

CIEDR 2018
**Contemporary Issues of Economic Development of Russia:
Challenges and Opportunities**

**INTERDISCIPLINARY STUDENT ENGAGEMENT AS A
POTENTIAL CONDITION OF DEVELOPING PROFESSIONAL
CREATIVITY**

P. G. Labzina (a)*, V. V. Dobrova (b), S. G. Menshenina (c), N. V. Ageenko (d)

*Corresponding author

(a) Samara State Technical University, Molodogvardejskaya ul, 244, Samara, Russia, labzinapg@mail.ru, +7-846-278-43-75

(b) Samara State Technical University, Molodogvardejskaya ul., 244, Samara, Russia, victoria_dob@mail.ru, +7-846-278-43-75

(c) Samara State Technical University, Molodogvardejskaya st., 244, Samara, Russia, menshenina.mail@mail.ru, +7-846-278-43-75

(d) Samara State Technical University, Molodogvardejskaya st., 244, Samara, Russia, 1-2402@ya.ru, +7-846-278-43-75

Abstract

The modern way of all society spheres development is sustainable and encourages the integration of the scientific processes. The transfer of ideas and research methods from one scientific area to another through the cognitive potential of different disciplines reflects this tendency. All these processes lead to a collaboration between the actual scientific and engineering spheres: the innovation projects today are characterized by increasing science-intensity, complexity and innovativeness, including not only technological, but also environmental, social, economic aspects. This multidimensionality determines the need for specialists who are able to find and solve complex professional tasks. It is this synthesis of science and production that can increase the competitiveness of the country's economy in the modern dynamics of all processes. Such conditions stimulate the interdisciplinary interaction in higher education institutions. In this respect the professional creativity of a technical specialist is important and is understood as the ability to create new products and get high performance results through the realization of the individual creative abilities. However, pedagogical science does not pay enough attention to the consideration of professional creativity in the context of creating and organizing the work of interdisciplinary project teams. The product of the team's activities is not presented in the light of its contribution to the formation of the student's professional personality. Therefore, in this paper we aim at revealing the potential of interdisciplinary interaction for the development of professional creativity, taking into account the characteristics of the product as a result of project activities.

© 2019 Published by Future Academy www.FutureAcademy.org.UK

Keywords: Creative thinking skills, interdisciplinary engagement, interdisciplinary project team, professional adaptation, professional creativity, virtual reality program.



1. Introduction

The development of modern technologies and socio-economic relations are reflected in the changing concepts of work structure in different organizations. In recent decades, the need for cooperation in the workplace has increased in production and organizational spheres, the integration of social, managerial and technological processes has become urgent, and the exchange of information has become global.

Following constant changes in society and science, education also loses its classical fundamental form, presupposing the necessity of training a specialist who knows how to work "in depth", to seek the laws of a disciplined organized professional sphere. The communicative, interdisciplinary nature of education becomes adequate to modern society and science as a form of its new fundamental, non-classical type. Interdisciplinary knowledge is not distinguished by disunity, and therefore the ability to apply the acquired knowledge in practice and adapt to changing conditions is considered today as a characteristic of a professional. In fact, modern science cannot be seen separately - as a theory, or as a technology and practice of the production process (Kirillov & Leontjeva, 2014; Aleksandrov, Feodorov, & Medvedev, 2012).

The new state of science, namely its interdisciplinary character, makes one master the surrounding reality through cognitive activity as a combination of cognitive and transformative components. In this connection, we actualize the need of the society for the specialist having non-standard, flexible, creative thinking skills that will allow him to activate and maximize the realization of potential opportunities (Hadzigeorgiou, Fokialis, & Kabouropoulou, 2012). All the above facts can become a theoretical and methodological basis for the possibility of reaching the applied level at the stage of higher education, what encourages interest in studying team forms of work. Achieving tangible results and maintaining the competitive potential of companies and their effectiveness directly depends on coherent team work in an atmosphere of cooperation. The use of an effective team, especially in project activities, leads to a significant change in the quality of the workforce. Collaborative work requires self-management and a well-organized interaction of team members. In addition, the development of education and modern technology requires the use of multiple work skills in the work, and not only the ability to perform one or two specific operations (Fenollera, Lorenzo, Goicoechea, & Badoui, 2012).]

