers.

Student competence portfolio is developed as a certain portrait of student capabilities. It makes it possible to check what has been learnt to date and what needs to be improved. Portfolio encourages teachers to focus on student outcomes, provide potential employers and the community with credible evidence of student achievement, and inform governmental institution about the university education system.

3. Context-aware learning

Context is important in domains such as decision-making, understanding, interpretation, analysis, diagnosis, negotiations, and learning. These intellectual activities rely on a background experience that is not explicit, but requires hid-

den information and subjective evaluation. According to Brezillon and Brezillon [2008], context is always relative to a focus, therefore the considerations can cover the context of a reasoning, the context of an action and of an object. Contexts have an infinite dimension and cannot be described completely. Taking into account a learning process, context allows the integration of incremental knowledge acquisition and practical learning as part of the process of decision making. The adaptation of mobile devices and new media to the learning process enrich a context of use of information and knowledge. The context of use is a run-time situation and describes the conditions of use of the learning system resources. The context of use of an interactive learning system includes:

– the people, i.e., students, teachers, and the university learning and communication processes,
– the platform used to interact in the learning processes, i.e., Moodle, Blackboard,
– new media, mobile applications and electronic libraries necessary in learning and communication at universities,
– the mobile devices and the hardware necessary in the educational processes,
– the physical environment, where the interaction takes place.

A learning platform is modelled in terms of resources, which determine the way information is computed, transmitted and manipulated by users. Resources determine the amount of available evidence of learning process.

The research on new media and mobile devices usage was realized to reveal the context of university learning. The research covered survey done at University of Economics in Katowice, Poland year by year in 2013-2015. The survey will be repeated in the next years. Students accepted the questionnaire as important for the evaluation of their competencies to use mobile devices in learning processes as well as in other activities. Generally, the students' tasks can be categorized based on the areas that can be affected by mobile technologies. So, there are three categories of students' tasks: information and knowledge acquisition tasks, interaction tasks among students and teachers, and future work planning tasks. Although, each category of tasks has specific requirements in terms of mobile support and there is a need to fit mobile technologies characteristics with the requirements in terms of content, processing, and device portability, this research considers which software applications and devices are used for learning.

The first question group in the survey concerns the issue of what devices and technologies are utilized by the students. The percents of positive answers are included in the Table 1 and in Fig. 2. In 2013 as well as in 2015, 114 students took part in the survey, however, in 2014, 127 students participated in the research.

Table 1. Technologies and mobile devices used by students

Mobile device & technology	2013 n = 114	2014 n = 127	2015 n = 114
stationary phone	2[*]	4	2
mobile phone	31	42	45
smartphone	26	64	61
iPod	3	2	0
iPad	5	6	3
notebook	67	68	66
netbook	20	25	20
desktop computer	43	56	55
tablet	10	14	22
GPS device	1	4	7
RFID device	0	1	5
automatic personal identification device	2	1	2
biometric personal identification device	2	1	1

[*] percentage of positive answers, index applies to all numbers in Table.

Source: Own.

Taking into account the answers, it should be noticed that students reject stationary phones for mobile phones and smart phones. The devices for automatic identification and biometric identification are still not very popular, although new passports are supported by the biometric identification of the owner. They still use desktop computers for learning, because at university laboratories there are desktop computers available, and only part of them prefer to use their own private notebooks at schools.
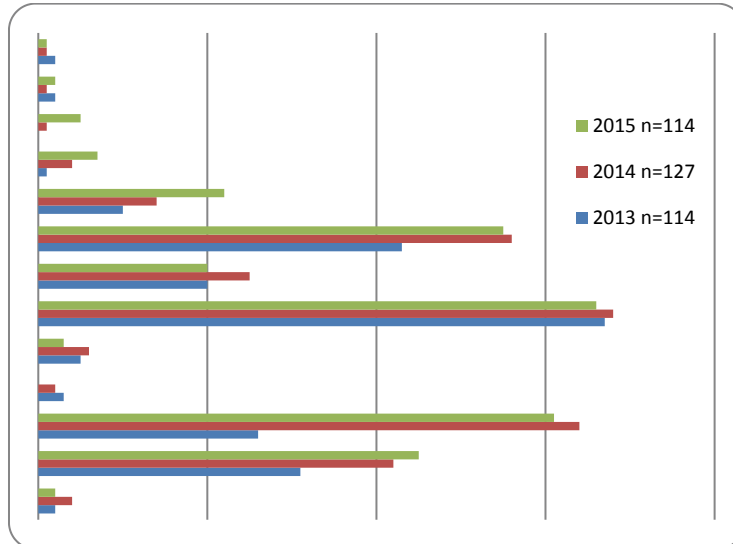

Fig. 2. Percent of students using the mobile devices

Source: Own.

The second part of the survey concerns the popularity of social media, social network portals and communication software among students and use of the technologies for learning support and for social relation development. The survey results are presented in Table 2 and Fig. 3. Email and SMS are the most popular communication forms. The email is known as "killer application" and it is treated as the basic communication form between university faculty staff and students. It should be noted that Facebook is also very popular in contrast with LinkedIn and Where Are You Now? (WAYN). Twitter is widely used in other countries and by politicians, but not by students in Poland. Recommender systems are implemented, but they are not widely approved by students. Perhaps students have their own preferences instead of using the suggested products. However, the percentage of students, who are recommender systems users, is systematically increasing.

