The Use of Cloud-Oriented Learning Technologies in the Digital Competencies Formation of the Future Specialists in Socionomics

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Abstract. Based on a survey of experts, the components of the digital competence of the specialists in socionomic professions are identified: information literacy and the ability to work with data; creation of digital content; communication and interaction in the digital society; security in the digital environment; solving problems in the digital environment and lifelong learning. The model of using cloud- oriented learning technologies for the formation of digital competencies of the future socionomics specialists is theoretically substantiated and experimentally tested. The stages of formation of digital competence of the future specialists of socionomic profile by means of cloud-oriented learning technologies are developed.

Keywords Digital Competencies, Cloud-Oriented Learning Technologies, Model, Future Specialists of the Socionomic Profile.

1 Introduction

Rapid digitalization of all spheres of human life puts forward several requirements for the digital preparation of future specialists in socionomic professions, whose activities take place in the human-human system. Usually such professions are related to medical care, education and upbringing, household services, legal protection, etc.

Under the influence of civilizational changes in the educational space, modern specialists in the field “human-human” must objectively have digital literacy, be mobile, flexible in the selection and integrated use of all the variety of digital technologies. Such technologies allow the specialists of the socionomic sphere to perform their functional duties qualitatively. Moreover, the use of digital technologies allows the development of important competencies: emotional stability, rapid switching of attention, empathy, observation, organizational skills, etc. Therefore, the formation of digital competence of socionomic profile specialists and methodological support of the cloud-oriented learning technologies use in the educational process of Higher Education Institution (HEI) is an urgent task.

2 Literature Review

In the studies of foreign researches, outlines proposals for the use of cloud-oriented technologies in the educational process [1], a review of the cloud learning management system is carried out [2], the impact of SaaS on the formation of a new phase learning management [3]. Researches of theoretical and practical bases of cloud computing application in education deserve our attention: Noteworthy are the studies of theoretical and practical bases of application of cloud computing in education: perspectives of digital humanistic pedagogy and use of ICT in education [4], application of cloud technologies in teaching higher mathematics in institutions of higher technical education [5], the use of cloud technologies to teach the basics of mathematical informatics to students of technical universities [6], the formation and development of cloud-oriented educational and scientific environment of higher education institutions [7]. The theoretical and methodological principles of using cloud-oriented technologies for the development of students' skills in the XXI century [8],[9] are outlined, revealed the advantages and disadvantages of e-learning [10],[11], revealed the role of informatization and it the impact on the professional teacher competences[12]. Метою The purpose of our article is to develop the model of using cloud-oriented learning technologies for the formation of digital competencies of the future specialists of socionomic profile.

3 Research Methods

In the research process methods were used: analysis of scientific literature, the definition of categorical-conceptual apparatus; synthesis, generalization, systematization; diagnostics (questionnaires and statistical processing). The research was performed within the framework of a complex scientific topic of the departments of the Borys Grinchenko Kyiv University. Scientific topic of the Faculty of Computer Sciences and Mathematics is "Theoretical and practical aspects of using mathematical methods and information technologies in education and science", SR № 0116U004625 and scientific topic of the Faculty of Management is "Improvement of management mechanisms in economic and social spheres of Kyiv" SR № 0116U003994.

4 Research Results

The subject of digital activity of a "human-human" type specialist are social systems, groups, people of all ages. Examples of socionomic professions are teachers, doctor, hairdresser, political scientist, advertising specialist, HR specialist, manager. Digitalization of socionomic professions causes appropriate requirements for such specialists: digital literacy, adherence of ethical norms and rules of online business communication, tolerance and ability to understand behaver of another person by analyzing his activity in social networks, the use of wide range of SAAS services to support joint activities, etc.

To determine the functions of digital competence, we turned to the results of C.Scott's study, where he highlights the following ability to use ICT and digital media; critically analyze digital media content; to carry out effective communication and collaboration; to have a technical component that provides safe and efficient use of gadgets; free use a wide range of consumer software to implement everyday tasks [13].

Appropriate for the formation of digital literacy, we see the classification of digital literacy components (as the basis of qualitative human interaction with the "number") identified by D. Belshaw [14] components: Cultural (how to be have), Cognitive (how to do), Constructive (how to use), Communicative (how to communicate) Confident (how to belong), Creative (how to make), Critical (how to evaluate), Civic (how to practicipate).

