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EFFICIENCY OF VIRTUAL REALITY TECHNOLOGIES IN THE DEVELOPMENT OF STRATEGIC THINKING OF FUTURE PROFESSIONALS

OLENA BULAVINA[1], DMYTRO KYSLENKO[2], VITA HMIL-CHUPRINA[3], SVITLANA ARTEMENKO[4], LIDIIA CHEREDNYK[5]

[1] Associate Professor of the Department of Pedagogy and Psychology, Personnel Management, Sociology and Phycology Faculty, State Higher Educational Institution "Kyiv National Economic University named after Vadym Hetman", Ukraine
[2] Associate Professor, Professor of Law Enforcement and Anti-Corruption Educational and Scientific Institute of Law Prince Vladimir the Great, Interregional Academy of Personnel Management, Ukraine
[3] Senior Lecturer of the Department of Linguodidactics and Journalism, Faculty of Law, Humanity and Social Sciences, Kremenchuk Mykhailo Ostrohradskyi National University, Ukraine
[4] Associate Professor of the Sociology Department, Faculty of Personnel Management, Sociology and Psychology, Kyiv National Economic University named after Vadym Hetman, Ukraine
[5] Senior Lecturer of the Department of Pedagogy of the Faculty of Humanities and Pedagogy, National University of Life and Environmental Sciences of Ukraine, Ukraine
E-mail: [1] OlenaPhd11@outlook.com, [2] Kyslenko.d123@gmail.com, [3] Hmilchuprinavita13@gmail.com, [4] Sveta_shvets17@bigmir.net, [5] Lidiya27@i.ua

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ABSTRACT

This research presents the results of studying the impact of the use of VR in the educational process of students - future specialists, on the development of strategic thinking in them. The purpose of the study is to analyse the influence of virtual reality on the formation of strategic thinking of future professionals. Methods: modelling, pedagogical experiment, expert assessment, survey, methods of mathematical statistics (t-test, Pearson correlation coefficient). For the experiment conduction, Oculus Rift for possible 3D visualisation of professional situations was used, and certain topics of training activities have been developed. The received results showed statistically significant differences in the evaluation of the development of strategic thinking of students, who used virtual reality technologies in the educational process (experimental group – 3.46-3.98 points; control group – 2.67-3.16 points out of maximum 7). Evaluation of the quality of students' interaction with objects in virtual reality demonstrates that components of interaction such as quality of sensory perception and truthfulness of objects were lower than quality, comfort, and evaluation of task performance. Correlation relationships between some components of evaluation of interaction with virtual reality and components of strategic thinking were strong, besides such components as "truthfulness of objects" and "quality of sensory perception". The received results have an important meaning for VR use in pedagogical practice for understanding the peculiarities of practical professional activity of future professionals. Further studies/perspectives may be directed at the study of the experience of VR use during classes of different types (including those with different quality of interaction with objects in virtual reality).

Keywords: *Learning Technology, Oculus Rift, Means of Education, Professional Qualities, Immersion Technologies, Development of Strategic Thinking of Future Specialists, Virtual Reality Technology in Professional Education*

1. INTRODUCTION

In the modern world, strategic thinking development is a primary objective for the formation of a high level of professional skills of future professionals in different spheres. Strategic thinking is characterised by the ability to orient in difficult situations, foresee consequences and make effective

decisions in different situations, as well as for the formation of successful methods of development of companies or business ideas [1].

Development of the educational landscape stipulates the need for studying new technologies and methodologies of teaching, which effectively develop and improve the strategic thinking abilities of future professionals. Among new technologies used in the educational process, virtual reality (hereinafter referred to as VR) enables students to receive experiences similar to real ones, which will contribute to the development of strategic thinking. Virtual reality technologies have become a powerful instrument for changes in different aspects of education and practice. VR is frequently used as a means of education, and studies commonly support successful results of students' education and improve the learning of new themes through the visibility and dynamism of the learning material [2]. Still, the issue of VR use for the development of critical thinking of students is understudied. The study of the influence of VR use for the development of strategic thinking is important for professional development and for preparing people to work in the modern world [3].

