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RESEARCH IN EDUCATION: SURVEY STUDY

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Abstract

The article describes some results of implementation of WorkPackage 4 (WP4) "Selection and testing new IT tools" in frame international research network IRNet (www.irnet.us.edu.pl) and researchers from partners institution from Ukraine, Poland, other countries. This results concerns analyzing and study the Research activity profile and its assessment. The first part of article includes the theoretical aspects of research as an activity: Research: activity profile, analysing of challenges of research collaboration, research collaboration quality requirement, forms of research collaboration and other items.

Second part of paper described the some research conducted in frame Module 008 WP4 and includes overview of the survey conducted in Borys Grinchenko Kyiv University (BGKU), Ukraine and in University of Silesia (US), Poland concerning the efficient employment of various online search tools for research purposes b three categories of search users: staff members, graduate students and undergraduate students. The cognitive implications of the research efficiency in using online search tools is argued Final part of manuscript contains some conclusions and comments.

Keywords

research, innovation, search, research activity, search engine, cognitive bias, education, ICT tools, assessment, e-learning.

INTRODUCTION

Within modern educational paradigm, the 21st century skills concept (Abbott, 2013) is motivated by the belief that teaching students the most relevant, useful, in-demand, and universally applicable skills should be prioritized in today's schools, and by the related belief that many schools may not sufficiently prioritize such skills or effectively teach them to students.

The basic idea is that students, who will come of age in the 21st century, need to be taught different skills than those learned by students in the 20th century, and that the skills they learn should reflect the specific demands that will placed upon them in a complex, competitive, knowledge-based, information-age, technology-driven economy and society.

While the specific skills deemed to be "21st century skills" may be defined, categorized, and determined differently the term does reflect a general—if somewhat loose and shifting—

consensus. The following list (Suto, 2013) provides a brief illustrative overview of the knowledge, skills, work habits, and character traits commonly associated with 21st century skills: **critical thinking, problem solving, reasoning, analysis, interpretation, synthesizing information; research skills and practices, interrogative questioning; creativity, artistry, curiosity, imagination, innovation, personal expression;** perseverance, self-direction, planning, self-discipline, adaptability, initiative; oral and written communication, public speaking and presenting, listening; leadership, teamwork, collaboration, cooperation, facility in using virtual workspaces; information and communication technology (ICT) literacy, media and internet literacy, data interpretation and analysis, computer programming; civic, ethical, and social-justice literacy; economic and financial literacy, entrepreneurialism; global awareness, multicultural literacy, humanitarianism; scientific literacy and reasoning, the scientific method; environmental and conservation literacy, ecosystems understanding; health and wellness literacy.

Critical thinking and decision-making are determined by behavioral biases (Baron, 2007). Many of these biases affect belief formation, business and economic decisions, and human behavior in general. They arise as a replicable result to a specific condition: when confronted with a specific situation, the deviation from what is normally expected can be characterized by the following cognitive issues: Ambiguity Effect (Jansen, Rieh 2010), Anchoring Or Focalism (Zhang Yu 2008), Anthropomorphism, Attentional Bias (Bar-Haim, 2007), Automation Bias, Availability Heuristic (Goddard 2011).

In lieu of the fact that critical thinking, leadership, teamwork, collaboration, cooperation is considered an integral part of the 21st century marketable skills scope, **the objective** of this paper is to consider the placement of research activities and skills across a comprehensive expertise of required ICT tools in education.

RESEARCH: ACTIVITY PROFILE.

Innovation is generically defined as a "new idea, device, or method" (MWED). However, innovation is often also viewed as the application of better solutions that meet new requirements, unarticulated needs, or existing market needs (Maryville,1992). The term "innovation" can also be disambiguated as something original and more effective and, as a consequence, new, that "breaks into" the market or society. (Frankelius, 2009).