The use of cloud-oriented learning technologies is one of the driving forces for formation of specialists' digital competences. In particular, considering the cloud technologies as a means of teaching the basics of mathematics information to students of technical universities O. Markova gives the following interpretation "… by cloud learning technologies … we understand sun ICT learning, which involves the use of network ICT with centralized network storage and data processing (program execution), when the user acts as a client (user of services), and "cloud" is a server (service provider)" [6]. It is worth noting, that cloud-oriented learning environment is associated with the above concept. The cloud learning technologies is a learning environment in which cloud computing technologies are used to support content-technological and information-communicational educational functions [9]. We will rely on these definitions in our scientific work.

We have systematized the ideas of Makovoz O.S. and Perederiy T.S., to outline the advantages and disadvantages of using cloud technologies in educational process [15]. So, the advantages include: maintaining the relevance of information; wuick adjustments; the possibility to customize the software to the needs of a particular teacher; opportunity to prepare well for the lesson; the opportunity for a student to complete a missed lesson; universal access to the Internet; accounting for the use of software. Disadvantages include: trust in the service provider, upon which the the smooth operation and preservation of important data depends; high requirements for the quality of communication channels; the number of errors and information leaks increases with usage.

Analysis of the functionality of cloud services (SAAS) allowed us to plan a hypothesis that their use significantly helps to form future professionals' digital competence.

The need for such a formation was determined by us in 2019 as a result of a confirmatory experiment at the Borys Hrinchenko University of Kyiv and Khmelnytsky National University. In consequence of the teachers- experts' survey (a total of 28 people), we outlined the components of digital competence (DC) of future specialists of socionomic professions:

- DC1 – information literacy and data handling skills (the use of computer and mobile devices, and basis and application software, apps, Internet and online applications, digital identity management, viewing, searching and filtering data, information and digital content, critical evaluation and interpretation of data, information and digital content, data management, information and digital content, etc.);

- DC2 – the creation of digital content (development, editing, and integration of digital content, creative use of digital technologies, etc.);
- DC 3 – communication and interaction in the digital society (interaction through digital technologies, dissemination and exchange of data through digital technologies, cooperation through digital technologies, responsibility, legal and ethical norms);
- DC 4 – security in the digital environment (protection of devices and secure connection to the Internet, protection of personal data and privacy, protection of health and well-being, etc.);
- DC 5 – solving problems in the digital environment and lifelong learning (solving technical problems, self-assessment of their own digital competence, identifying and eliminating gaps, solving life problems with digital technologies, lifelong learning, and professional development in the digital environment).

With the help of specially developed and adapted known methods, the real state of students' digital competence formation at three levels was established: high, medium, and low (see Table 1). 145 students of specialties “Mathematics”, “Management”, “Journalism”, “Philology” (Borys Grinchenko Kyiv University) took part in the experiment, which is about 5% of the general population - the number of students of the two faculties of the university.

The participants of the experiment were divided into groups - control (CG, volume 67 students) and experimental (EG, volume 78 students).

Table 1. The level of students’ digital competence (statement experiment), %

Levels	**High**		**Medium**		**Low**		χ^2
Components	**CG**	**EG**	**CG**	**EG**	**CG**	**EG**	
DC **1**	10,2	10,0	45,4	44,8	44,4	45,2	0.014
DC **2**	8,6	9,2	39,5	40,2	51,9	50,6	0,042
DC **3**	14,8	13,7	54,9	55,0	30,3	31,3	0,058
DC **4**	7,7	8,2	35,4	38,2	56,9	53,6	0,22
DC **5**	12,5	11,9	48,9	45,5	38,6	42,6	0,334

According to the results of the experiment, most students have a medium and low level of digital competence, which clearly confirms the need for research.

We compared the two empirical distributions obtained data using Pearson's statistical criterion χ^2. Thus, comparing students of control and experimental groups in accordance with the levels of development of DC 1 – DC5, it was found that $\chi^2_{empirical} < \chi^2_{critical}$, where $\chi^2_{critical}$ = 5,991 for the significance level $p \leq 0.05$ and the number of freedom degrees, which is equal to 2.

To achieve the study's purpose, we developed a model of digital competence formation of future specialists of socionomic profile through cloud-oriented learning technologies. In particular, each component of the proposed model is based on the use of free cloud services.

