IFTE 2018
4th International Forum on Teacher Education

THE INFLUENCE OF VISIAL LEARNING SPACE ON SELF-EDUCATIONAL COMPETENCE OF FUTURE TEACHERS

Elvira G. Galimova (a)*, Galia I. Kirilova (b)
*Corresponding author

(a) Kazan (Volga region) Federal University, Kremlyovskaya str., 18, 420008, Kazan, Russia,
elyagalimowa@yandex.ru
(b) Kazan (Volga region) Federal University, Kremlyovskaya str., 18, 420008, Kazan, Russia, gikirilova@mail.ru

Abstract

The importance of this research is driven by the fact that visual educational tools provide greater opportunities for the development of self-educational competence of students. Visual learning space, however, has its own specific characteristics which students should take into account. Future teachers are intended to become role-models for students and teach them to develop self-educational competence. Difficulties associated with this development process and perspectives for the transformation of the education system, taking into account positive effect of visual learning space on the development of self-educational competence of students, require detailed research.

Accordingly, favorable conditions such as openness, collaboration, and analytical orientation, that visual learning space creates for future teachers' self-development, were defined and accessed in this paper.

Firstly, openness presupposes that future teachers are provided with visual tools and demonstrable self-development results in the open information environment. Secondly, collaboration reflects the process of transferring ways of the development of self-educational competence to students through collaborative activities. All of this leads to positive self-development of future teachers, and their informed choice of an adequate individual educational strategy.

© 2018 Published by Future Academy www.FutureAcademy.org.UK

Keywords: Visual learning space, self-educational competence.

1. Introduction

There are two priorities for future teachers, namely, to develop the ability to act within a variety of situations and to succeed academically through self-educational competence. Teachers face the additional challenge - they need to become role-models for students and demonstrate personal traits and abilities such as determination, mobility, responsiveness, the ability to absorb and apply knowledge to new situations, and the ability to effectively communicate with other people. Each of these abilities can be developed through self-education. All this requires a particular approach to the education process.

In order to meet the challenge, it is essential to use visual tools, which create visual learning space, as a leading educational technology in pedagogical education and a means of organizing teachers' work.

Unlike common visual materials, visual tools imply that teachers operate dynamic visual objects, use concepts and schemes which disclose the content of curricula and the process of learning.

The main goal of visual learning space, emphasizing its integrity, is to disclose the content of components of education process while preparing future teachers. The pursuit of the established goal presupposes adequate demonstration of learning materials. The basis for technical realization of visual learning space is the digital workbook for students, which was experimentally tested. Visual tools are aimed at presenting theoretical materials, exercises and instructions for them, and results of assignments in a way that is easy to understand. Thus, a distinctive feature of the digital workbook is its complexity ensuring the targeted application of visual tools, which together form visual learning space.

The claimed complexity of visual learning space, outlined in the article, includes various development paths of visual learning and self-education, and correspond to different types of visualization, which can be grouped as follows:

- The first-order visualization. It aims to support self-education, in which visual tools are extensively used to learn new material. The leading role of visual tools here is to demonstrate intra-objective (internal) and extra-objective (external) dynamics, which is consequently the basis of the contents of taught subjects.

- The second-order visualization which leads to the collaborative creation and transfer of self-development techniques to students. Visual tools, which include motivational sketches and pictures, structured representation of goals and ways of achieving them, plans of activities presented schematically, educational video podcasts, and the use of infographics for presenting possible results, are more preferable than other visual tools.

In this way, visualization provides analytical support for self-understanding and is intended to justify the choice of practical and useful visual tools based on personal priorities. This type of visualization is personalized, as people are acting on basis of their own preferences. The main objective of visual tools, used in internal analysis, is to re-examine the previous visual experience, assess it and understand. As a result, it is possible to evaluate which visual tools were effective and which tools did not increase students' achievement.

2. Problem Statement

There are different approaches to the definition of competence in pedagogical literature. Having analyzed these approaches, it may be noted that competence in a general sense is a characteristic of a personality, implying that a student has a particular developed competence and including personal attitudes

to this competence, the scope of activities and minimal experience in a particular field (Shishov & Agapov, 2002; Zeer & Symaniuk, 2011; Mityaeva, 2007; Petrov & Degtyarev, 2005; Selevko, 2004).

