THE ADMINISTRATION OF THE DIGITAL ENVIRONMENT OF HIGHER EDUCATIONAL INSTITUTIONS: THE IDENTIFICATION OF USERS

Andrii V. Morozov[1] **& Tetiana A. Vakaliuk**[2]
Zhytomyr Polytechnic State University,
Chudnivska str., 103, 10005, Zhytomyr, Ukraine
[1] morozov@ztu.edu.ua, ORCID 0000-0003-3167-0683
[2] tetianavakaliuk@gmail.com, ORCID 0000-0001-6825-4697

Abstract: *The article considers the issue of administration of the digital environment of higher education institutions in terms of the identification of users. Each higher education institution sets its requirements, features of functionality, which leads to the constant adaptation of such systems for each educational institution. Therefore, it was decided to design and develop a digital educational environment of the university, which would digitize the basic educational and management processes of a typical free economic zone, but taking into account the peculiarities of the educational process at the Zhytomyr Polytechnic State University. When conducting educational activities with distance learning technologies using a digital educational environment, it is important to consistently identify, authenticate and authorize participants in the educational process. Therefore, this paper focuses on these issues from the point of view of the administrator of the digital environment. The article describes in detail the capabilities of the digital environment administrator, which are: editing student accounts, providing roles, managing users, roles, rights, rules, routes, and menus. Detailed attention is paid to the management of roles and their functionality. The use of the above-described approaches to the identification, authentication, and authorization of participants in the educational process does not guarantee the observance of academic integrity, in particular, when students undergo higher knowledge assessment and certification procedures.*

Keywords: administration, digital environment, higher education institution, identification of users.

INTRODUCTION

The digital transformation of all levels of education, as well as the beginning of the COVID-19 pandemic in Ukraine and the world, led to the transition to the educational

process using distance learning technologies, which led to the problem of higher education institutions need to immediately translate as many educational and management processes form. There are currently many options for implementing this, including automated management systems for higher education institutions. However, each higher education institution sets its requirements, features of functionality, which leads to the constant adaptation of such systems for each educational institution. This, in turn, is a waste of time, money, and resources. Also important is the fact that not always available systems allow taking into account all the necessary functionality required for the implementation of a particular institution of higher education. All of the above leads to the fact that some of the functionality remains outside of digitalization, which in the context of distance education requires improvement. Therefore, it was decided to design and develop a digital educational environment of the university, which would digitize the basic educational and management processes of a typical higher education institution, but taking into account the peculiarities of the educational process at the Zhytomyr Polytechnic State University.

As discussed by the authors in (Morozov & Vakaliuk, 2021), the digital environment consists of 4 components, among which the main role is played by the organization, which is responsible not only for the structure of the university, activities in higher education institution, etc. but also for the administration of the digital environment (see Figure 1).
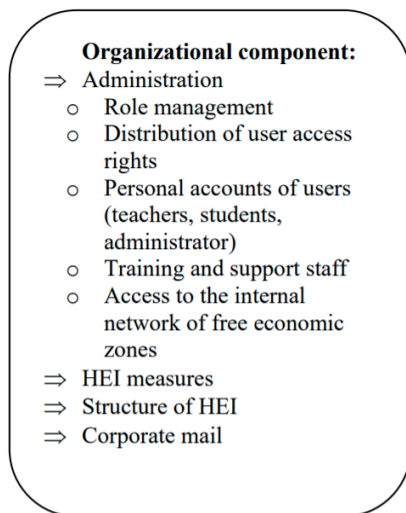
```
Organizational component:
⇒ Administration
    o  Role management
    o  Distribution of user access
       rights
    o  Personal accounts of users
       (teachers, students,
       administrator)
    o  Training and support staff
    o  Access to the internal
       network of free economic
       zones
⇒ HEI measures
⇒ Structure of HEI
⇒ Corporate mail
```

**F i g u r e 1. Organizational component of the digital environment
of higher education institution**
S o u r c e: Own work.

1. THEORETICAL BACKGROUND

Recently, in the context of the COVID-19 pandemic, many scientists are paying attention to e-learning (Hessah, & Afnan, 2021), (Jansson et al., 2021), (Vogt et al., 2021), (Wong et al., 2021), (Sailer et al., 2021).