Virtual reality (VR) is frequently used as a means of education, and studies commonly support successful results of students' education in evaluation, when learning VR tools are used. Experiential learning simulated in virtual simulations was found to significantly improve the memorising of new themes by students [4]. Implementation of new technologies in education requires evaluation of their efficiency. Conducted studies of VR use mostly demonstrate positive attitudes of students towards its use. In particular, results of the study of [5] show that rationally organised and relevant content in the virtual reality application for students learning significantly improves reflexive thinking and understanding of the material. Herewith, the research of the VR influence on the development of strategic thinking of students is insufficient [6]. Still, understanding the influence of VR use on the formation of strategic thinking of students of artistic specialities has an important meaning for future VR use in the educational process. The development of different technologies and economies stipulates the need for constant actualisation of curricula and means of education [7].

The purpose of the study is to evaluate the use of technologies of virtual reality in the development of strategic thinking of future professionals.

The tasks of the study are:

1. To study possibilities of the use of virtual reality technologies in students' education;
2. To implement classes with the use of VR into the educational curricula of the students of the experimental group;
3. To conduct a comparative analysis of the strategic thinking of students before and after experiment conduction;
4. To evaluate the quality of students' interaction with VR tools and to analyse the interrelation with the development of strategic thinking of students.

1.1. Research problem

The development of the modern world necessitates the use of modern technologies, which, in addition to the theoretical assimilation of the material, contribute to the development of various aspects of the professional skills of future specialists. The use of virtual reality is an interesting and exciting method of learning, however, the impact of the use of VR on the development of professional qualities, in particular, strategic thinking of future specialists, is understudied. Likewise, it has not been studied how different indicators of the quality of interaction of students with VR affect the development of their strategic thinking.

2. LITERATURE REVIEW

The use of virtual reality technologies opens new possibilities for revolutionary changes in the market, providing an exciting experience of freedom of movement. Virtual reality has a high resolution and video aspects change with the movement of the head and eyes of the users, which provides a maximal realistic work experience in a certain sphere. VR enables the development of the culture of studying with a reliable process of knowledge exchange and transfer in society, development of conditions for education transformation, increasing motivation to study and the level of knowledge of future professionals and advancement of qualification of the specialists [8]. Along with numerous advantages, [9] found that the use of VR has many challenges for education and its wide use in general. The development of intellectual technologies encourages entrepreneurs and other stakeholders who provide relevant services to the labour market, to develop interactive and realistic

virtual environments that are adapted to the needs of the modern market [10].

Strategic thinking ability is a vital quality for decision-making and is characteristic of employees with higher levels of professional skills. Future changes forecast and making strategic decisions require the development of a certain level of strategic thinking in different organisations. The developed ability to think critically helps managers to create new possibilities [11]. The main criteria of strategic thinking evaluation are the ability of a person to critically and systematically think, quality "opportunism" (ability to use changes in a situation for victory in competitions between groups, sectors, and organisations of effective development), and "futurism" (ability to develop future development scenarios, plan changes and forecast issues, related to the changes). The available educational programs do not always contain materials or possibilities for the development of strategic thinking abilities [12]. In turn, the use of virtual reality technologies significantly supplements the development of cognitive and communicative skills in different spheres. In particular, [13] studied optimisation of cognitive skills of students, improving attention span, memory capacity and analytical thinking. Literature analysis conducted by [14] demonstrates the increase in the number of studies on the efficiency of virtual reality, which is related to its intensive development and use. Results of the study by [15] show that virtual reality users made decisions faster in situations they had never encountered before, as the use of a VR system contributes to the decrease in the number of mistakes, and time for the conduction of experimental studies reduces. VR positively influences cognitive skills, spatial memory, learning and memorisation, and psychomotor skills. VR is also effective when there is a need for the creation of situations, which can arise in professional activity and which are dangerous for health and life, or require the development of certain knowledge and skills, which students do not have at the present moment [16]. For effective VR use in educational activity, it should be adapted to the possibilities, needs, and productivity of the user [17]. In [7] were found disadvantages of VR use in pedagogical practice, among which is the unwillingness to use VR in practice. Herewith, studies of the efficiency of the results of education with the use of virtual reality are insufficient.