The main learning outcome according to competency-based approach is the development of key competences, which presuppose the ability of a person to cope with various challenges (Khutorskoy, 2003).

Competency-based approach changes the place of a teacher in the organization of the educational process as well as the nature of relationship between a teacher and a student. A teacher serves as a mentor, facilitator, and partner, who guides learners in their independent pursuit of knowledge. In order to apply the competency-based approach to education, it is essential to create a special learning environment, which promotes the development of one of the key competences, viz., self-educational competence.

The notion of self-educational competence and approaches to its development are discussed in the works of many scholars and researches, who conclude that self-educational competence is developed during self-education activities (Podnebesova, 2018; Fomina, 2004; Sagitova, 2011; Sokolova, 2013).

The development of this competence plays an important role in any type of educational activity (scientific and research, project, creative, professional, etc.). This problem is especially acute at the early stages of competence development. Self-educational competence is nowadays regarded as an important professional skill. Teachers should engage in lifelong learning in order to maintain their expertise in their respective fields. Therefore, higher educational establishments are facing the challenge to create necessary conditions for the development of self-educational competence of students. It is vital that a need for self-education becomes the basis for the development of students' personalities and expertise (Zlotnikova, 2015).

Thus, the first condition for an effective educational process is the organization of collaborative visual learning space which promotes the development of self-educational competence of future teachers. This learning space was created to prepare future teachers at the Institute of Psychology and Education of Kazan Federal University (KFU). In order to design quality learning space, the digital workbook, based on Google tools, was introduced. A digital workbook platform provides a number of functions, namely, search function, select function, the function which allows users to view teaching materials for the course. It also enables students to view, edit, and comment individual documents created by their peers.

The second condition refers to collaborative organization process aimed at the effective development of self-educational competence of future teachers. Collaborative visual learning space presupposes that students participate in collaborative activities and present the results visually, for instance, they conduct collaborative surveys, collect research information, collaboratively create questionnaires, and visually present survey findings or statistical analysis using summary tables. Collaborative activities become a priority in teacher education and take on many different forms. These activities contribute to positive environment in the classroom, improve the teacher-student relationship, which is based on cooperation and the promotion of self-development, rather than on a teacher's authoritarian control.

Very important becomes analytical orientation of visual tools and teaching resources, presentations and text documents, aimed at representing information systematically. Analytical orientation of visual learning space has been apparent in applying content analysis to the documents that students prepared, and determining the sample size of educational materials using keywords research. Thus, the basic idea of self-education is that the development of teachers' capacity to act purposefully and constructively to direct their

professional growth and contribute to the growth of their colleagues (teacher agency) promotes students' self-development.

Research on the development of self-educational competence of students in visual learning space was conducted from 2015 to 2017 involving 260 students studying the Institute of Psychology and Education of KFU, and attending courses of 'Audio-visual technologies' and 'Information technologies in education'. Research results were analyzed and divided into two groups, namely, results related to visual tools and self-development of future teachers and results connected to the process of transferring knowledge of self-educational competence to students and methods for the development of this competence in visual learning environment.

3. Research Questions

In order to ensure that the need for self-development enables the development of expertise of learners, it is crucial to increase the effectiveness of educational process and create visual learning environment, in which the transfer of experience about self-educational competence from future teachers to their future students becomes a top priority.

4. Purpose of the Study

This study is aimed at determining the conditions for the effectiveness of visual learning space and its influence on the development of self-educational competence of future teachers. It has been experimentally shown that the main conditions contributing to the effectiveness of the visual learning space are openness and collaboration.

5. Research Methods

During the study, we used a range of research methods, which are as follows:

1. The organization of educational process in open information space based on Google tools, which provide a number of functions, namely, search function, select function, the function which allows users to view teaching materials for the course. It also enables students to view, edit, and comment individual documents created by their peers;

2. Analysis of surveys created by students. It should be noted here that future teachers learn to collect research information, collaboratively create questionnaires, and visually present survey findings or statistical analysis using summary tables;

3. Analysis of visually presented materials, presentations and text documents, and their classification; the application of content analysis to the documents that students prepared, and the determination of the sample size of educational materials using keywords research.