At the same time, the problem of designing the digital environment of higher educa-tion institutions has recently been considered by more and more scientists. In particu-lar, Diahyleva, Gritsuk, Kononova, Yurzhenko considered the educational electronic environment of maritime higher education institutions through computerized adap-tive testing (Diahyleva et al., 2020). Morze, Kucherovska explored ways to design a digital educational environment for K-12 education (Morze & Kucherovska, 2020), another group of authors suggested approaches to integrating business simulation software into the learning environment of technical university (Antoniuk et al., 2021). Dotsenko proposed to consider the information and educational environment through the use of competency training simulators for the study of general technical disci-plines (Dotsenko, 2021).

Lytvynova considered the cloud-oriented learning environment of secondary school. She thinks that implementation of COLE at secondary schools provides endless op-portunities for both teacher and student-created conditions for innovation and learn-ing (Lytvynova, 2017).

Shyshkina considered service models of the cloud-based learning environment of the educational institution. The author revealed the main types of the service models of design and deploy the cloud-based infrastructure of the educational institution; consid-ered the advantages and disadvantages of the cloud-based approach (Shyshkina, 2017). Spivakovsky, Petukhova, Kotkova and Yurchuk inspected historical approach to modern learning environment (Spivakovsky et al., 2019).

Kuzminska, Mazorchuk, Morze, and Kobylin also researched attitude to the digital learning environment in Ukrainian Universities. They verified using the empirical data factor analysis the theoretical model structure of the university's digital study-ing environments (Kuzminska et al., 2019). Fabiano Nicola considered ethics and the protection of personal data (Fabiano, 2019).

However, there are no studies on user identification and administration of the digital learning environment.

That is why in this paper, we **aim** to describe the administration of the digital envi-ronment of a higher education institution in terms of the identification of users.

2. RESULTS

When conducting educational activities using distance learning technologies using a digital educational environment, it is important to consistently identify, authenticate and authorize participants in the educational process.

2.1. Identification, authentication and authorization of participants in the educational process

By identification, we mean assigning a certain identifier to a participant in the edu-cational process, authentication – checking the identity of the users based on data provided by the users, which in practice often comes down to checking the login and password. Authorization is the granting of rights to the user to perform specific actions (Yakovina & Fedasyuk, 2008).

These tasks become extremely relevant when conducting forms of current or semester control of education and during the certification of higher education when participants in the educational process interact with each other through the Internet. If it is impossible to unambiguously authenticate the participant of the educational process, the possibility to establish the validity of the results of the current or semester control or certification disappears.

The letter (The letter, 2020) provides methodological recommendations of an organizational nature. Emphasis is placed on the fact that the institution of higher education (HEI) must ensure the observance of academic integrity and, accordingly, identify the applicant, which is extremely important during the semester control and certification of applicants for higher education.

To identify participants in the educational process in the digital educational environment, we use the assignment of unique identifiers to higher education seekers and university staff (persons who are representatives of the teaching and teaching staff of the higher education institution). The user's login will serve as such a unique identifier. In local databases of separate elements of the digital educational environment, additional assignment of numerical identifiers (ID) for concrete groups of participants of the educational process is possible. For example, when storing a list of higher education applicants in tabular form, a convenient way of identification would be to assign a unique numeric value associated with a specific applicant, similarly, a unique numeric employee ID will be used in the higher education institution's table in digital educational environment.

To ensure a single authentication of participants in the educational process, it is proposed to use LDAP-authentication by separating a separate server for this task (Mokriev, 2020). This will allow all participants in the educational process to use a single login and password in all online services of the digital educational environment (Portal, 2021).

2.2. Digital environment administration

The administrator of the digital learning environment manages the roles, rights, and rules, as well as the distribution of user access rights.

As a result of the distribution of access rights, employees and students of higher education institutions have a single login and password with which they can enter: personal accounts of users, the internal network of the university, corporate mail, and educational portal.

All this provides a complete and unambiguous identification of the users of the educational process in the digital environment of the higher education institution.

So, let's focus on the administration of the digital environment (Portal, 2021). The administrator of such an environment has the right to edit student accounts, assign roles, manage users, roles, rights, rules, routes, and menus (see Figure 2 and 3).

