

<sup>1</sup>Ljubica JANJETOVIĆ, <sup>2</sup>Mihaela POPA, <sup>3</sup>Simonida VILIĆ, <sup>4</sup>Darjana SREDIĆ, <sup>5</sup>Anna STASZEWSKA, <sup>2</sup>Amalia DASCAL

## THE SIGNIFICANCE OF DIGITAL COMMUNICATION COMPETENCIES AND MEDIA TOOLS FOR THE TEACHING PROCESS IN THE INTERNATIONAL UNIVERSITY STUDY

<sup>1</sup>Technical Faculty, University of Business Engineering and Management, Banja Luka, BOSNIA & HERZEGOVINA

<sup>2</sup>Faculty of Engineering Hunedoara, Politehnica University of Timișoara, Hunedoara, ROMANIA

<sup>3</sup>Faculty of Economy, University of Business Engineering and Management, Banja Luka, BOSNIA & HERZEGOVINA

<sup>4</sup>Faculty of Philosophy, University of Business Engineering and Management, Banja Luka, BOSNIA & HERZEGOVINA

<sup>5</sup>Akademia Górnośląska, Katowice, POLAND

**Abstract:** Digital communication skills and competencies have become a necessity in the contemporary education process, both for teachers and students, due to the increased integration of digital information technologies into the teaching process. Regarding the above-mentioned, this research was undertaken through the collaboration of three international universities to investigate the significance of digital communication and some overall skills and competencies in the teaching process. Two online questionnaires were formulated and administered by each university: one addressed to teaching staff and one addressed to undergraduate students. Data interpretation with the help of the SPSS program and graphic methods allowed the creation of a relevant image of the studied phenomenon. Several results are found in the study. For instance, both students and teachers attach great importance to the use of both digital and traditional media tools and communication channels in the teaching process. For older students and younger teachers, these tools were more important as support for the teaching process than for younger ones. On the other hand, younger students show greater independence in acquiring digital communicative skills and competencies, while among teachers, age was positively correlated with independence in acquiring these competencies. Out of the five evaluated digital tools and media, the telephone proved to be the most significant means of digital communication in the teaching process for students in all three countries.

**Keywords:** digital communication, digital skills, digital competencies, higher education, teaching process

### 1. INTRODUCTION

The development of digital technology and its use in the educational process, especially in the process of communication at educational institutions, have fundamentally changed the context of education. This has become particularly evident during COVID, but with the development of technology and digital devices, most institutions turned to these teaching methods even before the advent of COVID. Changes in the educational process caused by the use of digital technologies manifest themselves at different levels of education. Siddiq and Scherer, for instance, identify these changes in “the availability of ICT resources at schools, the access to the internet, and the transition from paper-and-pencil to computer-based exams” (Siddiq & Scherer, 2015). For teachers and students, digital communication skills have become necessary both for the education process and for other jobs (Muammar et al., 2022). Siddiq and Scherer find that most researchers identify “teacher computer self-efficacy” as one of the prominent factors for the integration of digital communication in teaching and learning practices (Siddiq & Scherer, 2015).

The concept of digital communication generally implies the transmission of information by digital devices, and in this research, it refers to the use of various technologies and digital equipment and devices (such as virtual platforms, e-mail services, internet services and online materials, mobile chat applications, social networks, and the like) for the purpose of information exchange and knowledge transfer between teachers and students.

There are many studies and research projects that have studied the role of digital communication skills and competencies for the teaching process (see Park & Yang, 2013; Khan et al., 2017; Makhzoum et al., 2021, Scheuermann & Pedró, 2009; Griffin & McGraw, 2012). Some of them stated that the success of students is directly related to the effective communication of the teacher (see Rodríguez-García et al., 2022; Johanson et al., 2022), while others researched the implementation of ICT in education process (Mumtaz, 2000; Kreijns et al., 2013; Tondeur et al., 2008; Schibeci et al., 2008). Regardless of the fact that this topic is quite researched, it is still necessary to talk about it and point out the importance of these skills and competencies, especially among the older population of teachers. It is also important to check how important personality traits and general communication skills are considered to be in digital communication. Since most educational

institutions at the international level are increasingly turning to distance and online learning, this research was undertaken through the collaboration of three international universities to investigate the significance of digital communication skills and competencies for the teaching process in a wider context.

## 2. RESEARCH DESIGN AND METHODOLOGY

In order to check the significance the participants attach to certain communicative tools, channels, and skills, some initial hypotheses were set.