The study began on September 1st in 2015 at the Institute of Psychology and Education of Kazan Federal University and has been going on ever since. 260 Master students specializing in 'Pedagogical Education' have taken part in the research to date.

6. Findings

The study presupposed a new organization of educational process with innovative pedagogical strategies, contributing to the development of self-educational competence of students. This organization process is aimed at identifying the most effective visual tools which can be tested when students collectively do exercises in the digital workbook. Components of self-educational activity in visual learning space will be presented later in the article.

6.1. Openness as a condition for the effectiveness of visual learning space and the development of self-educational competence of future teachers

The first and foremost condition for the effectiveness of visual learning space, which was experimentally tested, is openness. Almost all of the participants, taken part in this research, highlighted a positive effect of a visual representation of the results of students' work on the development of students' self-educational competence. It is possible to monitor students' work in and outside the classroom in open learning space. Table 01 below summarizes data on the aspects of openness of visual learning space, which students consider the most important in the process of visualization.

Table 01. Aspects of 'openness' of visual learning space selected by students

The most important aspects of openness from students' perspective	Number of students	Percentage
Separate education levels	58	22
Peculiarities of studied subjects	48	18
Types of visual tools	44	17
Other	110	43
Total	**260**	100

The most important aspects of openness of visual learning space, which students highlighted during the experiment, were summarized and presented in order of significance in Table 01.

'Separate education levels' were chosen by a large group of students (22%) as the most important aspect of visual learning space. It can be explained by the fact that graded education facilitates the process of setting educational goals taking into account students' specialization. Students also commented that openness in the context of a particular education level allows for the possibility to learn the successful practices of other teachers from the Department of Pedagogy at various educational establishments.

The second most important aspect of openness, marked by 18% of students, deals with peculiarities of studied subjects. The reason of this choice is that the peculiarities determine the structure and the content of curricula for future teachers. Students noted that monitoring of teaching programs is crucial at the current stage of the development of informatization, which provides an access to many components of education system. According to future teachers, visual representation of learning content is the most useful practice in visual learning environment. Monitoring of learning content can serve as the basis for an informed choice of the most suitable visual tools for students.

The third aspect titled 'types of visual tools' was mentioned by 17% of students. It refers to the organization of activities in visual learning space contributing to the development of self-educational competence of future teachers.

A disciplinary approach presupposes the choice of various visual tools and their arrangement in groups based on their connection to taught subjects such as humanities, physical and mathematical sciences, or natural sciences. Types of visual tools (intra-objective or internal and extra-objective or external) perform different functions and are used to highlight the peculiarities of a particular taught subject.

It should be noted here that 43% of students chose other aspects of openness of visual learning space, meaning that a more detailed analysis of research questions is required.

On the basis of analysis of student papers, available in an open learning space, we created Table 02 to show how visual tools and what types of visual tools were used in the education of future teachers specializing in various disciplines.

Table 02. The use of subject-specific visual tools in the classroom

Subject	Types of visual tools	The number of students	Percentage
Humanities	Extra-objective	124	48
Natural sciences	Intra-objective	50	19
Mathematical sciences	Intra-objective, Extra-objective	46	18
Information sciences	Algorithmic	20	8
Other	Mixed	20	7
Total		260	100

It is significant that the overwhelming majority of visual tools consisting 48% was implemented in teaching humanities. Apparently, pedagogy students preferred using extra-objective tools, as they are easy to prepare. In most cases, application of visual tools in humanities presupposes that students create simple illustrations and use them as additional education resources.

Nature and mathematical sciences require more complicated tools of visualization, namely, intra-objective tools, chosen by 19% of students, and the combination of intra-objective and extra-objective tools, applied by 18% of students. The combination of extra- and intra-objective tools may be used to present dynamic visual models, formulae, and charts.

Application of visual tools in information sciences is not shown in detail, as it requires software programming language skills, understanding of software packages and algorithm analysis techniques, which are not closely connected to key pedagogical competences. Thus, only 7% of students use visual tools in information sciences.