According to Peter F. Drucker, the general sources of innovations are different changes in industry structure, in market structure, in local and global demographics, in human perception, mood and meaning, in the amount of already available scientific knowledge, etc (HBR, 2002).

On the other hand, according to Joseph F. Engelberger innovations require three things: 1) A recognized need; 2) Competent people with relevant technology; 3) Financial support (*Kilbane, 2008*).

Innovation processes usually involve: identifying customer needs, macro and meso trends, developing competences through education and finding financial support *(Hargittai, 2002). As a vehicle of innovation, research* in education is commonly defined as creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of humans, culture and society, and the use of this stock of knowledge to devise new applications (OED, 2015 (WTID, 1993). It is used to establish or confirm facts, reaffirm the results of previous work, solve new or existing problems, support theorems, or develop new theories. There are several forms of research: scientific, humanities, artistic, economic,

social, business, marketing, practitioner research, etc. (OD, 2015), (OED, 2015 (WTID, 1993).

The major steps in conducting research (Creswell, 2008) are: identification of research problem; literature review; specifying the purpose of research; determine specific research questions; specification of a conceptual framework; choice of a methodology (for data collection); data collection; verify data; analyzing and interpreting the data; reporting and evaluating research; communicating the research findings and, possibly, recommendations.

Principle models and corresponding features of research are (Jansen, Rieh, 2008): 1) qualitative research; 2) quantitative research.

Big data has brought big impacts on research methods that now researchers do not put much effort on data collection, and also methods to analyze easily available huge amount of data have also changed (Kara, 2012).

The essential research approach in education was derived into what is known as TRIZ (Theory of Inventive Problem Solving) pedagogy. TRIZ is based on the study and application of the patterns of evolution of various systems – technological machines, manufacturing processes, scientific theories, organizations, works of art, and so on. Based on these patterns, methods have been developed for searching for creative solutions (Aleinikov, 2013, Schwarz, 1991). Experience in using TRIZ has shown that it develops certain useful peculiarities in a TRIZ specialist's way of thinking, such as: the need for creativity; an orientation toward searching for and solving creative problems in various areas; the ability to apply creative methods and models in various areas; the development of a new type of intuition based on the patterns of evolution; the ability to quickly and effectively assimilate knowledge in new areas.

Of all the educational paradigms, e-learning and u-learning (Crowe 2007: 129) relies almost exclusively on collaboration as an educational template, skills formation and assessment tool and ultimate objective. Every step of research procedure requires a use of specific ICT tools and an engagement into collaborative activities. Forms of research collaboration at a means of critical thinking skills formation comprise of 2 groups: 1) Relationship oriented: Affinity networks, Learning communities; 2) Task oriented: Communities of Practice, Project Communities.

Participants of research in education include: Universities, Educators, Students.

Hence, a **student's research environment** comprises of: learning materials (manuals, video, words, audio, multimedia, text, visuals maps), online libraries and databases, professional software (for translation, for statistics, for polling, for computation) enterprises, employment, formal, nonformal and informal education (open sources, wiki, MOOC, corpus, repositories, e-journals, e-conferences) people (peers, experts, supervisors).

Through the rise of Web 2.0 technologies Internet research has had a profound impact on the way ideas are formed and knowledge is created. Common applications of Internet research include personal research on a particular subject (something mentioned on the news, a health problem, etc.), students doing research for academic projects and papers, and journalists and other writers researching stories. Internet research is the practice of using Internet information, especially free information on the World Wide Web (OED), in research. It is focused and purposeful (so not recreational browsing), uses Internet information or Internet-based resources (like Internet discussion forum), tends towards the immediate (drawing answers from information you can access without delay) and tends to access information for free. The most popular search tools (MacDonald, 2015) for finding information on the

Internet include Web search engines, meta search engines, Web directories, and specialty search services.

RESEARCH ACTIVITY CASE STUDY FINDINGS.