VR contributes to the development of creativity and perspective thinking in different contexts, positively affects students' creativity, promotes an intuitive approach to solving various problems, and enables the experience of own projects more realistically with the immersing effect [18]. Herewith, the efficiency of VR use in education significantly depends on the design, quality, length, and frequency of classes. This creates the basis for the study of the efficiency of VR use in students' education within the context of the development of their strategic thinking.

3. MATERIALS AND METHODS

3.1. Research Design

The study was conducted with the use of a quantitative approach. To achieve the goal of the research, a pedagogical experiment was conducted, which consisted in studying the impact of the use of VR on the development of strategic thinking of future specialists. This was achieved thanks to the study of the level of development of strategic thinking of students before the experiment, the use of VR in the educational process of students of the experimental group, and the training of the control group using the traditional method, re-evaluation of the development of strategic thinking, and the assessment of the quality of interaction of students of the experimental group with VR, the study of the impact of quality on development of strategic thinking.

Using a survey of teachers, the content of educational classes with the use of VR was developed for students of different specialities. Education with the use of VR was conducted in the second academic semester during professionally oriented training. The length and frequency of VR use in educational classes were 3 classes per week lasting one academic hour (45 minutes), which amounted to half of the educational class. The other half of the educational class was dedicated to discussion of participation in a certain activity, analysis, and synthesis of different aspects of VR use and themes of educational classes. Garniture Oculus Rift with 3D models-images of various professional situations was used in the classes with VR use. Up to 20 students were present during the class.

VR was used during classes of "Fundamentals of Professional Skills". In particular, modelling of the following professional situations was used:

1. virtual excursions to places, related to the performance of professional tasks;

2. cooperation with different people in professional activity in VR;

3. interactive visualisation of processes of operation of different appliances used in different professions;

4. business simulations with the necessity of strategic decision-making: participation in different realistic business situations, which require decision-making;

5. strategic business games - immersing in a competitive business environment, enabling application of principles of strategic thinking, analysis of market dynamics, and prognosis of actions of competitors;

6. workshops in strategic planning - conduction of interactive seminars in strategic planning, where students cooperate for the development of plans and hypothetical business scenarios, which teaches joint problem-solving and strategic discussions;

7. market analysis and study of the competitors - the possibility of virtual market analysis, the study of development tendencies, and data collection for strategic decision-making;

8. training sessions in strategic communication - participation in virtual communication exercises such as conducting strategic presentations, negotiation, and participation in discussions, helps to develop effective communication skills, and influence interested parties;

9. strategic innovation laboratories - the study of innovational ideas, and development of strategic initiatives for the development under conditions of competition;

10. evaluation of risks in the environment - visualisation of risks and situations;

11. stimulation of professional development - immersing in strategic discussions, the performance of exercises for solving problems and reflections.

After the academic semester, the evaluation of the strategic thinking of students (who belonged to the experimental group and used VR tools in the educational process, and students of the control group, who did not use VR) was conducted with the help of teachers' evaluation. For this, teachers developed 10 practical tasks, which were performed by students of control and experimental groups. The performance of these tasks was evaluated according to an adapted survey for the evaluation of the development of strategic thinking [11]. Students of experimental groups also evaluated the quality of interaction with objects in VR. This evaluation was later correlated with the evaluation of the development of strategic thinking.

3.2. Sampling

147 fourth-year students participated in the pedagogical experiment. The average grade of the previous session of students, participating in the experiment, was above 80 according to ECTS (European Credit Transfer and Accumulation System). Students with lower academic levels also used VR in the educational process, which was foreseen by the organisation of the educational process, however, they did not participate in the survey. Students, participating in the survey, were divided into experimental and control groups. The detailed composition of the respondents is presented in Table 1.

Table 1: Composition of the Respondents, Participating in the Study

Experimental group			Control group	
Sex	Boys	Girls	Boys	Girls
Number	37	34	35	38

For the development of the design of classes with the use of VR in the education of students of different specialities, teachers of computer technique (22 individuals) and professionally oriented disciplines (26 individuals) were engaged. Teachers conducted 10 joint classes lasting 1 academic hour. Nuances of classes with VR technology use were discussed according to educational plans and possibilities of garniture use, available in educational institutions.