Consider in detail each element. In the "Student Accounts" section, the administrator has the right to view the general list of student accounts, save as a new user, view information about a specific student, edit account data, and delete a student (see Figure 4).
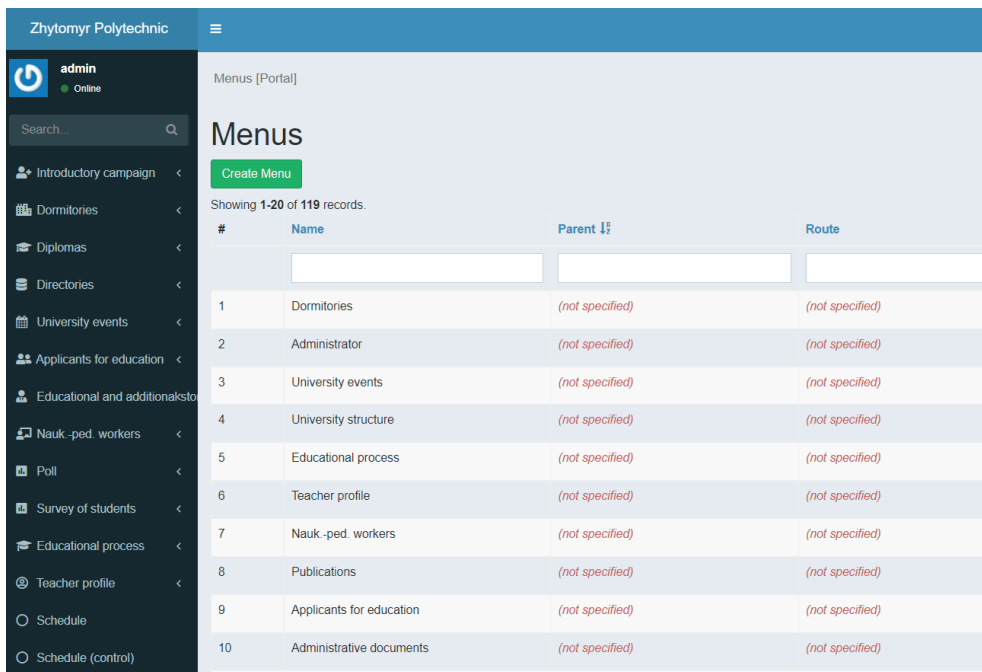
F i g u r e 2. Digital environment of Zhytomyr Polytechnic State University
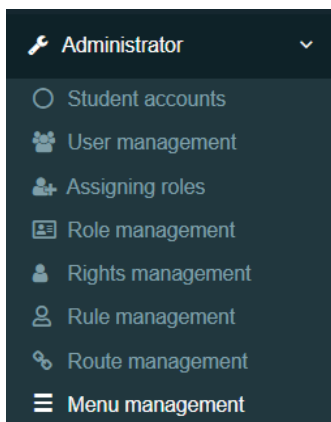S o u r c e: Own work.

F i g u r e 3. Administrator menu
S o u r c e: Own work.

When clicking on the view student account, the administrator can view the following data: student ID, username, authorization key, password, corporate email address, user status, ID card, name, date of birth, type of education document, series, and a number of the document, date of issue, full name in English, beginning and end of studies, faculty, educational degree (level), a form of study and other data (see Figure 5).
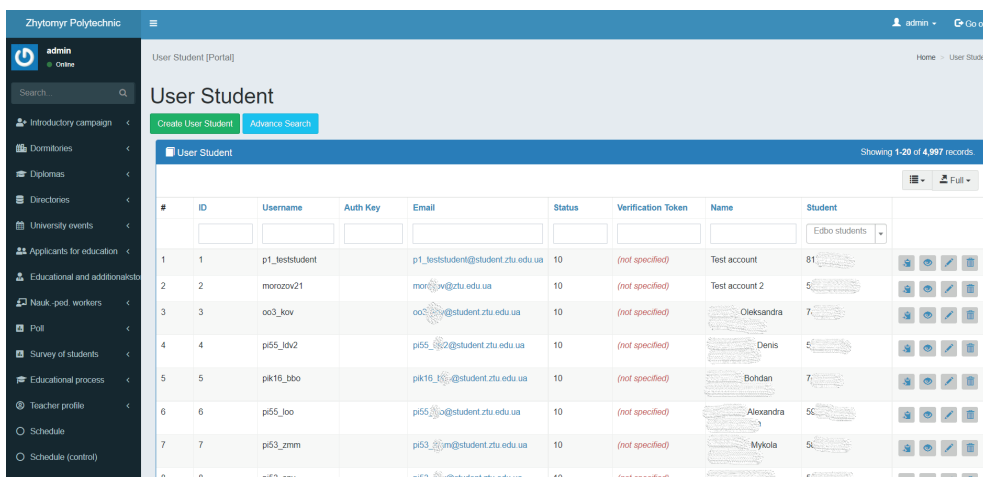
F i g u r e 4. Student's accounts

S o u r c e: Own work.