A study was conducted at Borys Grinchenko Kyiv University (BGKU), Ukraine and at the University of Silesia (US), Poland, concerning the quality and quantity assessment of research tools usage.

The survey spanned the following groups of researchers: 1) academic staff, 2) doctorate students, 3) undergraduate students.

The most widely-used search tools for research purposes: key word search in search engines (Google, Bing), wiki search, social networks search, library search blog search (Fig. 1):

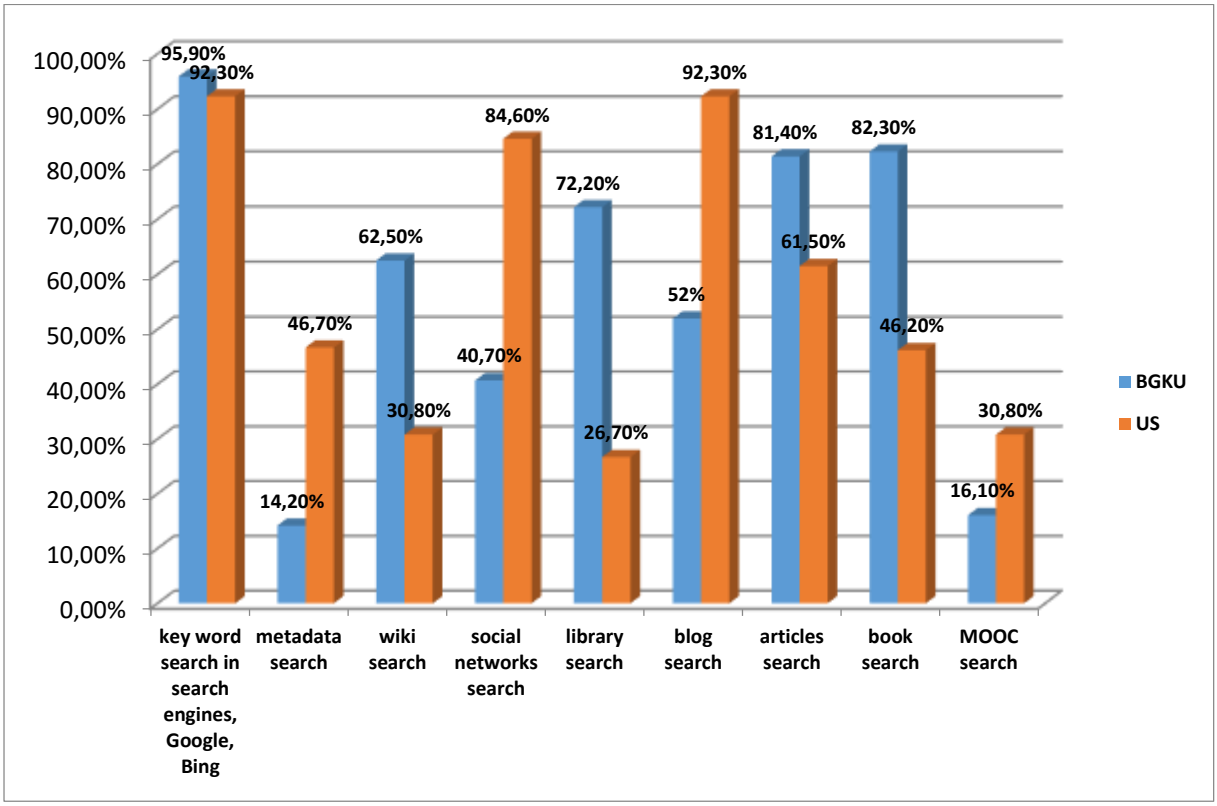


Figure 1. Search tools for research purposes, answers of respondents from BGKU and US (Source: own survey)

In general, keyword or all fields searching is the most common form of online searching and should be used when you need to know what materials the library or database contains on a specific topic. You should search by keyword if you are unsure about the author or title of an item. Keywords are significant words used to describe information in a catalog, database or search engine. The keywords you choose for searching have a large impact on how many relevant records are retrieved.