2. Problem Statement

The key characteristic of the modern professional environment is the synthesis of interdisciplinary knowledge and its creative application to problem solving. In this regard, traditional education does not contribute to training a specialist with a developed creative potential, flexible, associative thinking and ability to adapt to changing environments, which is the basis of professional creativity. In accordance with our experience, we believe the preparation of creative engineers to be possible when organizing the educational process in the form of an interdisciplinary project team as a potential condition for the development of students' professional creativity and choosing the product of this team activity with the process of its creating reflecting the motivational, cognitive and activity components of professional creativity.

3. Research Questions

What is the potential of interdisciplinary interaction as a condition for the professional creativity development?

What is the content of professional creativity as a personal quality?

Why is the training program in virtual reality a creative product of an interdisciplinary project team?

4. Purpose of the Study

The search for ideas to improve the quality and increase the effectiveness of training forces us to consider team forms of the educational process and to think carefully about the choice of the work topic. The purpose of this research is to update the concept of "professional creativity", which is developed during students' team working at an innovative product on the interdisciplinary basis. The product itself is a program of virtual reality for learning foreign languages. The choice of this product is determined by its motivational potential, the cognitive orientation and actionable character of the team work.

5. Research Methods

The methodology of the article is based on theoretical methods of analysing and summarizing information from psychological, pedagogical and methodological literature that made it possible to identify the key points of the research and clarify the essence of such concepts as interdisciplinary interaction, professional creativity, a virtual reality program for educational purposes, a project team that influence the professional training of future specialists.

6. Findings

The analysis of the sources of the problem stated allows us to conclude that there is a stable demand for a sufficiently long period of time for students with developed creative potential. Foreign researchers also believe that "the main goal of education is to create people who are creative and inventive personalities and able to do things, and not just repeat what other generations have done. The goal of education is the formation of minds that can make decisions, check information and not accept everything that they are offered in the existing form (Perry & Stewart, 2005; Sautwik, 2013). A modern dynamic world does not need a "trained person" or a "knowledgeable" (both of these concepts have a shade of passivity), but a "research person", a "creative person" who is not content with the knowledge, methods and standards accumulated by previous generations, but capable of thinking independently, solving complex problems through adapting and applying the existing knowledge in new environments. Education corresponding to the current cultural situation should become a means of creating reality, a way to see the world in a different way, to actively integrate into it and become a full participant in the creative process of the world formation (Shaheen, 2010; Ulyanova, 2012; Zhurakovskiy, 2013).

However, the list of professional competencies of engineering programs, does not contain the competence of creative development and self-development. This contradiction makes it necessary to

search for those conditions which could stimulate the process of flexible transfer of knowledge from one disciplinary area to another in a natural way. The idea is to develop a non-standard approach to solving educational problems and tasks (Blokhovtsova, 2011; Mynbayeva, Vishnevskaya, & Sadvakassova, 2016).

The concept of "creativity" is perhaps one of the most fashionable terms of modern society, which is paid close attention to in many scientific researches, but at the same time there is a large field for further investigation due to the multifaceted nature of the thought processes leading to a creative decision. The evidence of the creativity relevance is an increased attention on the part of researchers from different fields - philosophers, educators and psychologists. The basis of the methodology is ideas about creativity as a thinking process, as an inter-subject relationship, the way to focus on new solutions and preserve modern society, the necessary socio- technological element of modern civilization (Sokóła, Figurskab, & Blašković, 2015).

The specificity of creativity was marked by Whitehead (1990) in a precise way. According to his definition, creativity is the "actualization of potentiality, creative power, creative energy, inherent in human existence" (p. 107). The variety of interpretations of creativity allows us to consider it as a manifestation of personal self-realization because it is directly related to professional success. We also agree with the point of view of Khutorsky A., who defines creativity as "an integrative ability incorporating entire systems of interrelated elements such as independence, associativity, etc." (Aybatyrov & Magomedova, 2015, p.73). We should also note that creativity is an area of cognitive functioning that plays an important role in a wide variety of tasks solved in engineering, science and other spheres (Richardson & Mishra, 2018).

At present creativity determines the ease of adaptation of any young person in the world around him, which is the precondition for success in his professional activity. Since creativity is an essential attribute of self-actualization, it manifests itself in the ability to find creative opportunities in everything. Creative and self-actualizing people are psychologically ready for innovation in their professional activities, are less influenced by professional "burnout", which is a common thing nowadays (Bryakova, 2009).