3.3. Methods

The study involved the use of a survey of teachers with the purpose of the evaluation of the level of development of strategic thinking of students (a questionnaire for the evaluation of strategic thinking, offered by [11] was used), which was rephrased according to the evaluation of the development of strategic thinking of students by teachers; survey of students with the purpose of evaluation of students' interaction with objects in VR on the basis of the questionnaire developed by [19], modelling of educational classes with the use of VR; pedagogical experiment, which aimed at comparison of the efficiency of educational classes with VR use in educational curricula of students of experimental group for the development of strategic

thinking of students, and methods of mathematical statistics (descriptive statistics, comparison of estimates by determining the Student's T test, calculation of the Pearson correlation coefficient). Mathematical processing of received results of the conducted survey was conducted with the use of SPSS Statistics.

3.4. Instruments

Data collection was conducted using a survey, which was conducted in the form of a questionnaire filling using Google Forms. The questionnaire, developed by [11] was used as a survey concerning the development of strategic thinking of students. Authors [11] proved the validity of this survey as well as it was proved in this study with the changed formulation of questions for evaluation of strategic thinking by teachers during task performance, Cronbach's alpha was 0.87. Questionnaire questions enabled evaluation of characteristics of strategic thinking: conceptual and systemic thinking, responsiveness to changes, opportunism (appropriate actions, and using circumstances to one's own advantage), futurism and general evaluation. Evaluation criteria were as follows: points 1-1.87 - very poor level, 1.87-2.75 - low 2.-75-3.63 - lower than average, 3.62 – 4.50 – average, 4.50 – 5.37 – above average, 5.37 – 6.25 – high, 6.25 – 7 – very high. Teachers conducted an evaluation of strategic thinking on the basis of the performance of practical tasks by students (total number - ten), related directly to future professional activity. These tasks were performed after the course with the use of VR technology by students of the experimental group. The quality of interaction of students with VR was also studied with the use of a questionnaire offered by [19]. After that, the influence of the quality and evaluation of the experience of VR use on the development of strategic thinking was studied.

3.5. Ethical Criteria

In this study we followed ethical standards such as voluntary consent for participation in the survey, and unbiased treatment depending on the responses to questionnaire questions, which were guaranteed by the anonymity of the survey. Students provided consent for survey data publication in compliance with personal data protection. Participants of the study were also informed about the possibility of refusing to participate in the survey.

4. RESULTS

After the course of education, teachers evaluated the level of development of strategic thinking of students, responding to questionnaire questions on certain aspects of their activity during the process of performing ten practical tasks. Received results of the evaluation of students of the control group are presented in Table 2:

Table 2: Evaluation of the Level of Development of Strategic Thinking of Students of the Control Group

Subscales	Conceptual thinking		Systemic thinking		Responsiveness to change		Opportunism		Futurism		General evaluation:	
Sex	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Average grade	2.77	2.67	2.89	2.92	3.11	3.16	3.15	3.13	2.62	2.31	2.98	2.97
SD	0.76	0.81	0.75	0.66	0.70	0.88	0.88	0.81	0.76	0.69	0.77	0.79
t-test, p	0.985, >0.05		1.17, >0.05		0.85, >0.05		1.25, >0.05		0.94, >0.05		1.21, >0.05	

There were no significant differences in the evaluation of the development of strategic thinking of boys and girls in the control group, and the grade itself was on the low level according to evaluation interpretation. Evaluation of the level of development of strategic thinking of students of the experimental group was on the average level (Table 3):

Table 3: Evaluation of the Level of Development of Strategic Thinking of Students of Experimental Group

Subscales	Conceptual thinking		Systemic thinking		Responsiveness to change		Opportunism		Futurism		General evaluation:	
Sex	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls

Average grade	3.76	3.87	3.85	3.91	3.88	3.98	3.89	3.93	3.23	3.19	3.95	3.84
SD	0.87	0.79	0.78	0.82	0.69	0.95	0.87	0.84	0.76	0.87	0.80	0.85
t-test, p	1.121, >0.05		1.14, >0.05		1.21, >0.05		0.98, >0.05		1.21, >0.05		0.89, >0.05	
t-test of CG, p	14.23 <0.05	10.14 <0.05	5.56 <0.05	4.85 <0.05	5.41 <0.05	8.58 <0.05	6.74 <0.05	4.58 <0.05	5.42 <0.05	6.55 <0.05	3.95 <0.05	5.21 <0.05

Comparison of evaluation of strategic thinking in the experimental group indicates that both girls and boys of the experimental group equally evaluated components of strategic thinking. Evaluation of strategic thinking of students of the control group was statistically lower than that of students of the experimental group ($p<0,05$).

