How University Students Use Internet Resources: Students' Self-Assessment Vs. Exams Results

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Abstract

There is a generally accepted opinion that young people, born in the era of intensive use of ICT and the Internet, are much better at handling new technologies and using Internet resources than older generations. In support of this claim, it is stated that different digital technologies and the Internet have been a natural environment for these generations since birth. This paper aims to check to what extent the above statements apply to University of Mostar (SUM) students. For this purpose, the authors researched SUM students to determine how they self-assess their knowledge and use of Internet resources. On the other hand, it was necessary to use Internet resources to pass exams in certain subjects. In this paper, the authors compared the results obtained by surveying students with actual exam results. The results of the research suggest that the students have relatively good knowledge and coping skills with the tasks they solve within the individual courses of their studies. However, Insufficient mastery of the Internet and its information is indicated by lower ratings of the ability to evaluate found materials and ratings of the ability to use the advanced functions of the Google search engine.

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Introduction

The ongoing advancement of information technology (IT) brings new opportunities and challenges to every aspect of human life. The global COVID-19 crisis has demonstrated that most organizations can switch online swiftly and increase their level of digitalization nearly overnight. It was the COVID-19 crisis that proved the need to improve everyone's digital literacy, from the youngest to the elderly. That is required to sustain and accelerate the global digitalization process, which gained speed and force due to COVID-19.

The importance of digital competence to the knowledge society was recognized long before the COVID-19 crisis. As defined by UNESCO (2023), knowledge societies focus on people's skills to gather information, analyze it, and employ what they learn to advance humanity. In today's knowledge-based world, personal and professional success depends on effectively using digital tools (Graziano, 2018; Kim, Xie and Cheng, 2017). Digital competence has been identified by the European Union (EU) as a key competency for lifelong learning that can guarantee full and productive involvement in both society and the economy (EU, 2006). Universities play a pivotal role in fostering innovation and new technologies and preparing students and researchers for the new digital reality (EC, 2022). The European Commission envisioned a European Education Area and launched a specific Digital Education Action Plan (EC, 2018) in the Communication' Strengthening European Identity through Education and Culture (EC, 2018). In 2022, the EU launched two initiatives related to digitalization: a European Strategy for Universities and a Commission proposal for a Council Recommendation on building bridges for effective European higher education cooperation (EU, 2022). In its strategic vision, Digital Decade (EU, 2021), the EU has set an exceptionally ambitious goal: 80 % of EU citizens have at least basic digital skills, and 20 million ICT specialists will be employed by 2030. Universities will play a key role in achieving this goal by developing students' digital skills and offering and conducting various IT-related training for the social community.

Nonetheless, it is believed that learning digital skills can be challenging (Jang et al., 2016; Winberg et al., 2019). To be competitive in this area, students must be equipped with 21st-century abilities such as data literacy, problem-solving, programming, and creative thinking (Lavi et al., 2021). Employees with these skills are more likely to be valued by employers (Habets, 2020; Rios, 2020).

The majority of HEIs have acknowledged the necessity to modify existing curricula to meet the needs of the twenty-first century, including an emphasis on digital skills. As a result, students must educate themselves to prevent being laid off by their future employers (Mahmud and Wong, 2022). Despite the well-established need to develop digital skills, many people have had little exposure to them. Most of them believe that the problem stems from a lack of explicit and appropriate instruction on developing these essential abilities, leaving them feeling useless despite their enthusiasm to learn. While coping with challenges in modern society, these people will eventually lose their advantage over those well-equipped with digital skills (Joynes et al., 2019).

Most individuals, including students, now rely on the Internet as their primary source of information. Nevertheless, because anybody can publish stuff online, the Internet is rife with irrelevant, biased, or misleading information. As a result, critically assessing and evaluating digitally represented material is essential for dealing with the flood of unstructured data and making informed decisions about the information presented online (McGrew et al., 2018). Searching and source evaluation refers to the assessment of information and sources found online, and it includes the ability to select, understand, and evaluate relevant texts on a website, as well as to judge

whether a source is credible by using additional online resources and cross-checking with other search results (Nagel et al., 2020).