At the same time, the object of professional development and the form of creative potential realization in professional sphere are such integral characteristics of the personality as professional orientation, competence, purposefulness, emotional and behavioral flexibility being a psychological basis, necessary in all types of activity.

The importance of the professional creativity development is due to the constant technical and technological complication of production processes and machines, the situations of technical and social interaction, strict requirements for specialists within their professional activity. At the same time, it is obvious that there is insufficient theoretical development of questions concerning the concept of professional creativity, its content, orientation and mechanism of formation. This fact determines a high scientific relevance and practical significance of the research.

Such attributes of professional activity as creative thinking, expressed in originality, the ability to produce ideas, unconventional way of finding solutions to problems, ingenuity and innovation in productive areas, as well as the curiosity that is in the openness to knowledge and activity, meet the

standards and allow us to talk about professional creativity. Vishnyakova (1996) introduced the concept of "professional creativity", which includes the productive professional orientation of the individual, the level of ingenious thinking, improvisation, openness to the new in activity and innovation. We believe that the representation of these characteristics becomes a resource for the specialist personality formation in the context of interdisciplinary interaction.

In accordance with the research problem stated and the ideas presented by Aybatyrov & Magomedova (2015), we will consider the professional creativity of the student as an integral personal quality, formed in the process of interdisciplinary training and manifested in the learning process as structured motives, knowledge, skills that allow not only to adapt to new situations quickly, but also to find and effectively apply non-standard, original solutions in professional production, to reveal a tendency for self-realization and self-development in future career.

Characteristics of the creative product of the professional activities are novelty, economic usefulness of technical and technological developments, as well as the overall effectiveness of professional activity, expressed in the optimal organization of engineering practices, taking into account the minimization of energy costs.

Based on the above definitions, the development of professional creativity as a system personal quality should be conducted in conditions of interdisciplinary interaction, which ensures the implementation of the motivational, cognitive and activity components of professional creativity (Sorokina, 2007).

The motivational component of professional creativity includes a positive, creative attitude to work, a constant interest in innovations in the relevant professional field. This component should be formed as a harmonious combination of cognitive and professional motivation, the desire for productive activity, involvement in innovative processes, openness to changes, the focus on personal growth through raising the educational level. At the same time, motivation provides an interest in non-standard professional tasks; emotional involvement in creative activity; the tendency for creative cooperation in the process of solving problems; orientation on the process of achieving the goal, obtaining the desired and innovative result of professional creative activity. It is the product itself as the output of the interdisciplinary project team work which reflects the motivation component.

The cognitive component of professional creativity is presented in the idea of professional creativity essence and the ways of its development; in representation of the requirements for a specialist in the labor market; in the notion about the spheres of professional creative skills application; on the level of professional knowledge that allows to operate and combine it to adapt to a specific situation.

The activity component of professional creativity reflects fluency (the ability to generate ideas and offer several solutions to problems); flexibility (the ability to offer different types or categories of the problems solution); ability to structure and imagine; ingenuity (the ability to change and transform educational and professional tasks); ability to abstract and concentrate in the process of problems solving; ability to transfer knowledge and skills from the technical field to other areas (Barysheva, 2005).

We came to the conclusion that the essence of the professional creativity of a specialist is the readiness and ability to forward his professional activity not only to get actual technological results, but

also to obtain results of application value that would increase the efficiency of production and the enterprise as a whole.

The basic mechanism for the development of professional creativity is a reflexive one, since by reflecting a person is able to catch the valuable and important ideas that appeared in the working process. Another mechanism, that is a self-regulation, helps increase the activity of the individual in situations of uncertainty, contributes to stimulating and stability of creative activity.

The essential characteristic of professional creativity is a high level of professional self-realization, based on a unique personal experience. Such an attitude towards the personal position of self-actualization does not contradict the collaborative process in the professional working group. The depth of knowing one's own motives, self-discovery and self-affirmation through results that benefit the whole group, enable all team members to show flexibility, adaptability, the ability to realize their own potential in the course of joint project work.

Components of professional creativity and their indicators correlate with elements of the interdisciplinary educational process that lead to significant learning and each of these is a common feature of interdisciplinary forms of instruction.