To understand the peculiarities of students' interaction with VR and the results of the development of strategic thinking, an evaluation of the interaction of students of the experimental group with the VR environment was conducted. The results are presented in Table 4:

Table 4: Evaluation of Interaction with Objects of Virtual Reality of Students Experimental Group

Factor	Average response grade		T test
	Boys	Girls	
Interaction quality (6)	3.98±0.63	3.91±0.76	(No. 1 ns No. 2)
Comfort	3.43±0.78	3.34±0.54	(No. 1 ns No. 2)
Evaluation of tasks performance (4)	3.55±0.67	3.65±0.45	(No. 1 ns No. 2)
Objects' truthfulness (2)	2.89±0.67	2.97±0.62	(No. 1 ns No. 2)
Quality of sensory perception (2)	2.79±0.49	2.85±0.56	(No. 1 ns No. 2)

The evaluation allows to state that boys and girls of the experimental group equally evaluated interaction with the virtual environment. The students evaluated objects' truthfulness and quality of sensory perception less than other interaction components. These grades were lower than 3 points (Table 4). To determine the influence of interaction evaluation on the development of strategic thinking of students, correlation analysis was conducted. The results demonstrate that such components as quality of interaction, comfort, and evaluation of task performance had positive correlational interrelations with components of evaluation of strategic thinking, while objects' truthfulness and quality of sensory perception had no significant influence on the evaluation of strategic thinking students (Table 5).

Table 5: The Results of Correlational Analysis between the Evaluation of Interaction with VR and Strategic Thinking of Students of the Experimental Group

Components of strategic thinking	Group	Components of the evaluation of interaction with VR				
		Quality of interaction	Comfort	Evaluation of task performance	Objects' truthfulness	Quality of sensory perception
Conceptual thinking	Boys	0.78	0.76	0.69	0.43	0.42
	Girls	0.76	0.78	0.80	0.34	0.24
Systemic thinking	Boys	0.75	0.81	0.54	0.45	0.39
	Girls	0.77	0.67	0.53	0.44	0.37
Responsiveness to change	Boys	0.76	0.69	0.57	0.49	0.43
	Girls	0.69	0.71	0.66	0.51	0.47
Opportunism	Boys	0.79	0.75	0.64	0.42	0.34
	Girls	0.80	0.69	0.73	0.43	0.42
General evaluation:	Boys	0.78	0.72	0.72	0.43	0.48
	Girls	0.83	0.71	0.76	0.47	0.39

For visualisation, the received results of the influence of the quality of interaction on the evaluation of the influence of VR for the development of strategic thinking are presented in Figure 1.