It has long been assumed in higher education that students, as the generation of digital natives, are proficient in computer use and information retrieval and hence use digital media competently (Murray and Pérez, 2014; Kopp et al., 2019). Recent research, however, has revealed that students are not very good at determining which online sources may be trusted (McGrew et al., 2018; McGrew et al., 2019; Maurer et al., 2020). Students, despite being familiar with a variety of digital media (e.g., social networking sites, video websites), use them primarily for private entertainment or social exchange and are incapable of applying their digital skills in higher education and critically transferring information-related skills to the learning context (Ciampaglia et al., 2018). Students frequently make snap judgments about websites without looking into their history or the reliability of the author, based on factors like the order of search results and the authority of a search engine, the website design, or prior experience with the websites and the content offered there (McGrew et al., 2017). Student use of all web search tools was rudimentary, with Wikipedia and Google being the most popular despite low-reliability ratings (Maurer et al., 2020). Students base their thoughts and judgments on the information they find. Thus, they must learn how to properly evaluate and, in particular, select trustworthy websites and the material inside them. Students would undoubtedly make poorer or wholly erroneous judgments if they relied on websites that contained biased or distorted material. That makes it all the more concerning that preliminary research suggests that students have difficulty determining which websites to trust and how to evaluate their credibility (McGrew et al., 2019). Therefore, the assumption that all today's students share a natural affinity for technology is unreasonable (Nagel et al., 2020). To deal successfully with internet material, today's students must first learn to critically question, investigate, and assess it (Kopp et al., 2019).

All this motivated the authors to research to determine to what extent the finding mentioned above applies to students of the University of Mostar (SUM). The goal was to compare the student's results on faculty assignments and the results of their self-assessment of their ability to use the Internet and Internet information.

Methodology

The database was formed from the students' results on the homework and tasks during class and their answers by filling out the survey questionnaire. The tasks were carried out during the winter semester of the academic year 2022/2023 (1 October 2022 – 31 January 2023), and the survey was conducted at the end of the first month of 2023. A short description of homework and tests realized during classes is shown in Table 1.

Table 1
Description of homework and tests

Problem/task	Code	Description
Homework 4	Dz4	Watch the given video online, describe the process it shows, and draw the corresponding BPMN process using the provided software.
Test 5	T5	Search the Internet for information about ERP manufacturers and choose 3 ERP systems you will describe in more detail - list their characteristics.
Homework 5	Dz5	Look for examples of successful and unsuccessful ERP system applications on the Internet. State which ERP systems are involved - two good and two bad examples.

		Highlight the positive aspects of their application (minimum five advantages) and highlight the shortcomings/problems that led to their unsuccessful application (minimum five issues).
Homework 6	Dz6	Choose 2 (two) from the offered BIS (business information system) development methodologies. Search for information on the chosen methodologies on the Internet, and for each one, list and briefly explain its stages, as well as state advantages and disadvantages (at least three each).
Homework 9	Dz9	On the given web page, analyze and describe the database ranking methodology. Find two rankings of the best databases for the past year and compare their methodology and results.
Homework 11	Dz11	Search the web and find three successful stories related to the application of business intelligence (business intelligence success stories), with the fact that each story MUST be about a different tool (platform/software) of business intelligence. - State the website from where you downloaded the story, which business intelligence tool/platform was used, what makes it a success story for a specific company/organization, and what analytical capabilities the used platform offers.

Source: Prepared by the authors

Based on the student's answers, the % of accuracy was determined for each task (expressed in decimal numbers).

The authors prepared the survey questionnaire. It contained:

1. A question about the use of the Internet as a source of information for university duties, for additional education, for finding literature for creating assignments, writing seminars and final theses,
2. A set of tasks for self-assessment of one's Internet search abilities, recognition, understanding, evaluation, and assessment of the accuracy of found materials.

The offered answers were as follows:

1. rating scale from 1 to 5: 1 - never, 5 - always,
2. rating scale from 1 to 5: 1 - no ability, 5 - excellent ability.