- **H1:** There is a strong belief among participants in communication in the teaching process that digital tools and channels greatly support the teaching process.
- **H2:** There is no significant difference in attitudes towards digital communication tools and channels used in the teaching process with regard to gender, age, or nationality.

The research was done between January and March 2023, and the tool used in the examination of opinions was the online questionnaire. Two questionnaires were designed to address questions that were related to the particular interests of each group (students and teachers) and administered by each university. Respondent demographics were reported using descriptive statistics, and the data interpretation was done with the help of the SPSS and graphic methods.

The Overall Attitude Scale towards the digital communication channels in the teaching process (ADC) is constructed for the purposes of this research, and is used as a part of the complete questionnaire. The ADC scale contains 6 items that are used to assess the respondents' attitudes toward certain aspects of digital communication channels and tools and their support for the teaching process (overall support, professional email, personal email, online educational platform of the higher educational institution, social networks, and phone).

## 3. RESULTS

A total of 307 respondents participated in the research, of which 237 were students and 70 were teachers. The gender distribution of the sample is optimally uniform (55.4% of respondents are female and 44.6% are male); most respondents come from Poland (41.4%) and the least from Bosnia and Herzegovina (23.8%). In the group of students, most of them are in the age category of 18 to 25 years (65.4%), while in the group of teachers, the largest number of respondents are in the age category of 41 to 45 years (21.4%). When it comes to academic title (for the group of teachers) and year of study (for the group of students), the largest number of respondents are in the groups of assistants and assistant professors (40% and 35.7%), that is, first and second years of study (38.4% and 23.6%).

The distribution of the responses of the total sample of respondents to the categorical items of the questionnaire, which refer to the importance that participants attach to specific media and communication channels (professional and personal email, virtual education platform, social networks, and phone) as support for the teaching process, is shown in Table 1. In Table 1 there are also responses from the total sample toward the importance of the way of keeping notes during the teaching process, the organization of activities, the use of means of digital communication in the classroom and laboratory, the use of teaching methods in classes and seminars, visiting digital expert meetings and events (seminars, conferences, and symposiums), as well as the way in which respondents acquired digital communication skills.

The largest number of respondents (35,5%) consider that the importance of digital media and channels for communication in the teaching process is at level 4 on a scale of 1 to 5. A large percentage of respondents (56.4%) consider that the virtual educational platform of a higher education institution is of great importance for the educational process. Also, 52.8% of respondents attach extremely high importance to the phone as a support tool for digital communication in the educational process. Apart from social networks, all other channels and media were evaluated as extremely important for the teaching process.

Table 1. Distribution of responses to variables of the questionnaire referring to communication tools and channels

Item	Item values	Total sample
How much does digital communication support you in the teaching process?	1 – Very little	0,7%
	2	5,5%
	3	29,6%
	4	35,5%
	5 – Very much	28,7%
How important do you consider the following channels of digital communication as support in the teaching process?		
Professional email	1 – Little importance	2,0%
	2	2,3%
	3	19,2%
	4	30,0%
	5 – Great importance	46,6%
Personal email	1 – Little importance	7,2%
	2	7,5%
	3	17,9%
	4	27,7%
	5 – Great importance	39,7%
A virtual platform of a higher education institution	1 – Little importance	0,7%
	2	3,3%
	3	15,6%
	4	24,1%
	5 – Great importance	56,4%
Social networks	1 – Little importance	7,5%
	2	6,8%
	3	23,5%
	4	31,3%
	5 – Great importance	30,9%
Phone	1 – Little importance	5,5%
	2	4,9%
	3	15,0%
	4	21,8%
	5 – Great importance	52,8%
Way of taking notes during the teaching process	On paper	17,9 %
	Digitally	17,3 %
	On paper and digitally	56,6 %
	I don't take notes	4,3 %
Organization of activities in the teaching process	In my head (I remember everything)	15,0 %
	I occasionally write on paper	7,2 %
	I always write everything down on paper	15,3 %
	I occasionally use a digital organizer	9,8 %
	I always use a digital organizer	12,1 %
	I use both paper and a digital organizer	40,4 %
Communication tools used in classes	Video projector/laptop/smart TV	21,5 %
	Social networks	12,8 %
	The official virtual educational platform of the higher education institution	21,5 %
	Internet applications and materials	13,7 %
	Other	1,0 %
	All of the above	29,6 %
Communication tools used in the lab	Video projector/laptop/smart TV	45,3 %
	Internet applications and materials	33,9 %
	The official virtual educational platform of the higher education institution	12,5 %
	Other	1,7 %
	All of the above	6,5 %
Teaching methods used in classes	Blackboard and chalk	17,9 %
	Magnetic board	19,5 %
	Dictation and writing	32,2 %
	Oral presentation	14,0 %
	Other	2,6 %
	All of the above	13,7 %
Teaching methods used at seminars	Blackboard and chalk	16,0 %
	Magnetic board	19,9 %
	Dictation and writing	30,3 %
	Oral presentation	16,3 %
	Other	2,9 %
	All of the above	14,7 %
Frequency of visiting digital expert meetings	No	22,8 %
	Yes. Once per academic year.	23,5 %
	Yes. 1–3 times per academic year.	35,8 %
	Yes. More than 3 times per academic year.	17,6 %
	other	0,3 %
Way of acquiring of digital communication skills	Self-education	43,3 %
	At online courses	11,7 %
	By attending face-to-face classes	6,5 %
	At high school or college	16,6 %
	All of the above	11,1 %
	Other	10,1 %