Preparation unit – contains organizational and methodological materials to ensure the educational process (are electronic educational and educational and methodological

materials). The data is combined for its intended purpose (an inverted class model can be used). Examples of using services: Google Class, YouTube, LMS Moodle, Google Disk.

Theoretical unit - allows you to access materials and, using the means of communication, to analyze the content together with classmates and / or teachers. Examples of using services: Hangouts Chat, Google Documents, Google Spreadsheets (with the ability for students to edit and comment on online documents).

The block of technological and methodological support - provides the creation of joint documents for small research groups that perform the tasks assigned to each small group. For example, the formation of a table of correspondence for informational textual content as e-learning, content plan, content program. Examples of the use of services: Google Documents, Google Spreadsheets (with the ability for students to edit and comment on online documents), PicxelExpres, WeWedeo, Google forms (to provide an experimental survey of recipients by student researchers).

The practical block is the consolidation of the received achievements by students, which is based on the processing of the developed data, as well as the publication of the research results and the defense of the project before the audience. Example of using services: Google Documents and/or Google Presentations (for project demonstration), Google Spreadsheets, Google Forms (for evaluation and analysis of project results).

Prognostic block - based on the received results the trajectory of further improvement of digital readiness and digital competencies (strategic planning of development of digital competence) is developed.

We offer for digital competence formation future specialists in the socionomic profile of the use of cloud-based learning technologies in combination with traditional (classical) forms of the learning organization. To carry out the experiment, the interdisciplinary connection of such disciplines is used: "ICT in research", "Information Relationship Management", "Research Methodology", "Personnel Management", "Mathematics", "ICT in professional activities". Execution of the project is carried out according to the table algorithm "Use of cloud-oriented learning technologies in the process of professional training of the future specialist of socionomic profile" (Fig. 1). Offered by us methodical support is an upgraded to cloud-oriented acmeological technology version developed by the author of the model "Organization of research work of students in learning computer science disciplines" [15].

Each stage of the algorithm is preparatory to the next, contains a brief description of activities and services that can be used during its implementation. Note that the algorithm is not linear, but involves the return from any stage to the appropriate (problematic) component, which requires refinement (or modernization) by a future specialist.

We will focus on the practical part of the model implementation. Depending on the peculiarities of the educational process, the following practice-oriented methods in the training of a socionomic specialist along with cloud-oriented learning technologies are used: brainstorming, situational method (case method), synergetic acmefuching, educational discussion, demonstration and illustration, video method, etc.

Phase	Phase name (Stage name)	Activities aimed at the formation of digital competence/*Example of service*	The activity aimed at the formation of professional subject competence	Deadline (week of within the semester)
I.	Coalescence into small groups	Creating a common environment for project implementation / *G_Disk, G_Class, Dropbox.*	Association in small groups (3-5 pax) within the common environment, determination of the project manager, distribution of roles according to the project (analyst, diagnostician, designer, technologist-developer, acmeologist).	The first lesson
II.	Definition of cloud service for the formation of digital competencies of the socionomic profile future professionals'	Choosing a service/technology among free online resources /*Independent choice of students*	Each group chooses a profession of socionomic profile. Creating the perfect portrait of a representative of such a profile.	The second week
III.	Defining goals and objectives	Outlining the task for processing the service / technology/ *Google Documents .*	Outlining the task for each group to work on.	The third week
IV.	Distribution of tasks in the group	Distribution of tasks and areas of research within a small group (according to selected and agreed tasks) / *Google Documents, G_Tables .*	Distribution of tasks and areas of research within a small group (according to selected and agreed tasks).	The third week
V.	Selection of diagnostic material (First preparatory)	Preparation of abstracts on the use of the selected service/technology (according to the tasks) / Service selected by students, and *Google Documents, Hangouts Chat, Kahhoot .*	Selection of diagnostic material and diagnosis (directly and using cloud technologies).	Up to 8 weeks
VI.	Composing, editing a portrait of a profile representative (Second preparatory)	The layout of the publication into a single whole, implementation of error editing, material improvement / *Google Форми, PicxelExpres, WeWedeo .*	Processing the results of diagnosing and creating a portrait of a real representative of the selected profile.	Up to 10 weeks.
VII.	Acmeographic	Submission of materials for the selected conference(ies) (competitions, seminars, round tables) / *G_Tables., PadLet, MindMeister.*	Development of an acmeogram for the representative of the socionomic profile chosen by the group.	Up to the 13th weeks
VIII.	Designing	Creation on the basis of the developed materials of an electronic educational and methodical complex (for one subject) in the Moodle distance learning system /*Moodle, G_Tables, MindMeister.*	Development of the acmeological development trajectory of the representative of the socionomic profile professional chosen by the group.	Up to the 16th weeks
IX.	Technological	The report at the conference should include theoretical developments and experience of use, in particular experience of using the chosen service / technology in a particular specialty / *Webex.*	Development of the acmeological development trajectory of the representative of the socionomic profile professional chosen by the group.	Up to the 16th weeks
X.	Final	Preliminary defense of the project within academic groups.	Project design (by each small group).	17 weeks
XI.	Project protection	Global protection of research projects / *Awwap, G_Meet, G_Form*	Global protection of research projects.	Week 18