The research included 67 third-year students in the first cycle of studies at the Faculty of Economics of the University of Mostar who attended the Business Information System course. IBM SPSS Statistics, version 25, was used for statistical data analysis.

Results

Test and homework results

The results of tests from classes and completed homework show relatively high results, which are confirmed by the means - all means are higher than 80% (Table 2). As expected, some students had a very poor performance on some tasks, but others had a 100% test performance. Among the analyzed tasks, homework 6 stands out - the performance on this task was higher than 55% for all students.

Table 2
Descriptive statistics of performance on tests and homework

Code	Min	Max	M	SD	CV (%)
Dz4	0.33	1	0.85	0.21	24.7
T5	0	1	0.85	0.30	35.3
Dz5	0	1	0.83	0.28	33.7
Dz6	0.67	1	0.92	0.12	13.0
Dz9	0	1	0.85	0.21	24.7
Dz11	0	1	0.52	0.31	59.6

Note: Min – minimum; Max – maximum; M – mean; SD – standard deviation; C – coefficient of variation
Source: Prepared by the authors

The unweighted average of achieved results on homework and assignments is M=0,800 (SD=0,117)

Survey results

Students primarily use the Internet for information, that is, as a source of various information - all students gave grades 4 and 5 to the statement related to the mentioned activity (Table 3). The results for the statement about using the Internet to search for literature that will be used for writing seminars and final theses are similar (more than 85% of students agree or completely agree with the statement). The scores for the other two purposes of Internet use are somewhat lower. The assessment of the claim about using the Internet for additional education is particularly surprising. Almost 70% of respondents do not agree with the statement or have a neutral attitude, which shows that students do not recognize the Internet as their teacher.

Table 3
Reasons for using the Internet among the surveyed students

	Number of responses (%)						
The purpose of using the Internet	1-never	2-rarely	3-often	4-very often	5-always	M	SD
a source of information	0	0	0	11 (16.4)	56 (83.6)	4.84	0.37
university duties	0	1 (1.5)	14 (20.9)	43 (64.2)	9 (13.4)	3.90	0.63
additional education	3 (4.5)	15 (22.4)	27 (40.3)	19 (28.4)	3 (4.5)	3.06	0.94
finding literature for seminars/ final theses	0	3 (4.5)	6 (9.0)	27 (40.3)	31 (46.3)	4.28	0.81

Note: Min – minimum; Max – maximum; M – mean; SD – standard deviation
Source: Prepared by the authors

Results of self-assessment of one's abilities in searching the Internet

Most statements/actions offered have an average score between 3 and 4. Lower scores were given for using advanced options on the Google search engine and for the ability to assess the accuracy and evaluation of the collected materials on the Internet.

Self-assessment of one's Internet search abilities, recognition, understanding, evaluation, and assessment of the accuracy of found materials is shown in Table 4.

Table 4
Descriptive statistics of a set of items for self-assessment of Internet search abilities

Code	Min	Max	M	SD	CV (%)
(s1) Internet search using default keywords	1	5	3.76	0.78	20.7
(s2) Choosing a keyword to search for a given topic	1	5	3.67	0.82	22.3
(s3) Recognizing types of websites (advertising/commercial, educational...)	1	5	3.58	1.08	30.2
(s4) Recognizing the type of text (scientific, seminar, other student papers, commercial, etc.)	1	5	3.24	0.84	25.9
(s5) Evaluations of the reliability of the found texts	1	5	2.90	0.87	30.0
(s6) Understanding of found texts for the given topic	2	5	3.34	0.69	20.7
(s7) Estimates of the accuracy of Internet sources	1	5	2.87	0.89	31.0
(s9) Finding suitable materials for the given topic	2	5	3.84	0.69	18.0
(s10) Using advanced Google search functions	1	5	2.97	0.95	32.0

Note: Min – minimum; Max – maximum; M – mean; SD – standard deviation; C – coefficient of variation; measurement on a scale: 1-never; 2-rarely; 3-often; 4-very often; 5-always
Source: Prepared by the authors

A mean rating of student abilities on the Internet was formed from individual activities and skills ratings: M=3.21 (SD=0.55).