When a basic keyword search is performed, the system locates words and phrases throughout the bibliographic record (Harris, 2015), which is the information about a book or other item that is listed in a library catalog or database.

Many search engines such as Google and Bing provide customized results based on the user's activity history. This leads to an effect that has been called a filter bubble. The term describes

a phenomenon in which websites use algorithms to selectively guess what information a user would like to see, based on information about the user (such as location, past click behaviour and search history). As a result, websites tend to show only information that agrees with the user's past viewpoint, effectively isolating the user in a bubble that tends to exclude contrary information. Prime examples are Google's personalized search results and Facebook's personalized news stream. According to Eli Pariser (Pariser, 2015), who coined the term, users get less exposure to conflicting viewpoints and are isolated intellectually in their own informational bubble.

However, the results concerning the search availability somewhat tent to disprove the existing theory of the FUTON bias on Figure 2:

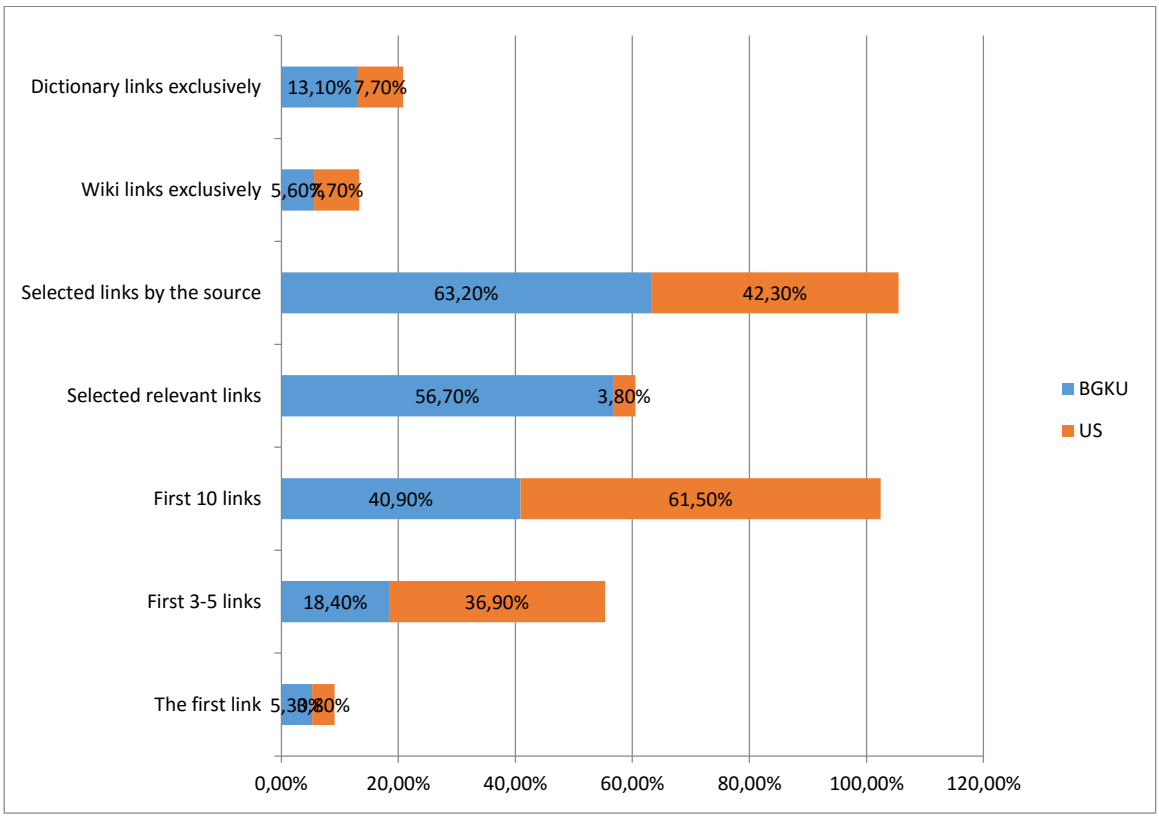
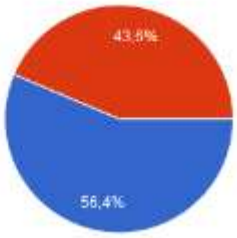
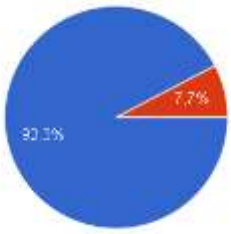