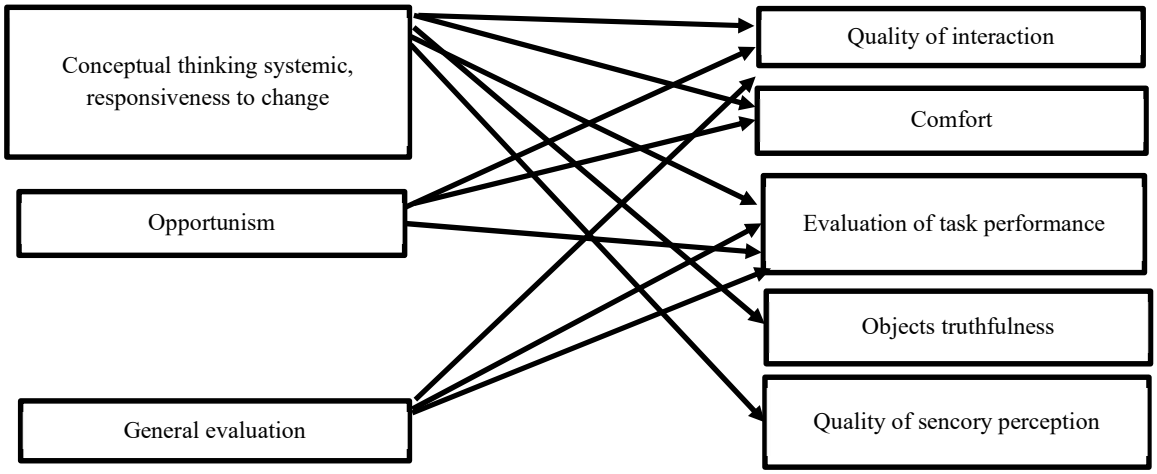

Figure 1. *Interrelation between the Components of Interaction and Evaluation of Strategic Thinking*

Thus, the use of VR tools has a positive influence on the development of strategic thinking of future professionals. The quality of interaction, objects' truthfulness, and quality of sensory perception in VR did not have a significant influence on the evaluation of strategic thinking of students. This does not mean that the level of objects' truthfulness and the quality of sensory perception do not influence the quality of VR use in educational activity at all. However, the level of strategic thinking did not depend on these components in this study. This is mostly influenced by the possibility of staying in the conditions of professional activity and solving certain problems, although objects' truthfulness could be somewhat imperfect according to students' evaluations.

5. DISCUSSION

The practical value of the research lies in proving the positive impact of using VR technology when studying professionally oriented disciplines. This is confirmed by a statistically significant difference in the evaluation of strategic thinking of students, who did not use VR technologies during education ($p<0,05$). Evaluation of the quality of interaction of students of the experimental group with objects in VR was on the average level, thus, classes were comfortable and of high quality for the users. Components of interaction "objects' truthfulness" and "quality of sensory perception" were evaluated somewhat lower, which indicates the insufficient level of development of these components of VR in certain educational curricula. To increase the level of evaluation of these components of interaction with VR, it is necessary to improve VR software for education in different specialities. The received results supplement the findings of [7] that the use of training activities on the basis of VR helps to teach future professionals with understanding of the development of trends in modern society and change educational curricula according to the requirements concerning knowledge in the modern world. Demonstrating the efficiency of VR for the development of strategic thinking skills of future professionals, this study significantly contributes to understanding the potential advantages of virtual reality technologies for the development of professional skills. The results of the study have practical significance for teachers, who want to integrate VR in educational curricula and practice. The data gathered concerning the absence of the influence of the quality of sensory perception and objects' truthfulness in VR indicate that regardless of the level of available VR tools in educational institutions, the use of VR is of great significance for the development of strategic thinking. At the same time, considering the research [20] in certain industries, it is important to consider the quality of the image and this can have a direct impact on the formation of professional abilities.

The evaluation demonstrates that VR is effective for the development of strategic thinking of future professionals, and may be used for education, which corresponds to the recommendation of specialists [21] This study demonstrated the efficiency of the use of 3D models of virtual reality reproduction, as mentioned by researchers [22],

although evaluation of interaction of students shows low evaluation of the Objects' truthfulness and the quality of sensory perception. This may be explained by students' understanding of objects' reflection in VR and students' unpretentiousness to these components. Thus, the importance of VR use lies in the creation of an environment, which reflects situations in professional activity, although the realism of objects cannot be high. This confirms scientific data on the importance of using virtual reality in the process of preparing students for practical activities [4].

This is an important factor for VR use in educational institutions with limited access to apparatus or software due to financial or other technological reasons, as the creation of conditions of relevant quality is still effective for studying students and developing their professionally important qualities [23].

The earlier conducted studies of VR use in the educational process were related mainly to the sphere of healthcare, but only a few studies were related to the evaluation of the level of behaviour and results of education of students of other specialities [24]. To meet the requirements of the modern labour market, it is necessary to use new methods and technologies of education, which contribute not only to knowledge mastering but also to effective thinking formation [25]. The use of VR enables a better understanding of trends and moods of society, especially professional activity, with consideration of these factors. The students can try to use different roles in certain professional situations, or study materials presentation in such roles in a VR environment, which helps to better understand their future professional activity. According to the results of the study by [26], the experience of education with the use of VT is almost identical to real conditions of professional activity. Thus, the use of VR effectively prepares future professionals for the activity in the selected sphere and contributes to the development of their strategic thinking [27].