Also here the administrator can save as a new user, update the data (including reset-ting the password) and delete the account (see Figure 5). At the same time, clicking "edit" on the previous page (Figure 4) allows the administrator to update only certain fields of this account (see Figure 6).
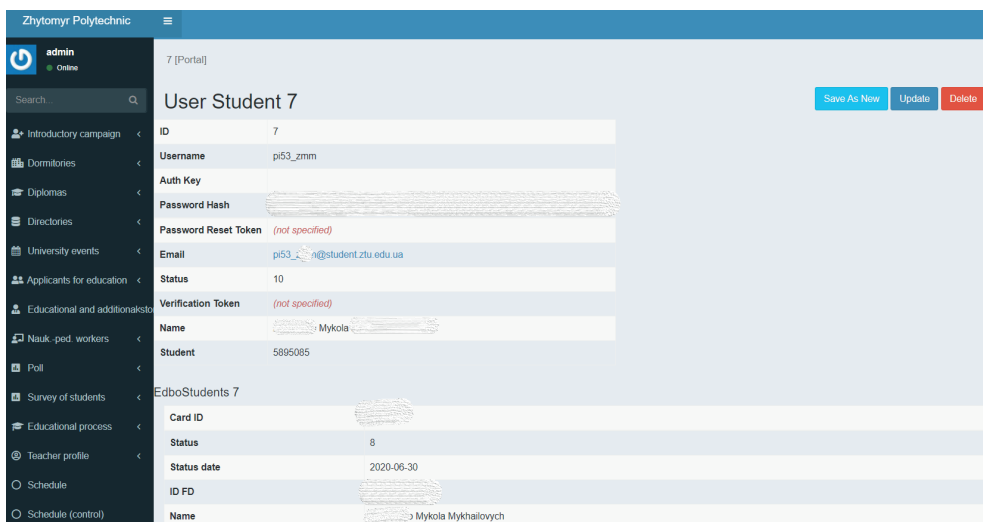

F i g u r e 5. View student account

S o u r c e: Own work.

In the "User Management" section (see Figure 6), the administrator sees all users, as well as their data: username, full name, user type, e-mail, registration time, last login time, and activation. In addition, the administrator in this section can lock/

unlock a specific user, then have the opportunity to log in to the environment under that user (👤), generate and send a new password to the user (✉), update data (✏), and delete user (🗑).

F i g u r e 6. Updating student information
S o u r c e: Own work.

F i g u r e 7. User Management
S o u r c e: Own work.

In the section "Assigning roles" (Figure 8), the administrator can provide individual roles for a specific user (👁). Thus the administrator chooses what roles to give to the given user (Figure 9). The Role Management section (Figure 10) manages the roles and functionality of each role, where you can view, update, and delete a specific role.

All the management of roles and their functionality can be represented in the form of a diagram (see Figure 11). In particular, as we can see from the presented scheme, some roles have full access to functionality, some – partial. In addition, some roles provide new data, some only view data, others edit, and some delete data.

Assignments

Showing 1-20 of 890 records.

#	User name	Name	Type	Email	
1	kn201_laa	Andriy	student	kn201_@student.ztu.edu.ua	👁
2	zgg19_gvv	Victor	student	zgg19_@student.ztu.edu.ua	👁
3	kebpua_ktv	Tetyana	teacher	kebpua@ztu.edu.ua	👁
4	zpd191m_kyuo	Yuriy	student	zpd191m_@student.ztu.edu.ua	👁
5	koa_sdo	Darya	teacher	koa_@ztu.edu.ua	👁
6	pua4_gav	Andriy	student	pua4_@student.ztu.edu.ua	👁
7	tz7_byui	Yuliy	student	tz7@student.ztu.edu.ua	👁

F i g u r e 8. Assigning roles

S o u r c e: Own work.

Assignment : kn201_laa [Портал]   Головна > Admin > Assignments

Assignment : kn201_laa

Search for available

Roles
  roleAdmin
  roleBypass
  roleDean
  roleDeputyDean
  roleDeputyHeadOfDepartment
  roleEmployeeOfDeanery
  roleEventsDepartmentManager
  roleEviManager
  roleExamSheetsFacultyManager
  roleGraduationWorksDepartmentManager
  roleHeadOfDepartment
  roleHostelAdministrator
  roleHostelViewer
  roleLibrary
  roleMainAdmin
  roleNMV
  rolePaymentsHostels
  rolePaymentsStudy
  roleScholarship
  roleStudent

Search for assigned

F i g u r e 9. Assignment roles

S o u r c e: Own work.