In the second part of the questionnaire, the following results were obtained: The largest number of respondents take notes and organize activities both on paper and digitally (56.6% and 40.4%), and

respondents mostly acquired digital communication skills through self-education through informal forms of learning (43.3%), while distributions in other items are variably distributed (Table 1).

The overall attitude towards digital communication channels in the teaching process and the overall attitude towards general communication skills and competencies were checked using the ADC scale. The reliability of the scale was checked using Cronbach's alpha coefficient. The reliability of ADC scale in this study had a value of  $\alpha = 0.69$ , which is less than the recommended values (greater than 0.7). However, as stated by Briggs and Cheek (1986, as cited in Pallant, 2009), the Cronbach alpha coefficient is very sensitive to the number of items in the scale, and for short scales (less than 10 items), it is more appropriate to calculate the mean value of the correlation between the items. The mean value of the correlation between items for the ADC scale is optimal and equals 0.28, which indicates that this scale has good internal consistency parameters. The maximum score for the ADC scale is 30, which indicates a strongly positive attitude about the support that digital communication has for the teaching process. The minimum scores were 10.

In Table 2, descriptive indicators for the ADC scale are shown. Based on the values of the skewness and kurtosis coefficients, it can be concluded that the values are unevenly distributed and that non-parametric statistical techniques are suitable for these scales. Based on the arithmetic mean, it is evident that the respondents achieved high scores on the ADC scale, which indicates relatively positive attitude when it comes to the support that digital communication has in the teaching process, which confirms the first hypothesis.

Table 2. Statistical indicators of the ADC scale

Scale	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
Scale ADC	10,00	30,00	24,0326	4,00477	-,731	,445

Correlations between the variables in the questionnaire were checked with the Spearman's rho correlation coefficient, which is a suitable coefficient for examining the connection between variables on non-parametric data. The ADC scale is not significantly related to any of the sociodemographic variables in the questionnaire, which is in line with the second assumption that the attitudes of participants in digital communication do not depend on gender, age, or country of study or work (Table 3).

Table 3. Correlations of sociodemographic variables with ADC and ASC scales

		Gender	Country	Age
ADC	Spearman's rho	,040	-,109	-,017
	Sig.	,482	,056	,763

\*\* Correlation significant at the 0.01 level; \* Correlation significant at the 0.05 level

Table 4 shows all the values of the correlation coefficients for the intercorrelations of all variables in the questionnaire, as well as the correlations of all variables with the ADC scale. The variable with the highest number of correlations is age, which has a statistically significant positive correlation with the variables academic title (year of study for the students), way of organizing activities, tools of communication used in classes, and tools of communication used in the laboratories, while it is negatively correlated with the variable about the way of acquiring knowledge of digital communication. All correlations are of low intensity, except for the correlation with the academic title variable, where the strength of the connection is of medium intensity. The activity organization variable, which refers to the use of paper or digital tools in the organization of teaching activities, also shows several statistically significant positive correlations of low intensity. The correlations between the items of ADC scale are in a statistically significant positive relationship with the variables of the way of organization of activities and tools used for communication in classes, while negatively correlated with the variable of tools for communication in the laboratory.

In order to determine the differences between the groups, several non-parametric tests were performed. With the help of the Mann-Whitney U test, it was checked whether there were gender differences in the scores on the ADC scale. The results of this test showed that there are no differences when it comes to gender distribution on the ADC scale, as well as in the variable on the

way of acquiring digital communication skills and occupation, as well as the other variables of the questionnaire (Table 5). Using the Kruskal–Wallis H test to compare group differences based on age groups, no statistically significant differences were found in the distribution of results in relation to age (Table 6).