VR also enables analysing themes from different perspectives (reader or reviewer in journalism, student or another teacher in pedagogyics, clients in management), which significantly extends their career possibilities [28]. According to the conclusions of [29], the creation of individual virtual content by students has a positive influence on the formation of necessary professional skills in general and expands the possibilities of future specialists in different activity spheres. VR use contributes to mastering skills and abilities to work with this technology, which in turn contributes to the creation of the strategy of VR use in future classes with students, which is a modern trend in the development of educational techniques [30]. Visualisation and interaction with complex processes in modelled 3D environments enables the development of conceptual skills, problem-solving skills, and project management [31]. Professionals with a high level of strategic thinking development are needed for organisations under conditions of high competition, [32], and VR use is very effective in achieving this [33]. The professional activity of some specialists involves abilities to work in VR, as the virtual environment is used in marketing as the means of production or service presentation for clients [34]. Other researchers [35] have indicated the importance of using virtual reality as a strategic development of a certain industry.

The data received from the conducted study demonstrate the positive influence of VR use, which enables receiving exciting experience of management and use of certain strategies and means, receiving feedback on them, critical evaluation and correct decision-making. This in general positively influences the development of strategic thinking of future teachers, which supplements the results of previous studies on VR efficiency in general.

5.1. Practical Recommendations

The use of VR technologies in the educational process during studying professionally oriented disciplines by students of further years of studying is effective under the condition of modelling future professional activity. The study of other educational disciplines with the use of VR technologies (review of peculiarities of certain materials or processes) can have other results in relation to strategic thinking, but also positive results in other aspects of education. The quality of interaction and objects' truthfulness did not have a significant influence on the evaluation of strategic thinking of students, but this aspect can have a decisive role in studying the speciality.

5.2. Study Limitations

This study was conducted based on the use of Oculus Rift garniture, with a certain level of knowledge of faculty concerning VR use in educational activity and a certain level of knowledge and skills of students. The study was conducted with the involvement of 4th-year students while studying disciplines of the professionally oriented cycle of the curricula. Future studies may be conducted with the use of different garnitures and a higher level of knowledge of teachers and students concerning VR use in education, in particular with consideration of the results of this study.

6. CONCLUSION

The study demonstrates the potential of VR technologies for the development of strategic thinking among students, and critical aspect of their professional skillset. Students who utilized VR in their educational process exhibited valuable improvements in the level of the strategic thinking, particularly in the areas of conceptual and systemic thinking adaptability and opportunism. The quality of interaction with the VR technology, comfort of use and evaluation of task performance had strong interrelations between all components of strategic thinking (conceptual, systemic thinking, responsiveness to changes, opportunism, as ability to adapt to changes in the environment with maximum benefits). Herewith, the level of objects' truthfulness and the quality of sensory perception did not influence the level of strategic thinking in this study. Improvement of software with VR use can be more effective for the development of strategic thinking of students. It is necessary to consider that the specifics of classes with students of certain specialities can require a better quality of interaction with VR (i.e. the study of certain substances or materials). The influence of VR technologies use on the formation of components of strategic thinking of future specialists and interrelation with the quality of interaction with objects in VR was studied for the first time in the study.

The results of this study suggest that further enhancements in VR would amplify its effectiveness in fostering strategic thinking. It must be taken into account that different academic disciplines may require specialized VR experiences due to their specific needs and for the development of the strategic thinking of the students some specialties.

The practical implications of this study are substantial and provide evidence that VR technology can positively influence the educational outcomes of students, especially in professionally-oriented disciplines. Using VR for practical and theoretical lessons helps students to qualitative boost of their strategic thinking abilities.

Further studies can be directed at the study criteria of the quality of educational classes with VR use, the study of the experience of VR use during different classes, with different interaction quality, the study of the influence of the classes with the use of VR during longer period, evaluation of the influence of classes with different length and frequency on the results of education of students, for the prevention of digital overload in the educational process.

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