The relationship between performance on tasks and self-assessment of Internet ability

The mean grade of student abilities on the Internet was correlated with the moderate success of students on tests and homework, and the following was obtained: Spearman's correlation coefficient Rho=0.257; p=0.036. Most of the correlation coefficients have a positive sign, and it leads to the conclusion that good use of the Internet and its options implies good test results.

Table 5
Speraman's rho coefficient of correlation between self-assessment of students' abilities to use the Internet and performance on individual tasks

	The self-assessment of student abilities in using the Internet	
Performance on the test	Rho	p
Dz4	0.022	0.861
T5	-0.054	0.666
Dz5	0.219	0.078
Dz6	-0.047	0.708
Dz9	0.071	0.569
Dz11	0.258	0.038

Source: Prepared by the authors

Discussion

The performance results on the tests suggest that the students have relatively good knowledge and coping skills with the tasks they solve within the individual courses of their studies.

The reasons for using the Internet show that students use it relatively often to solve their university duties. Assessments of the ability to use the Internet and the information

it offers indicate that the students are also well-versed in this field. Although positive correlations indicate that students use technology correctly, adequately, and with quality and accordingly have success on assignments and tests, the results can certainly be questioned.

Verbal conversations with students during class show they are not engaged with technology. Some teachers do not require them to use the Internet actively and intensively communicate with it during exam preparation. The results of the tests in the class, which required the technology to be used immediately on the spot, did not show adequate results.

In addition, students assessed their abilities, which can significantly distort the actual situation. Furthermore, the ability scores range between 3 and 4, indicating a poor proficiency in the Internet, and the coefficients of variation demonstrate that the student's scores vary among themselves. Insufficient mastery of the Internet and its information is indicated by lower ratings of the ability to evaluate found materials and ratings of the ability to use the advanced functions of the Google search engine.

Conclusion

The research findings indicate that students have substantial knowledge and coping skills with the tasks they accomplish in specific course classes during their studies. Assessments of students' abilities to use the Internet and its information show they are likewise well-versed in this subject.

It is critical to note that the current research is primarily based on student self-assessment of Internet use. Because the study was done on a limited sample of students, the findings should be interpreted cautiously. Furthermore, part of the assignment was completed at home, implying that the conditions were not controlled. Future research could expand the sample, i.e., include other students from the same and other HEIs in Bosnia and Herzegovina and, more broadly, in the research, allowing comparisons between students from different institutions and various scientific fields. That would provide a more in-depth understanding of the student's ability to use the Internet for information collecting and learning.

References

1. Ciampaglia, G. L. (2018). The digital misinformation pipeline, in Positive Learning in the Age of Information, eds O. Zlatkin-Troitschanskaia, G.Wittum, and A. Dengel (Wiesbaden: Springer), 413–421. doi: 10.1007/978-3-658-19567-0_25
2. EU (2006). Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning. Official Journal of the European Union, L394/10. Retrieved May 21, 2023, from http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006H0962&from=EN
3. EC (2022). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on a European strategy for universities. Retrieved May 23, 2023, from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A16%3AFIN
4. EC (2018) European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the Digital Education Action Plan, Retrieved May 23, 2023, from https://ec.europa.eu/education/sites/education/files/digital-education-action-plan.pdf
5. EU (2022). The EU launches two new initiatives to foster higher education sector. Retrieved May 12, 2023, from https://digital-skills-jobs.europa.eu/en/latest/news/eu-launches-two-new-initiatives-foster-higher-education-sector.