Table 4. Correlation matrix of all questionnaire variables

Variable		Age	Academic Title/Year of study	Notes	Activ. organiz.	Com. tools /classes	Com. tools/labs	TM 1	TM 2	Particip. in digital seminars	Way of obtaining dig. com. skills	ADC
Age	Spear. rho	.	,370**	,007	,217**	,158**	,163**	,018	,004	,079	–,231**	–,020
	Sig.	.	,000	,908	,000	,009	,007	,770	,951	,194	,000	,743
Academic title /Year of study	Spear. rho	,370**	.	,099	,107	,123*	,057	,076	,043	,082	–,117	,031
	Sig.	,000	.	,105	,078	,043	,351	,211	,478	,175	,054	,614
Notes	Spear. rho	,007	,099	.	,214**	,097	–,065	,108	,093	,034	,009	,049
	Sig.	,908	,105	.	,000	,110	,282	,075	,125	,571	,882	,420
Activity organiz.	Spear. rho	,217**	,107	,214**	.	,166**	–,051	,095	,041	–,054	–,036	,180**
	Sig.	,000	,078	,000	.	,006	,401	,118	,496	,374	,557	,003
Com. tools /classes	Spear. rho	,158**	,123	,097	,166**	.	,088	,122	,098	–,055	,047	,173**
	Sig.	,009	,043	,110	,006	.	,149	,045	,105	,371	,439	,004
Com. tools/labs	Spear. rho	,163**	,057	–,065	–,051	,088	.	,009	,105	,198**	–,075	–,244**
	Sig.	,007	,351	,282	,401	,149	.	,878	,084	,001	,220	,000
Teaching methods – classes	Spear. rho	,018	,076	,108	,095	,122	,009	.	,541**	,027	–,064	,015
	Sig.	,770	,211	,075	,118	,045	,878	.	,000	,659	,294	,806
Teaching methods – labs	Spear. rho	,004	,043	,093	,041	,098	,105	,541**	.	,035	–,020	–,029
	Sig.	,951	,478	,125	,496	,105	,084	,000	.	,560	,745	,639
Particip. in digital seminars	Spear. rho	,079	,082	,034	–,054	–,055	,198**	,027	,035	.	–,086	–,178**
	Sig.	,194	,175	,571	,374	,371	,001	,659	,560	.	,156	,003
Way of obtaining digital commun. skills	Spear. rho	–,231**	–,117	,009	–,036	,047	–,075	–,064	–,020	–,086	.	,115
	Sig.	,000	,054	,882	,557	,439	,220	,294	,745	,156	.	,058
ADC	Spear. rho	–,020	,031	,049	,180**	,173**	–,244**	,015	–,029	–,178	,115	.
	Sig.	,743	,614	,420	,003	,004	,000	,806	,639	,003	,058	.

\*\* Correlation significant at the 0.01 level; \* Correlation significant at the 0.05 level

Table 5. Gender differences in the distribution of results

	ADC	Way of obtaining digital communication skills	Academic title/ Year of study
Mann–Whitney U	11101,500	8333,500	10840,500
Wilcoxon W	20554,500	15473,500	25375,500
Z	–,705	–1,639	–1,077
Sig. (2–tailed)	,481	,101	,281

Grouping Variable: gender

Table 6. Differences in age groups

	ADC	Way of obtaining DC skills	Notes	Activity organization	Communication tools /classes	Communication tools/labs	TM1	TM2	Participation in digital seminars
Kruskal–Wallis H	10,494	19,599	1,371	16,023	11,481	9,250	6,543	12,092	5,093
df	2	2	2	2	2	2	2	2	2
Sig.	,105	,003	,968	,014	,075	,160	,365	,060	,532

Table 6a. Comparison of medians for differences by age groups of students and teachers

Age group (students)	Way of obtaining DC skills	Activity organization
18–25	2,00	4,00
26–30	1,00	5,50
31–35	1,00	6,00
36–40	1,50	5,00
over 40	1,00	6,00
Age group (teachers)	Way of obtaining DC skills	Activity organization
26–30	1,00	5,00
31–35	1,00	6,00
36–40	1,00	5,00
41–45	2,00	5,00
46–50	2,00	5,50
51–60	2,00	5,00
over 60	1,00	5,50

When it comes to the differences between age groups in terms of acquiring knowledge about digital communication, by comparing the medians, the Kruskal–Wallis H test revealed a statistically significant difference in the first category in the sample of students (18–25 years) and in the fourth,

fifth, and sixth age groups in the sample of teachers, while the median value of Md = 2 in both samples indicates that these groups acquired their knowledge in a less independent way (online courses, individual lessons, high school, etc.) (Table 6a).