Table 2. Communication Software and Social Media Usage

Communication Software & Social Media	2013 n = 114	2014 n = 127	2015 n = 114
email	89[*]	83	86
SMS	61	42	43
chat room	44	42	57
Skype	25	31	31
Facebook	47	65	61
YouTube	45	52	58
Twitter	1	1	1
WAYN	0	0	0
LinkedIn	0	1	5
recommender system	4	1	8
price comparison portal	11	9	23
Google Maps	39	18	47
Wikipedia	74	90	95
discussion fora	46	59	68
blogs	14	29	43
open e-book repositories	47	49	53
open e-publication	67	39	50

[*] percentage of positive answers, index applies to all numbers in Table.
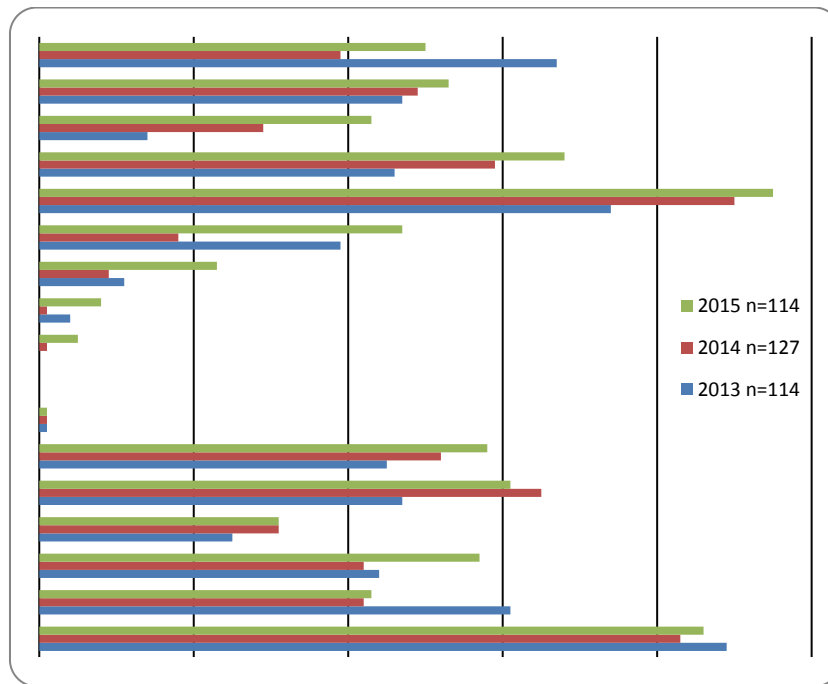
Source: Own.

Fig. 3. Percent of students using new media

Source: Own.

Taking into account Table 2 and Fig. 3, students readily support their learning process by knowledge from open repositories. Reading e-publication is more comfortable than reading printed materials.

Conclusion

Nowadays, gathering student learning evidence is crucial for effective educational assessment. The traditional approach to educational assessment has relied on indirect evidence pertaining to student's self-perceptions of their learning and their perspectives on program structure and curricular contents. Recently, it is not sufficient and the usefulness of passing grades as indicative of the amount and quality of student learning has been questioned by university stakeholders, who expect the evidence of educational processes. Therefore, the student portfolios, departmental evaluations of students' projects and diploma theses, institutional and individual certificates are provided as university identity constructive evidence. Course quality, development and implementation of a customized collaboration capability are not merely a matter of implementation of technology

framework, but it is oriented towards the development of motivation for students to enable their active participation in the value creation process. Partially, the problem is solved, because of the strong involvement of students in the usage of mobile devices, social media and modern technologies in the learning processes.

Accreditation commissions used to analyze supporting evidence that is indirect in nature, e.g., surveys of student perceptions of teachers and course materials, and alumni or employer surveys. Accreditation commissions are oriented towards promotion of a culture of evidence, because evidence is a base of their final decision. Accreditation commissions focus on university digital assets supporting educational processes. However, students' abilities to use different mobile technologies and social media should also be taken into account as determinants of educational processes at universities.

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KONTEKST TECHNOLOGII INFORMACJI W PODEJŚCIU DOWODOWYM NA UNIWERSYTECIE

Streszczenie: Proces boloński skłania uniwersytety do wdrażania Krajowym Ram Kwalifikacyjnych oraz opracowania i wdrażania efektów uczenia się. Zdaniem autora wprowadzenie efektów kształcenia wiąże się z koniecznością uzyskiwania dowodów jakości kształcenia. Autor proponuje w tym celu zastosowanie podejścia zarządzania opartego na dowodach. Autor twierdzi, że narzędzia technologii informacji i komunikacji oraz nowe media wspomagają tworzenie, gromadzenie, monitorowanie dowodów kształcenia. Artykuł ma służyć poparciu ogólnej tezy, że współcześnie nie tylko każde przedsiębiorstwo jest przedsiębiorstwem technologii informacji, ale praktycznie każdy człowiek (a więc także student) stanowi swego rodzaju organizację technologii informacji ze względu na wyposażenie w indywidualny sprzęt i oprogramowanie oraz szeroko rozbudowane możliwości gromadzenia i przetwarzania informacji. W artykule przedstawiono przykład wyposażenia w urządzenia informatyczne studentów, co stanowi specyficzny kontekst uniwersyteckiego uczenia się i uniwersytet powinien być oceniany na podstawie tego kontekstu.

Słowa kluczowe: zarządzanie oparte na dowodach, technologie mobilne, media społecznościowe, uniwersytet.