Roles

[Create Role]

Showing 1-20 of 24 records.

#	Name	Rule Name	Description	
1	roleAdmin	(not specified)	Administrator: has access to all modules	👁 ✏ 🗑
2	roleBypass	(not specified)	Bypass letters: marking	👁 ✏ 🗑
3	roleDean	(not specified)	Dean	👁 ✏ 🗑
4	roleDeputyDean	(not specified)	Deputy Dean	👁 ✏ 🗑
5	roleDeputyHeadOfDepartment	(not specified)	Deputy Head of the Department	👁 ✏ 🗑
6	roleEmployeeOfDeanery	(not specified)	An employee of the dean's office	👁 ✏ 🗑
7	roleEventsDepartmentManager	(not specified)	Management of activities of the structural unit	👁 ✏ 🗑
8	roleEviManager	(not specified)	PC: registrars on EVI	👁 ✏ 🗑
9	roleExamSheetsFacultyManager	(not specified)	Dean's Office employee: rights to manage performance data	👁 ✏ 🗑
10	roleGraduationWorksDepartmentManager	(not specified)	Access to qualification works of the structural unit	👁 ✏ 🗑
11	roleHeadOfDepartment	(not specified)	Head of Department	👁 ✏ 🗑

F i g u r e 10. Role Management section
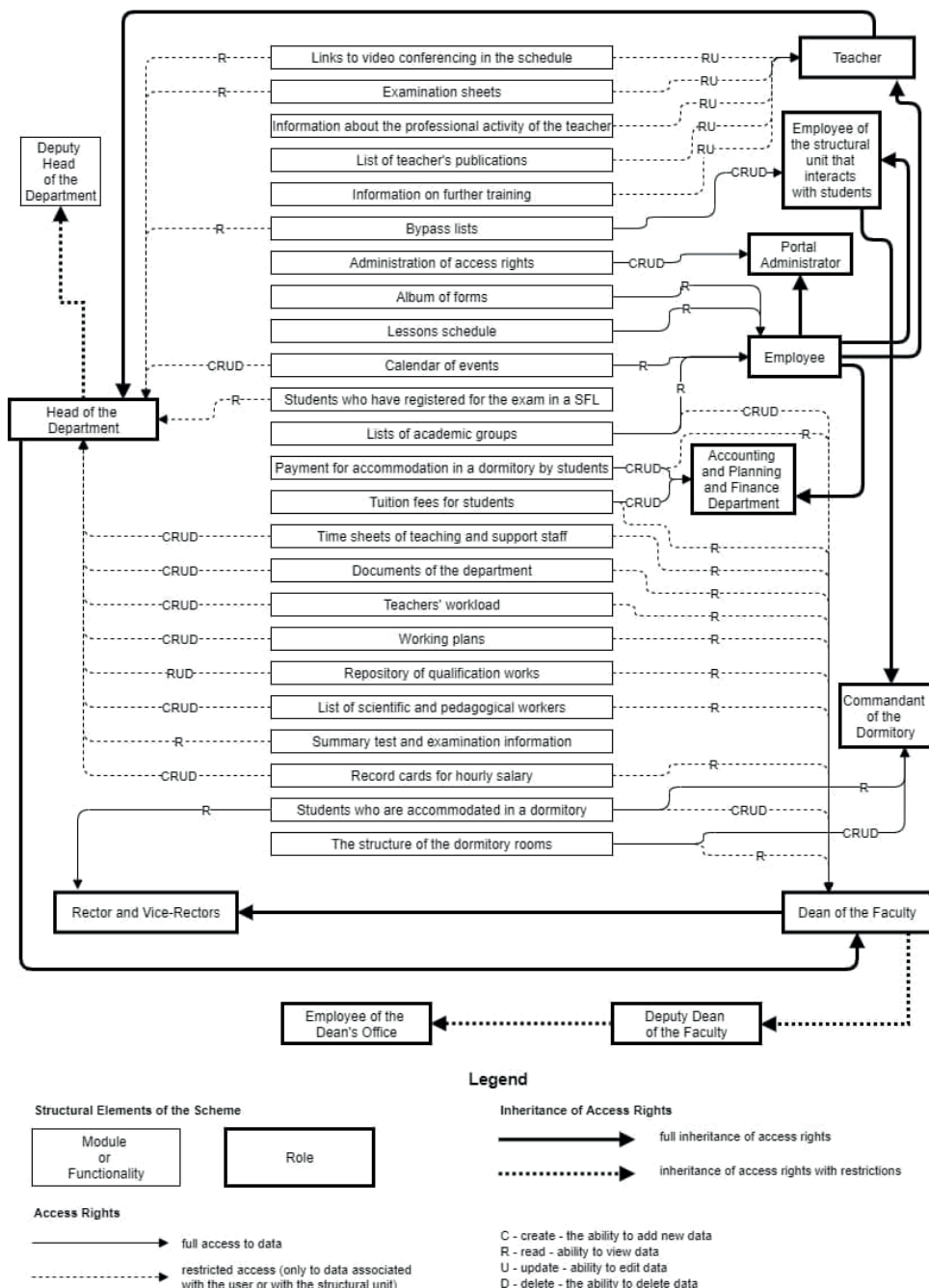
S o u r c e: Own work.