The organization of activities is statistically significantly different in the third and fifth categories in the student sample and the second age category in the teacher sample (Md = 6), which indicates that respondents belonging to these age groups mostly organize activities using both paper and digital organizers (Table 6a).

The Kruskal–Wallis H test revealed a statistically significant difference on the ADC scale, as well as in the variables attitude toward using tools of communication in the lectures and visiting digital expert meetings, in relation to the variable of country, while there was no statistically significant difference between country and other variables from the questionnaire (Table 7). By comparing the median and average values of the ranks of the mentioned variables and categories of countries, this test shows that the category Romania has the highest values of these parameters on all variables except for the variable of visiting digital meetings, seminars, and conferences. The category of Bosnia and Herzegovina achieves the highest parameters when it comes to the variable visiting digital meetings (Table 7a).

Table 7. Differences in the countries of study or work

	ADC	DC skills	Notes	Activity organization	Communication tools in classes	Communication tools in labs	TM1	TM2	Particip. in digit. meetings
Kruskal–Wallis H	27,486	4,891	2,378	3,214	7,790	9,958	,332	,065	26,273
df	2	2	2	2	2	2	2	2	2
Sig.	,000	,087	,304	,200	,020	,007	,847	,968	,000

Table 7a. Comparison of medians and ranks for established differences by the countries

Country		ADC	Communication tools in classes	Digit. meetings
BiH	Median	24,0	3,0	3,0
	Ranks	140,49	154,34	195,27
Romania	Median	26,0	3,0	2,0
	Ranks	189,88	171,09	129,17
Poland	Median	23,0	3,0	3,0
	Ranks	131,54	139,41	151,19

Table 8. Differences in variable year of study (for students)

	ADC	The way of obtaining DC skills	The way of taking notes	Activity organization	Com. tools in classes	Com. tools in labs	TM1	TM2	Particip. in digit. meetings
Kruskal–Wallis H	3,251	3,540	6,430	8,631	10,598	2,227	2,769	1,567	12,398
df	4	4	4	4	4	4	4	4	4
Sig.	,376	,472	,169	,071	,031	,694	,597	,815	,015

Grouping Variable: year of study

Table 8a. Comparison of medians and ranks for differences in year of study

Year of study		Communication tools used in classes	Participation in digital expert meetings
I god	Median	3,0000	2,0000
	Rank	107,27	114,18
	N	91	91
II god	Median	3,0000	2,0000
	Rank	119,71	102,48
	N	56	56
III god	Median	4,0000	3,0000
	Rank	133,27	126,10
	N	44	44
IV god	Median	3,0000	3,0000
	Rank	112,98	132,31
	N	32	32
Graduate students	Median	5,0000	3,0000
	Rank	161,25	163,68
	N	14	14

The comparison between the groups of the categorical variables academic title (for teachers) and year of study (for students) and the values of the other variables of the questionnaire was made using the Kruskal–Wallis H test. The Kruskal–Wallis H test revealed that there is a statistically significant difference between the groups on two variables of the questionnaire, which refer to the use of digital media tools in the classes and participation in digital expert meetings (Table 8). By

comparing the medians and ranks of different categories of years of study, it was found that the category of graduate students has the highest values of these parameters, which indicates that this category has the highest values of the mentioned variables (Table 8a).

The Kruskal–Wallis H test revealed that a statistically significant difference between the groups exists on one variable of the questionnaire, which is related to note-taking (Table 9). By comparing the medians and ranks of different academic titles, it was found that the category full professors and the category others (lecturers, professors emeritus, and the like) have the highest values of these parameters (Table 9a).