6.2. Collaboration as a condition for the effectiveness of visual learning space and self-development activities of future teachers

Collaboration is an important condition for the effectiveness of visual learning space. When students have an access to a software platform allowing to view and edit documents online, they can easily identify

and analyze challenges faced by their peers. The digital workbook, which was tested during the experiment, proved to be very effective in collaborative activities.

Table 03. Distribution of work styles in collaborative activities

Aspects that need to be changed according to future teachers	The number of future teachers	Percentage
Students' work style	158	61
Teachers' work style	102	39

There are some differences in the organization of collaborative activities. Teachers should not only influence students' development, but also work towards self-improvement. However, less than half of future teachers (39%) indicated their willingness to change their work styles. The majority of participants (61%) claim that it is essential to change students' work style. Nevertheless, the transfer of self-educational technologies to students requires efforts of both sides. Students observe teachers' self-development, learn from their experiences, and therefore formulate their own strategies in order to develop self-educational competence.

Students' and teachers' work deals with accumulation and transfer of experience related to self-education. Teacher should be aware how to use visual tools effectively.

Table 04. Students' preferences on the use of visual tools in the classroom

The type of visual tool	Number of students	Percentage
Video podcast	138	53
Presentation	46	18
Electronic resource	16	6
Poster	14	5
Table	6	2
Other	24	9
Total	260	100

As seen in Table 04, students prefer recording podcasts on mobile devices to preparing presentations. This fact deals with the development of modern technologies. The use of combination of visual tools can be described as an effective educational practice. For instance, it is possible to include infographics, 'dynamic' models and schemes in a video podcast. A combination of visual tools was highlighted as positive by most of those interviewed (78%). However, only 7% of respondents showed how they use a combination of visual tools in practice. Posters (5%) and tables (2%) were the least preferable visual tools. This can be explained by the fact that they refer to traditional means of presenting information and lack the possibility of dynamic visualization.

The experiment showed that a small proportion of future teachers could enumerate (7%) and give examples (3%) of visual tools which promote collaborative activities. The number of people aware of visual tools contributing to collaboration between students increased and constituted 21% after the use of the digital workbook at the final stage of the experiment.

Modern teachers should be willing to explore new visual tools and ways of applying them in a new environment. All this involves a long and arduous effort.

Analytical orientation of visual learning space presupposes that students learn to use tools for the analysis of teaching aids and outcomes of self-development and compare them with outcomes of other participants of educational process.

Conditions for the effective use of visual tools, contributing to self-development of teachers, were identified on the basis of content analysis; they are as follows: variable visual tools as a means of the development of self-educational competences, visual learning space as a means of transferring ways for the development of self-educational competences, a modern computer platform, software, free Internet access, educational resources taking into account the potential of ICT.

Table 05 and 06 summarize the data obtained during the experiment. Table 05 shows the frequency of using computer visual tools in elementary school, while table 06 is related to the appropriate amount of time that future teachers spend on using computer visual tools in elementary school.

Table 05. The frequency of using computer visual tools in elementary school

Frequency	Before the experiment	1st grade	2nd grade	3rd grade	4th grade
		After the experiment			
Always	2	2	2	3	7
Often	10	8	10	10	6
Seldom	2	2	1	1	1
Never	0	1	0	0	0

Table 05 shows the amount of participants, using visual tools in the classroom at different grades of elementary school. During the experiment, it was necessary to not only express an opinion on the use of visual tools in the classroom, but also prove it in practice.

The experiment also consisted of preliminary surveys and classes on the use of visual tools in the classroom. During school-based internships, students had an opportunity to apply the acquired knowledge in practice.

Table 06. The appropriate amount of time that future teachers spend on using computer visual tools in elementary school

	Mathematics	Natural science	Language	Reading	Handicraft
more than 20 min	0	1	0	2	3
5-20 min	2	4	2	2	6
3-5 min	8	10	6	7	6
1-3 min	7	2	9	6	2

Based on a survey of future teachers, who have already done school-based internships and gained experience in using visual tools in the classroom, we identified some recurrent challenges encountered by future teachers. These challenges can be listed in the order of their frequency: 1) the lack of effective disciplinary-based audio-visual means of education at schools (61.9%); 2) the lack of teachers' necessary

knowledge and competences required for using audio-visual means of education (28.6%); 3) the under-development of visual tools and their failure to take into consideration age specificities (9.5%).