F i g u r e 11. Role management scheme

S o u r c e: Own work.

Thus, the diagram shows the following roles: rector and vice-rectors, dean of the faculty, deputy dean, dean's office employee, dormitory commandant, head of the

department, deputy head of the department, teacher, accounting, employee of the structural unit that interacts with students, administrator, employee. In addition, this diagram presents all the functionality of the portal and modules, as well as how they are provided for specific roles: links to video conferencing in the schedule; credit and examination information of success; information about the professional activity of the teacher; list of teacher's publications; information on teacher training; bypass letters; administration of access rights; album forms; lessons schedule; calendar of events; list of students registered at EVI / EFVV; lists of academic groups; payment for accommodation in dormitories by students; tuition fees; timesheets of teaching and auxiliary staff, documents of the department, teaching load of teachers, working curricula, a repository of qualification works, list of scientific and pedagogical workers, summary test-examination data, tables for hourly wages of students housed in dormitories, the structure of dormitory rooms.

This scheme of presentation of functionalities and roles illustrates all the possibilities of the digital educational environment.

The next task is the authorization task, which involves granting access rights to an authenticated user. To solve the problem of authorization in the context of the proposed structure of the digital educational environment in (Morozov, 2021) we highlight the following basic roles: "Employee", "Teacher", "Head of Department", "Dean of the Faculty", "Rector and Vice-Rectors".

"Employee" – the basic role, it is allowed to view the lists of academic groups, the calendar of events, the schedule of higher education, approved forms of documents. Based on the role of "Employee" is defined the role of "Teacher", which additionally can attach to the schedule links to video conferencing or messages for higher education, to put grades in test scores, enter information about their publications in the database, increase qualification and performance of points of professional activity by the License conditions for educational activities.

Based on the role of "Teacher", the role of "Head of the Department" is created, which has some additional features. For the role of "Head of the Department" the following opportunities are provided: to control the conduct of classes in distance form by teachers of the department, view the list of links to videoconferences of teachers of the department and connect to videoconferences, view and mark students in electronic emails, list of students who have registered for the only entrance professional exam, formation of curricula and work plans, distribution of study load, uploading qualification works to the repository, creation of hourly payroll records, creation of timesheets for teaching and support staff, review of consolidated test and examination information

The next role in the hierarchy is "Dean of the Faculty". This role additionally provides for the possibility of forming lists of academic groups, reviewing information on tuition and payment for living in dormitories by higher education seekers, performing settlement and eviction of faculty students from the dormitory. Instead, for this role, some of the opportunities inherited from the "Head of Department" are limited. In particular, the role of the "Dean of the Faculty" provides only the possibility of reviewing for: workload, initial and work plans, a repository of qualifying works, timesheets, timesheets of teaching, and support staff. This is since the listed

information is created and updated by the departments, and the dean of the faculty has a controlling function.

The role of "Dean of the Faculty" is followed by the role of "Rector and Vice-Rectors". Each role provides access to information only about the relevant structural unit and its subordinate structural units. For example, the "Head of the Department" has access to the formation (creation, editing, modification, and deletion) of curricula of educational programs implemented by the relevant department. The "Dean of the Faculty" has access (limited to one operation – review) to all curricula of educational programs that are implemented by each department of the faculty. The role of "Rector and Vice-Rectors" is associated with the root structural unit "Institution of Higher Education", and this gives access to the data of all structural units to users to whom this role is assigned.