Table 9. Differences in variable academic titles (teachers)

	ADC	The way of obtaining DC skills	The way of taking notes	Activity organization	Com. tools in classes	Com. tools in labs	TM1	TM2	Particip. in digit. meetings
Kruskal–Wallis H	3,021	6,035	10,455	1,161	,469	,922	1,877	5,479	3,626
df	4	4	4	4	4	4	4	4	4
Sig.	,343	,197	,033	,884	,976	,921	,758	,242	,459

Grouping Variable: academic title

Table 9a. Comparison of medians and ranks for differences between the variable academic title and the variable taking notes

Academic title	Taking notes	
Assistants	Median	2,0000
	Rank	24,79
	N	7
Assistant professors	Median	3,0000
	Rank	31,21
	N	28
Associated professors	Median	3,0000
	Rank	39,10
	N	25
Full professors	Median	3,0000
	Rank	46,00
	N	8
Others	Median	3,0000
	Rank	46,00
	N	2

#### 4. DISCUSSIONS

Some important research findings are highlighted in this section using graphs and descriptive statistics. The largest number of total 307 respondents are in the groups of assistants and assistant professors (40% and 35.7%), and first and second years of study (38.4% and 23.6%), which means that the majority of participants, both students and teachers, are of a younger age. 35.5% of total respondents consider that the significance of digital media and channels for communication in the teaching process is at level 4 on a scale of 1 to 5. All the mentioned media and channels of digital communication (except social networks) received the highest rating when evaluating their significance for the educational process. While among students, the phone proved to be the most important digital tool for communication in the teaching process.

The overall student evaluation of the significance of digital media and communication channels in the educational process by country is shown visually and statistically in Figure 1, while the same results for teachers are shown in Figure 2. Figures 3, 4, 5, and 6 show the values of the significance of social networks, telephones, and professional and personal email. From Figure 4, it can be seen that in all three countries, respondents consider the telephone to be a very important tool for participants in digital communication in the teaching process.

The results showed that the majority of respondents take notes and organize activities both on paper and digitally (56.6% and 40.4%, Figure 7), and the respondents mostly acquired their digital communication skills through self-education through informal forms of learning (43.3%, Table 6a).

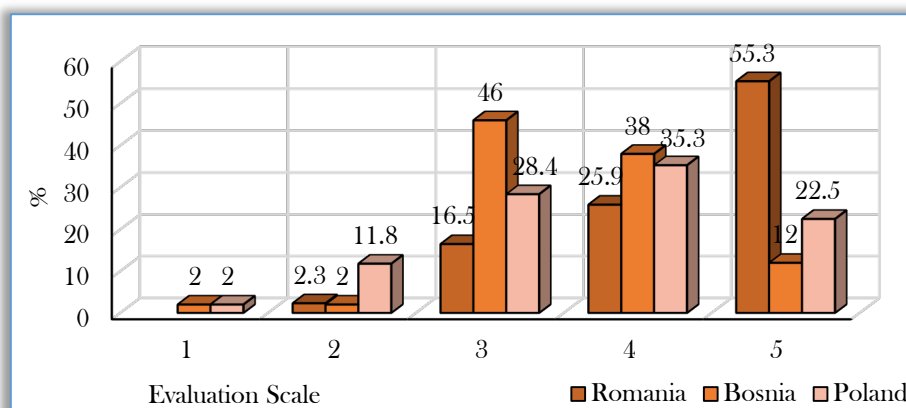


Figure 1. Overall students' attitudes toward the support of communication tools and channels for the teaching process

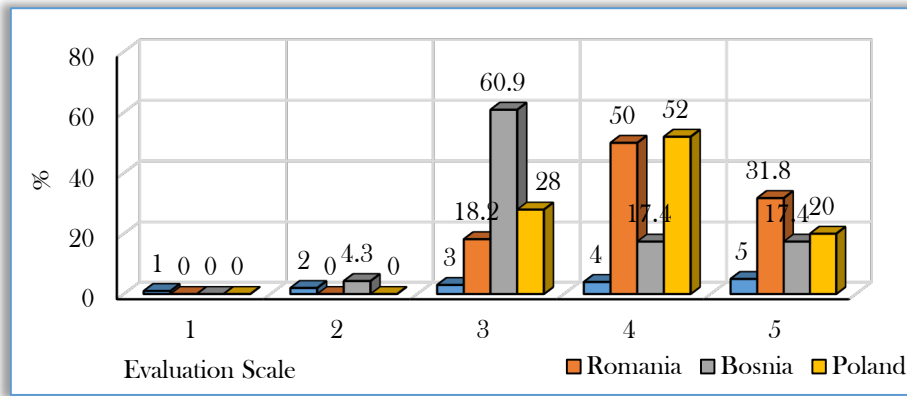


Figure 2. Overall teachers' attitudes toward the support of communication tools and channels for the teaching process