Fig. 1. Model of using cloud-oriented learning technologies for the formation of digital competence future specialists of socionomic profile

Raising the level of the digital readiness of the future socionomic specialist can be achieved by introducing cloud-based learning technologies and innovative pedagogical learning technologies in the educational process: interactive, problem-based learning, inverted learning, project learning, positional learning. Having our own vision of digital competence formation we propose to build this process with the implementation of developmental (acmeological) technology in cloud services, which, in our opinion, is quite effective in the process of professional training.

Of particular interest among students was project work, which provided the creation of the author's project of professional development (self-development) of socionomic profile future specialist using the formed digital competencies. Work on this project, followed by its protection, took place in face-to-face form with the maximum use of cloud-based learning technologies and cloud services.

Professional competence aimed at actualizing the potential of personal and professional development of the future specialist, the development of his professionalism (among which one of the first places is occupied by digital competence). Professional competence is realized based on the use of a modular system of pedagogical-professionalized acmeological training and acmeological developmental classes.

To ensure the convenience of teachers and teamwork of students, as well as to increase the motivational competition between teams, the teacher-coach creates a table of team activities. The table of team activities contains: - names of teams and a list of team members (rapid interaction), the name of the cloud service for each team's project (thus ensuring no duplication of research topics), fields to fill in links to cloud services component tasks (at each stage the teacher and the team monitor compliance with the project implementation deadline.

At the same time, the implementation of the tasks received by students in cloud services provides rapid interaction of small group members. In particular, at the stage of "Grouping in small groups" students form a team and share access to the online document(s). These documents serve as a "draft" and an "experimental mini platform" where participants accumulate their ideas and experiences. Example, Google Documents, Google Spreadsheets. And then, step by step at each stage, one (or more) cloud services are used to prepare the project and create the appropriate intermediate or reporting electronic resource (Google Presentation, Mind Map, Padlet, Awwap, graphic, audio-, video-, flash- cloud editors, etc.). In the final stage (global project protection) Google Spreadsheets (and/or) Google Forms are used (to analyze the results of the project).

The formative stage of the experiment, the purpose of which was to test the effectiveness of the proposed methodological support for the use of cloud-based learning technologies for the formation of digital competencies of future socionomic professionals profile was held in 2020.

In the control group, the educational process was carried out according to the traditional methodical system of digital training of the future specialist.

To assess the quality of digital training of future professionals used not only the method of "control sections", but also a comprehensive assessment and self-assessment using the author's questionnaire. The questionnaire was developed to determine the

level of development of existing digital competencies among the future socionomic profile professionals, which, in our opinion, contributes to better training. The survey was conducted five times a semester every three weeks. The questionnaire provided criteria for assessing digital readiness and a brief description of them. Each student was evaluated not only by the teacher, but also by self-assessment.