Based on the role of "Employee", the roles of heads of structural units of the university are created. For example, "Dormitory Commandant", "Employee of the Planning and Finance Department and Accounting", "Portal Administrator", "Head of the Training and Methodological Department", "Head of the Personnel Department", etc. These roles are assigned certain separate access rights to individual modules, which are directly related to the activities of the relevant structural unit.

In a higher education institution, there is often a need to provide some, often somewhat limited, access to deputy heads of departments. For example, the role of "Deputy Head of the Department" can be created based on the role of "Head of the Department" by restricting certain rights. Similarly, based on the role of "Dean of the Faculty", the role of "Deputy Dean of the Faculty" can be created, which has limited rights. Closely related to role management is the section on "Rights Management" (see Figure 12), which can also be seen in the distribution diagram (see Figure 11).

Figure 12. Rights Management

S o u r c e : Own work.

The sections "Rule Management", "Route Management" are auxiliary in the work of the administrator. The "Menu Management" section allows you to set the parent menu sections.

CONCLUSION

The use of the approaches described above to identify, authenticate and authorize participants in the educational process does not guarantee the observance of academic integrity, in particular, when higher education students go through the procedures of knowledge assessment and certification. Therefore, it is proposed to conduct all forms of control using videoconferencing, which will make it possible to verify the identity of the applicant for higher education.

Implementation of the proposed approach to the identification, authentication, and authorization of participants in the educational process in the model of digital educational environment of higher educational institution, will ensure compliance with academic integrity and increase the degree of verification of learning outcomes.

REFERENCES

A n t o n i u k, D.S., V a k a l i u k, T.A., I e v d o k y m o v, V.V., M o r o z o v, A.V., & K o n t s e - d a i l o, V.V. (2021). Integrating business simulations software into learning environment of technical university. *Journal of Physics: Conference Series, IOP Publishing. 1946*, 012018. https://doi.org/10.1088/1742-6596/1946/1/012018.

D i a h y l e v a, O.S., G r i t s u k, I.V., K o n o n o v a, O.Y., & Y u r z h e n k o, A.Y. (2020). Computerized adaptive testing in educational electronic environment of maritime higher education institutions. In S. S e m e r i k o v & M. S h y s h k i n a (Eds.). *Proceedings of the 8th Workshop on Cloud Technologies in Education (CTE 2020), CEUR Workshop Proceedings, 2879* (pp. 411–422). Retrieved from http://ceur-ws.org/Vol-2879/paper23.pdf, ISSN 1613-0073 (accessed 1 June 2021).

D o t s e n k o, N.A. (2021). Technology of application of competence-based educational simulators in the informational and educational environment for learning general technical disciplines. *Journal of Physics: Conference Series, IOP Publishing, 1946*, 012014. https://doi.org/10.1088/1742-6596/1946/1/012014.

Ethics and data protection (2018). Retrieved from https://ec.europa.eu/info/sites/default/files/5._h2020_ethics_and_data_protection_0.pdf (accessed 28 July 2021).

F a b i a n o, N. (2019). Ethics and the Protection of Personal Data. *Systemics, cybernetics and informatics, 17(2),* 58–64. ISSN: 1690-4524.

H e s s a h, A.-S. & A f n a n, O. (2021). Effects of E-Learning on Girls' Presence and Empowerment to Access Education. *International Journal of Information and Communication Technology Education, 17*(3), 86–104. https://doi.org/10.4018/IJICTE.20210701.oa6.

J a n s s o n, M., H r a s t i n s k i, S., S t e n b o m, S., & E n o k s s o n, F. (2021). Online question and answer sessions: How students support their own and other students' processes of inquiry in a text-based learning environment. *The Internet and Higher Education, 51,* 100817. https://doi.org/10.1016/j.iheduc.2021.100817.

K u z m i n s k a, O., M a z o r c h u k, M., M o r z e, N., & K o b y l i n, O. (2019). Attitude to the digital learning environment in Ukrainian Universities. In E r m o l a y e v, M a l l e t, Y a - k o v y n a, K h a r c h e n k o, K o b e t s, K o r n i l o w i c z, K r a v t s o v, N i k i t c h e n k o, S e m e r i k o v, & S p i v a k o v s k y (Eds.). *CEUR Workshop Proceedings, 2393* (pp. 53–67).

Retrieved from http://ceur-ws.org/Vol-2393/paper_245.pdf. ISSN 1613-0073 (accessed 1 June 2021).