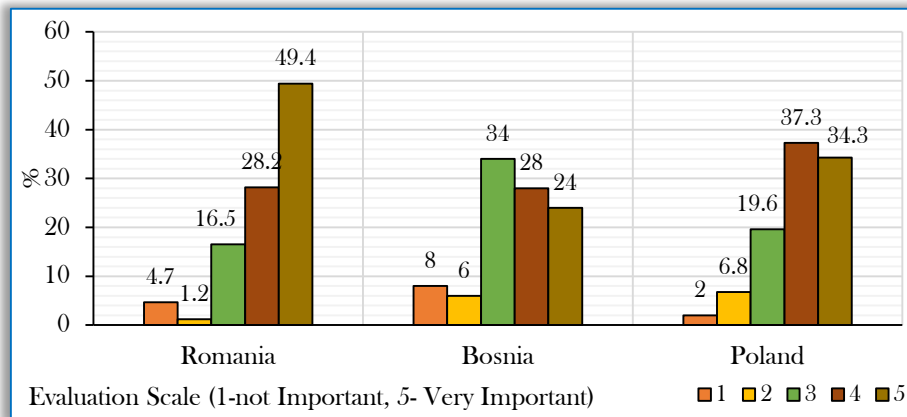


Figure 3. Students attitudes toward the importance of using of social networks in the teaching process

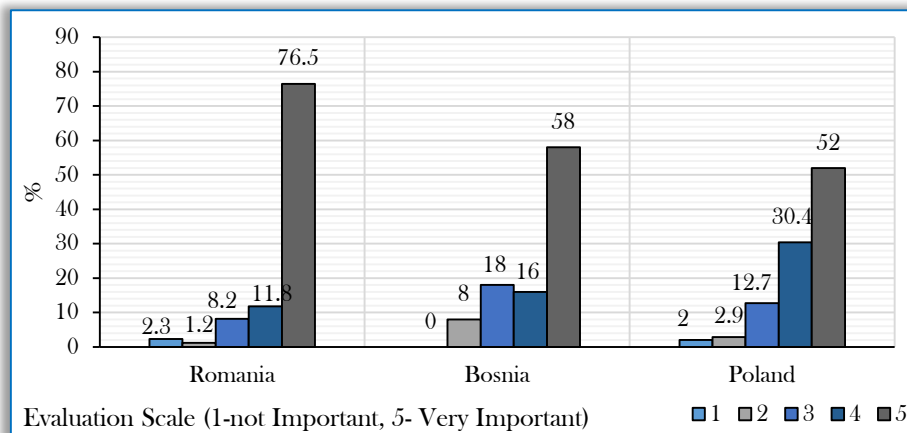


Figure 4. Students attitudes toward the importance of using a phone in the teaching process

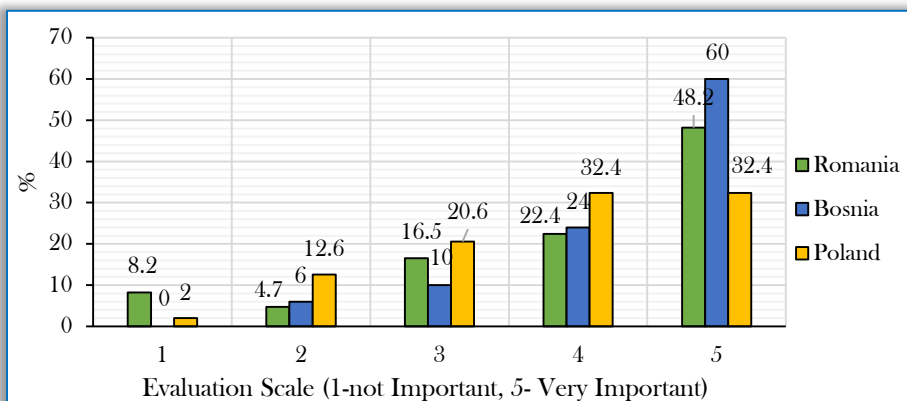


Figure 5. Students attitudes toward the importance of using a personal email in the teaching process