Research findings show that there is an increasing tendency among teachers in using visual tools in the classroom, which are an integral part of self-development activities.

7. Conclusion

It should be noted that self-development and self-reflection of teachers and students differ. The traditional way of teaching presupposing that teachers deliver educational material and simultaneously explain ways of independent learning proved to be ineffective. Visual tools, introduced in the paper, allow for the possibility to eliminate disparities in students' knowledge, avoid information overload, and create and maintain supportive and safe learning environment in the classroom.

The research showed that proposed conditions for 'openness' and 'collaboration' motivate future teachers to develop their self-educational competences and transfer the experience of self-educational activities from teachers to students and from future teachers to their future students.

During the experiment, each student gained preliminary experience of different ways to develop self-educational competence while using modern computer technologies, the software, and the Internet. Students also started to better understand the development mechanisms of visual learning space. All this encourages future teachers to develop their self-educational competence in order to transfer it to future students during their professional activity.

Acknowledgments

References

Fomina E. (2004). Formirovanie samoobrazovatel'noj kompetentnosti studentov na osnove primenenija modul'noj tehnologii [Development of self-educational competence of students through modular technology]. (Doctoral dissertation) Retrieved from http://nauka-pedagogika.com/pedagogika-13-00-08/dissertaciya-formirovanie-samoobrazovatelnoy-kompetentnosti-studentov-na-osnove-primeneniya-modulnoy-tehnologii.

Khutorskoy, A. (2003). Kljuchevye kompetencii kak komponent lichnostno-orientirovannoj paradigmy obrazovanija [Key competencies as a component of the learner-centered paradigm of education]. *National education-Russia, 2*, 58-64.

Mityaeva, A. (2007). Formirovanie uchebno-issledovatel'skoj kompetentnosti studentov v bakalavriate i magistrature [Development of academic and research competence of Bachelor and Master students]. (Doctoral dissertation) Retrieved from http://www.dissercat.com/content/kompetentnostnaya-model-mnogourovnevogo-vysshego-obrazovaniya-na-materiale-formirovaniya-uch.

Petrov, A., & Degtyarev, V. (2005). Kompetencija - kompetentnost' - professional'naja kompetentnost': ih sootnoshenie. Samorazvitie cheloveka. [Competence – competency – their correlation. Personal development]. Novgorod: the Pedagogical Academy.

Podnebesova M. (2018). Sushhnostnye harakteristiki samoobrazovatel'noj kompetentnosti [Characteristics of self-educational competence]. Retrieved from http://econf.rae.ru/article/7457.

Sagitova R. (2011). Formirovanie samoobrazovatel'noj kompetencii studentov vuza v processe izuchenija gumanitarnyh disciplin [Development of self-educational competence of students while studying

humanities]. (Doctoral dissertation) Retrieved from http://www.dissercat.com/content/formirovanie-samoobrazovatelnoi-kompetentsii-studentov-vuza-v-protsesse-izucheniya-gumanitar.

Selevko G. (2004). Kompetentnosti i ih klassifikacija [Competencies and their classification]. *National education-Russia, 4*, 138-143.

Shishov S., & Agapov I. (2002). Kompetentnostnyj podhod k obrazovaniju: prihot' ili neobhodimost'? [Competency-based approach to education: whim or necessity?]. *Standards and monitoring in education-Russia, 2*, 58-62.

Sokolova L. (2013) Self-educational competence of young researchers of pedagogical problems: Methodological aspect. *Middle East Journal of Scientific Research, 15*(3), 339-343.

Zeer E., & Symaniuk E. (2011). Kompetentnostnyi podkhod kak faktor realizatsii innovatsionnogo ob obrazovaniia [Competency-based approach as a catalyst for the realization of innovative education]. *Education and Science-Russia*, 8, 3-14.

Zlotnikova E. (2015). Organizacionno-pedagogicheskie uslovija stanovlenija samoobrazovatel'noj kompetencii kak cennosti budushhih bakalavrov-pedagogov. Sovremennye problemy nauki i obrazovanija [Organizational-pedagogical conditions of formation of self-competence as values of future bachelors-teachers]. *Modern problems of science and education-Russia*, *1*(1).