L y t v y n o v a, S.H. (2017). Cloud-oriented learning environment of secondary school. In S e m e r i k o v & S h y s h k i n a (Eds.). *CEUR Workshop Proceedings, 2168* (pp. 7–12). Retrieved from http://ceur-ws.org/Vol-2168/paper2.pdf. ISSN 1613-0073 (accessed 1 June 2021).

M o k r i e v, M.V. (2020). Intehratsiia navchalno-naukovykh pidsystem v yedyne informatsiino-osvitnie seredovyshche (na bazi vidkrytoho prohramnoho zabezpechennia) [*Integration of educational and scientific subsystems into a single information and educational environment (based on open-source software)*]. Elektronne naukove fakhove vydannia "Vidkryte osvitnie E-seredovyshche suchasnoho uniwersytetu" [*Open educational E-environment of a modern university*], *8*, 60–71. https://doi.org/10.28925/2414-0325.2020.8.7 [in Ukrainian].

M o r o z o v, A.V. & V a k a l i u k, T.A. (2021). An electronic environment of higher education institution (on the example of Zhytomyr Polytechnic State University*). Journal of Physics: Conference Series, 1840*, 012061. https://doi.org/10.1088/1742-6596/1840/1/012061.

M o r z e, N.V. & K u c h e r o v s k a, V.O. (2020). Ways to design a digital educational environment for {K-12} education. In S. S e m e r i k o v & M. S h y s h k i n a (Eds.), *Proceedings of the 8th Workshop on Cloud Technologies in Education (CTE 2020), CEUR Workshop Proceedings, 2879* (pp. 200–211). Retrieved from http://ceur-ws.org/Vol-2879/paper08.pdf, ISSN 1613-0073 (accessed 1 June 2021).

Portal of Zhytomyr Polytechnic State University, 2021. Retrieved from http://portal.ztu.edu.ua (accessed 08 November 2021).

S a i l e r, M., S c h u l t z - P e r n i c e, F., & F i s c h e r, F. (2021). Contextual facilitators for learning activities involving technology in higher education: The Cb-model. *Computers in Human Behavior, 121,* 106794. https://doi.org/10.1016/j.chb.2021.106794.

S h y s h k i n a, M.P. (2017). Service models of the cloud-based learning environment of the educational institution. In S. S e m e r i k o v & M. S h y s h k i n a (Eds.). *CEUR Workshop Proceedings, 2168* (pp. 1–6). Retrieved from http://ceur-ws.org/Vol-2168/paper1.pdf, ISSN 1613-0073 (accessed 1 June 2021).

S p i v a k o v s k y, A., P e t u k h o v a, L., K o t k o v a, V., & Y u r c h u k, Y. (2019). Historical approach to modern learning environment. In V. E r m o l a y e v, F. M a l l e t, V. Y a k o v y n a, V. K h a r c h e n k o, V. K o b e t s, A. K o r n i l o w i c z, H. K r a v t s o v, M. N i k i t c h e n k o, S. S e m e r i k o v, & A. S p i v a k o v s k y (Eds.). *CEUR Workshop Proceedings, 2393* (pp. 1011–1024). Retrieved from http://ceur-ws.org/Vol-2393/paper_420.pdf. ISSN 1613-0073 (accessed 1 June 2021).

The letter of the Ministry of Education and Science of Ukraine No. 1 / 9–249 dated May 14, 2020 "On the organization of current, semester control and certification of students using distance technology" Retrieved from https://osvita.ua/legislation/Vishya_osvita/73574/ (accessed 1 June 2021).

V o g t, A., B a b e l, F., H o c k, P., B a u m a n n, M., & S e u f e r t, T. (2021). Prompting in-depth learning in immersive virtual reality: Impact of an elaboration prompt on developing a mental model. *Computers & Education, 171,* 104235. https://doi.org/10.1016/j.compedu.2021. 104235.

W o n g, J., B a a r s, M., H e, M., de K o n i n g, B., & P a a s, F. (2021). Facilitating goal setting and planning to enhance online self-regulation of learning. *Computers in Human Behavior, 124,* 106913. https://doi.org/10.1016/j.chb.2021.106913.

Y a k o v i n a, V.S. & F e d a s y u k, D.V. (2008). Osnovy bezpeky kompiuternykh merezh: Navchalnyi posibnyk. [*Fundamentals of computer network security*] Lviv: NVF "Ukrainski tekhnolohii" [*Lviv: Scientific and Production Enterprise "Ukrainian Technologies"*]. [in Ukrainian].