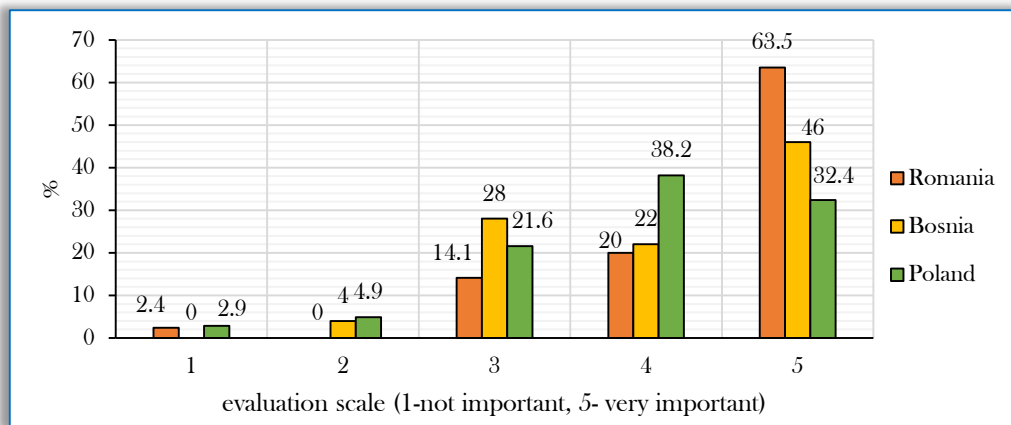


Figure 6. Students attitudes toward the importance of using a professional email in the teaching process

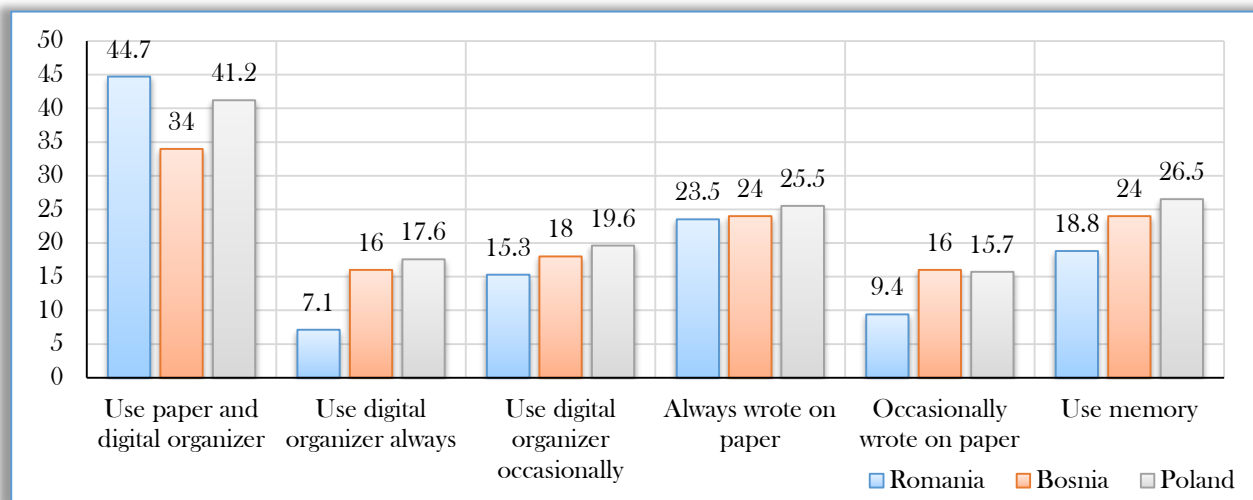


Figure 7. Ways to organize learning and teaching

Figure 7 shows the overall ratio of importance that participants in digital communication in higher education attach to individual tools and channels for organizing learning and teaching and communication in the teaching process. The diagram shows that in all three countries, respondents attach great importance to both traditional and digital channels and media.

## 5. CONCLUSIONS

Based on the data and results obtained by examining the attitudes of participants in digital communication in the teaching process at three different higher education institutions in three different European countries, it can be concluded that both students and teachers attach great importance to the use of digital media and communication channels in the teaching process and that they believe that these tools provide them with great support in the teaching process. Almost equally, students in all three countries use both paper and digital devices for storing data from classes. Gender does not show a significant influence on the attitudes of students or teachers towards digital communication tools and channels used in the teaching process.

The age of students is positively connected with the use of digital communication tools in classes as a support for the teaching process. Older students attach greater importance to the use of digital media and channels during the teaching process, while younger students (age group 18–25) are more independent in acquiring skills for digital communication.

For the group of teachers, it is also true that age is positively related to the importance they attach to tools and channels (digital and traditional) in the organization of the teaching process and digital communication in higher education, and unlike the group of students, the same is true for the correlation of the age category with the independence category in the way of acquiring skills for digital communication. Older teachers are more independent in acquiring digital skills (age group

41–60). The obtained results do not show significant deviations from the results of previous researches, which are listed in the theoretical framework of the paper.

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