Figure 2 Search results assessment for research purposes. answers of respondents from BGKU and US (Source: own survey)

The FUTON bias is the tendency of scholars to cite academic journals with open access—that is, journals that make their full text available on the Internet without charge—in preference to toll-access publications. (FUTON is an acronym for full text on the Net) (Krieger, 2008). The scholars of the sampled groups tended to use the first the selected results in a single search choice over the 10 results of the search in research activities. The FUTON bias override may be determined by the equal aptitude, demonstrated by the sample group to use both extended (56,4% in BGKU, 92,3% in US) and non-extended search types (43,6% in BGKU, 7,7% in US):



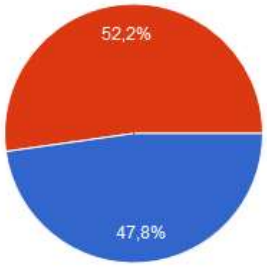


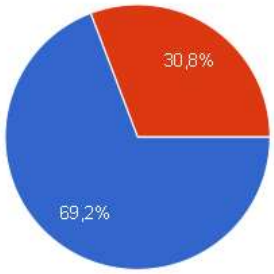
a) BGKU b) US

Figure 3 Extended search use
(Source: own survey)

Boolean logic allows the use of AND, OR and NOT to search for items containing both terms, either term, or a term only if not accompanied by another term (*Stankovic, 2011*). Boolean operators help to narrow or broaden the search (CU, 2016). The most useful logical connectors are **AND, OR, NOT**: **AND** finds records containing both terms which narrows the search; **OR** finds records containing either one or both terms which broadens the search. It can also be used to account for variant spellings; **NOT** finds records containing the first term, but not the second term which too arrows the search.

The sampled researchers' group stated approximately equal aptitude in extended Boolean operators use, with a larger proportion (52,2%) of the respondents from BGKU being unfamiliar with the technique of Boolean logic in online search (Fig. 4 a), simultaneously larger proportion (69,2,2%) of the respondents from US being familiar with the technique of Boolean logic in online search (Fig. 4 b).





a) BGKU b) US

Figure 4 Use of Boolean operators for search purposes
(Source: own survey)