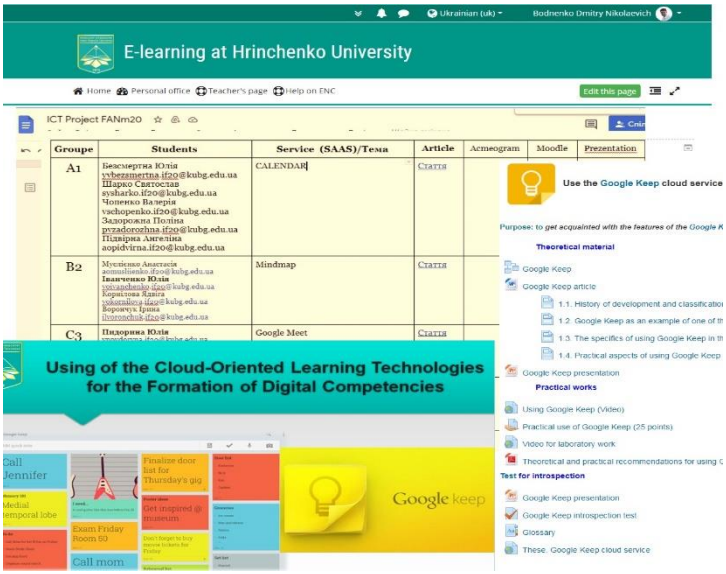

Fig. 2. Example of project implementation with the help of cloud services

After completing the online questionnaire (completed in Google Forms), all the results were consolidated into a summary table (each survey participant had his own code, the table recorded the corresponding amount of points for each of the eight-five components separately for each slice). Based on all these data, summary graphs that reflect the levels of development of parameters and the dynamics of their development in both control and experimental groups are constructed. Based on these graphs, we developed prognostic trajectories.

We believe that to improve and assess the development of digital competencies of the future specialist appropriate components that will contribute to the formation of this readiness, namely: analytical (how to be), gnostic (how to do), constructive (how to use), creative (what new can be done), critical (how to evaluate), communicative (how to communicate), creation (how to develop and improve oneself), prognostic (how to predict the development of professional competence).

The results of the control group indicate an insufficient level of effectiveness of traditional methods of training and, accordingly, not high enough quality of digital competencies of the future specialist. (Table 2).

Table 2. The level of digital competence of students (molding experiment), %

Levels	High		Medium		Low		χ^2
Components	**CG**	**EG**	**CG**	**EG**	**CG**	**EG**	
DC **1**	8,4	24,1	49,2	60,7	42,4	15,2	21,632
DC **2**	8,9	20,2	48,8	59,6	42,3	20,2	13,278
DC **3**	10,6	38,7	57,2	51,0	32,2	10,3	27.656
DC **4**	8,7	22,2	40,4	59,3	50,9	18,5	24.606
DC **5**	10,9	24,9	53,5	58,3	35,6	16,8	12.426

We compared the obtained data using Pearson's χ^2 statistical criterion again. Thus, comparing students of control and experimental groups according to the levels of DC1 – DC5 development, it was found out that $\chi^2_{empirical} > \chi^2_{crititcal}$, where $\chi^2_{critical}$ = 9,21 for the significance level $p \leq 0.01$ and the number of freedom degrees which is equal to 2. This shows that the organization of the educational process by means of cloud-based technologies is effective. Note also that when choosing the volumes of the control and experimental groups, we used Pearson's criterion χ^2. It is obtained that $\chi^2_{empirical} < \chi^2_{crititcal}$, where $\chi^2_{critical}$ = 3,841for the significance level $p \leq 0.05$ and the number of degrees of freedom, which is equal to 1. This means that the volumes of the control and experimental groups do not differ statistically.

The analysis of the received data testifies to obvious growth of development of components of digital competencies of the future specialist of a socionomic profile. Having conducted a criterion analysis for each student, we can predict the dynamics of changes in his professional qualities, which, in our opinion, will significantly improve his further development as a representative of the socionomic profession and in the formation of his digital readiness for practice.

5 Conclusion

In the research based on a thoroughly practical approach, the model of formation of future specialists' digital competencies of a socionomic profile by means of cloud-oriented technologies of training is created. Recommendations for the use of the presented model are given. The stages of the model implementation are highlighted, the activity aimed at the formation of digital and subject competence of students is outlined with the indication of cloud-oriented learning technologies and cloud services, the terms of the model stages implementation are given. Based on the expert assessment, the components of digital competence of future specialists of socionomic professions are formed: information literacy and ability to work with data; creation of digital content; communication and interaction in the digital society; security in the digital environment; solving problems in the digital environment and lifelong learning.

The practice of introducing the formation of digital competencies by using the model developed by us in combination with the project methodology and the method of small groups helps to better master and learn these competencies.

We see prospects for further research in the introduction and methodological support of the model of using cloud-based learning technologies for the formation of digital

competencies of future professionals in the fields of "human-human", "human - technology", "human - nature" and reveal details of the specifics the use of IT components.

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