6. EU (2021). Digital Decade. Retrieved May 10, 2023, from https://digital-skills-jobs.europa.eu/en/actions/european-initiatives/digital-decade
7. Graziano, K.J. (2018). Preservice Teachers' Comfort Levels with Technology in an Online Standalone Educational Technology Course. *Journal of Teaching and Learning with Technology*, *7*, 70–86.
8. Habets, O., Stoffers, J., Heijden, B. V. D., Peters, P. (2020). Am I fit for tomorrow's labor market? The effect of graduates' skills development during higher education for the 21st century's labor market. *Sustainability*,*12(18)*. https://doi.org/10.3390/su12187746
9. Rios, J. A., Ling, G., Pugh, R., Becker, D., Bacall, A. (2020). Identifying critical 21st-century skills for workplace success: A content analysis of job advertisements. *Educational Researcher*, *49(2)*, 80–89. https://doi.org/10.3102/0013189X19890600
10. Jang, H. (2016). Identifying 21st century STEM competencies using workplace data. *Journal of Science Education and Technology*, *25*, 284–301. https://doi.org/10.1007/s10956-015-9593-1
11. Joynes, C., Rossignoli, S., Fenyiwa Amonoo-Kuofi, E. (2019). 21st century skills: Evidence of issues in definition, demand and delivery for development contexts. (K4D Helpdesk Report). Brighton, UK: Institute of Development Studies.
12. Kim, M. K., Xie, K., Cheng, S.-L. (2017). Building teacher competency for digital content evaluation. *Teaching and Teacher Education*, *66*, 309–324. https://doi.org/10.1016/j.tate.2017.05.006
13. Kopp, M., Gröblinger, O., Adams, S. (2019). Five common assumptions that prevent digital transformation at higher education Institutions. INTED2019 Proceedings, 13th International Technology, Education and Development Conference, Valencia, 11-13 March 2019, 1448–1457. https://doi.org/10.21125/inted.2019.0445
14. Lavi, R., Tal, M., Dori, Y. J. (2021). Perceptions of STEM alumni and students on developing 21st century skills through methods of teaching and learning. *Studies in Educational Evaluation*, *70*, 101002. https://doi.org/10.1016/j.stueduc.2021.101002
15. Mahmud M. M., Wong S. F. (2022). Digital age: The importance of 21st century skills among the undergraduates. *Frontiers in Education*, *7*, https://doi.org/10.3389/feduc.2022.950553
16. Maurer, M., Schemer, C., Zlatkin-Troitschanskaia, O., Jitomirski, J. (2020). Positive and Negative Media Effects on University Students' Learning: Preliminary Findings and a Research Program. In Zlatkin-Troitschanskaia, O. (Ed.). Frontiers and Advances in Positive Learning in the Age of Information (PLATO) (p. 109-119). New York: Springer.
17. McGrew, S., Ortega, T., Breakstone, J., Wineburg, S. (2017). The challenge that's bigger than fake news. Civic reasoning in a social media environment. *American Educator*, *41(3)*, 4–9.
18. McGrew, S., Breakstone, J., Ortega, T., Smith, M., Wineburg, S. (2018). Can students evaluate online sources? Learning from assessments of civic online reasoning. *Theory and Research in Social Education*, *46*, 165–193. https://doi.org/10.1080/00933104.2017.1416320
19. McGrew, S., Smith, M., Breakstone, J., Ortega, T., Wineburg, S. (2019). Improving university students' web savvy: an intervention study. *British Journal of Educational Psychology*, *89*, 485–500. https://doi.org/10.1111/bjep.12279
20. Murray, M. C., Pérez, J. (2014). Unraveling the digital literacy paradox: how higher education fails at the fourth literacy. *Issues in Informing Science and Information Technology*, *11*, 85–100. https://doi.org/10.28945/1982
21. Nagel, M.-T., Schäfer, S., Zlatkin-Troitschanskaia, O., Schemer, C., Maurer, M., Molerov, D., Schmidt, S., Brückner, S. (2020). How Do University Students' Web Search Behavior, Website Characteristics, and the Interaction of Both Influence Students' Critical Online Reasoning?. *Frontiers in Education*, *5*, https://doi.org/10.3389/feduc.2020.565062
22. UNESCO (2023). Knowledge society. Retrieved May 18, 2023, from https://www.ibe.unesco.org/en/glossary-curriculum-terminology/k/knowledge-society
23. Winberg, C., Adendorff, H., Bozalek, V., Conana, H., Pallitt, N., Wolff, K., Olsson, T., Roxå, T. (2019). Learning to teach STEM disciplines in higher education: A critical review of the literature. *Teaching in Higher Education*, *24*, 930–947. https://doi.org/10.1080/13562517.2018.1517735

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