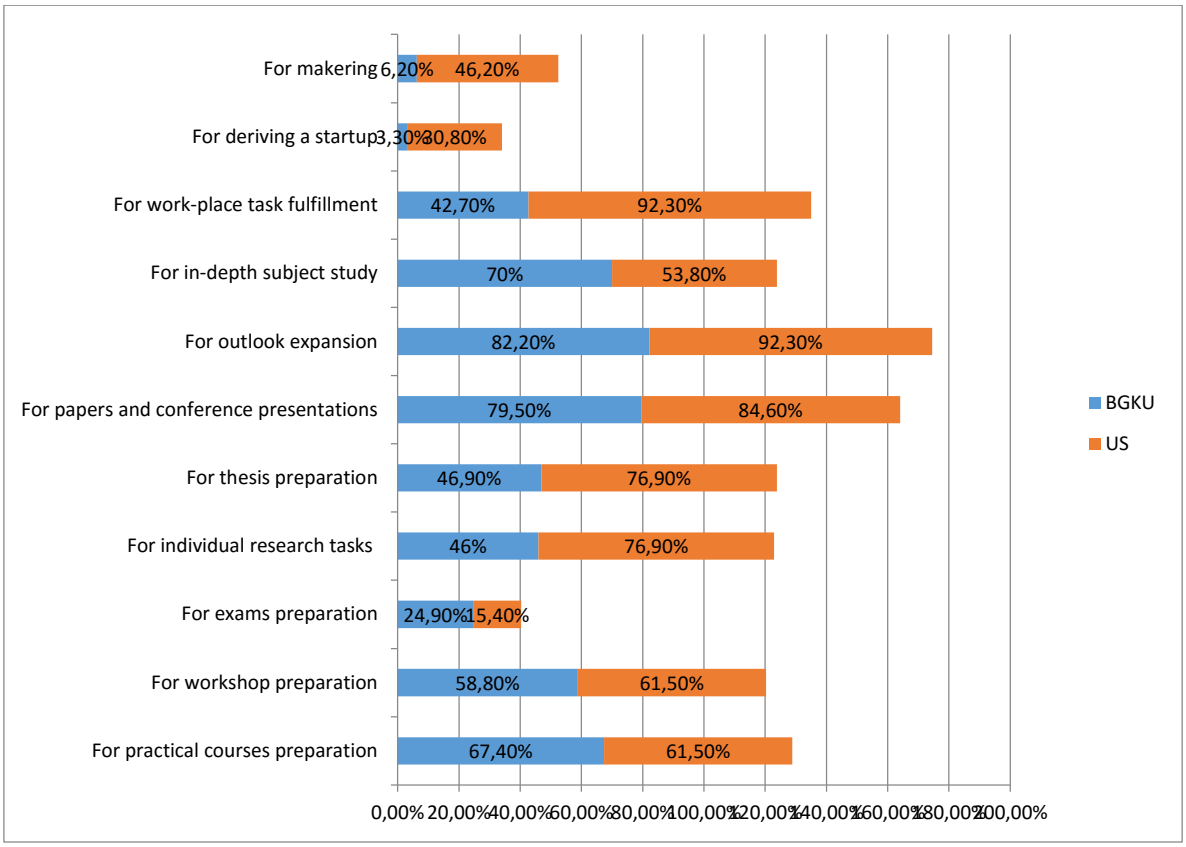


Figure 5 Research purposes types of search tools usage. Answers of respondents from BGKU and US (Source: own survey)

Acordingly, the proportionate distribution of research tasks (Fig. 5) yields the top ranking: practical tasks fulfillment (67,4%); subject matter in depth analysys (70%); articles and thesis preparation (79, 5%) - BGKU. Tha data, received at US adequately – 61,5%, 92,3%, 84,6% and 4th top results - 92,3% for work-place task fulfillment.

In view of the disribution of research activities the onlines search is employed for, it may be stated that the correlation search and research skills application corresponds to the origin of research skills (Claxton, 2002) within the 21st century skills set: investigative **curiosity; attentiveness; patience; hands-on construction; skepticism.**

CONCLUSIONS

In view of the challenges the 21st century skills development pose, it is necessary to develop a different approach to educational courses for undergraduate students and young researchers, based on the specificity of information and knowledge: Specific information: information that relates to specific problems. Non-specific information: knowledge and skills that are widely used by the majority of people in various situations, thinking skills. Logical, systematic approaches, formation of intuition and techniques for verbalizing rules, the ability to use abstract models, idealization, techniques for creative problem-solving, critical approaches, overcome psychological inertia, perform a probabilistic assessment, make decisions given unclear conditions. The ability to work with a knowledge base. The ability to eliminate excessive information, to systemize it. Specific computer search skills. By improving search skills, one can identify information relevant to research without having to sift through irrelevant results. Relatedness between researchers and research topics that is characterized by a *visibility boost*—increase of a researcher's visibility by focusing on a particular topic.

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