- Foundational Knowledge – acquiring information and understanding ideas
- Application – acquiring an understanding of how and when to use skills
- Integration – the capacity to connect ideas
- Human Dimension - recognition of the social and personal implications of issues
- Caring – acknowledgment of the role of feelings, interests, and values
- Learning How-to-Learn – obtaining insights into the process of learning (Why Teach with an Interdisciplinary Approach?, n.d.; Rowland, 1996).

The benefits of teams can be seen in many environments including the educational environment. Teachers have found that cooperative work among students can increase learning (Kruck & Faye, 2009). Interdisciplinary integration is presented in our research as a pedagogical condition that changes the content of education, makes it more extended and holistic. Besides, it introduces modern information technologies into the educational process, activates cognitive activity of students, forms integrated professional thinking. It was revealed that such integration, including a foreign language, specialty, computer technologies, economic planning, ensures that the level of graduates' training corresponds to the requirements of the society and employers (Rzheutskaya & Kharina, 2017).

We tried to take into account all the points mentioned when creating and organizing the work of an interdisciplinary project team. The idea was that students need to work on creating a business idea and drawing up a business plan. Students of technical specialty should deal with the project from the technical and operational point of view, while students studying economic specialties should offer a new vision and understanding of the product, provide a market research, financial and economic analysis.

The theoretical analysis and practical work allowed to identify the main indicators of the successful project team organization:

- leadership and management

- effective communication
- personal rewards, training and development
- appropriate resources and procedures
- appropriate skills mix
- positive and enabling climate
- individual characteristics
- clarity of a shared vision
- quality and outcomes
- respecting and understanding roles (James Jacob, 2018)

As we have already mentioned, the choice of the project team's product is of great importance for the realization of the motivational, cognitive and activity components of professional creativity. The optimal interdisciplinary solution was the creation of a virtual reality program to learn foreign languages. We explain our choice by the increased importance of intellectual work based on information resources of a global scale, constantly developing scientific and production technologies and the importance of international communication in the professional sphere. The product meets the requirements of the educational process effectiveness on the basis of its individualization, informatization and intensification, lifelong learning, enhancing the professional competence and competitiveness of future specialists in various industries.

The creation of modeling pedagogical software based on virtual reality technology determines a number of research directions (mathematical modeling, virtual reality modeling philosophy, information display theory, the psychology of computing space perception, virtual reality ecology, basic didactics principles) and this fact proves the potential of the chosen product for interdisciplinary interaction (Tretjakova, 2010).

The functional purpose of the integrated learning system in a foreign language with VR/AR technologies is an introduction of the innovative method of teaching a foreign language; use of the latest VR/AR technologies in the process of learning a foreign language; interactive acquaintance with the professional sphere; preparation of teachers of a foreign language of a higher educational institution for conducting classes with the help of VR/AR technologies.

The project work on creating a virtual reality program to learn foreign languages is organized according to the individual students' curriculum which has such disciplines as "Practical-oriented project", "Discourse methodology", "Project management methods", "3D modeling".

The creative nature of the virtual reality program is supported by the creative approach to the development of the program scenario, taking into account the technical capabilities and demand for a particular topic in the aspect of learning a foreign language; choice of design solutions for creating locations in a virtual environment; non-standard product description from the economic point of view with the purpose of presentation on the market.

Theoretical analysis and practical work allowed to evaluate the choice of the innovative product for the realization of the interdisciplinary interaction in the project team with the goal of mastering professional creativity. The process of the product development includes both group and individual

activities and the key to success is reflection - an analysis of the personal goals achievement for effective teamwork. Cognitive functioning is reflected in the connection of the experience gained in different combinations. Adaptive ability is expressed in creating and maintaining contacts with all group members.

7. Conclusion

Innovation in education is based on the possibility of interdisciplinary interaction at the expense of its potential, which is represented by its resources - ideas and approaches from different areas, and opportunities for increasing the level of scientific knowledge in the aspect of creating a qualitatively new and adapting knowledge that has already been obtained in non-standard situations.

The goal of implementing interdisciplinary interaction is the development of professional creativity among learners, which will enable them to acquire the missing knowledge from different sources independently; to adapt and use the acquired knowledge to solve cognitive and practical problems; to acquire communication skills when working in a group; to develop research skills and unconventional thinking.

Professional creativity is understood as a personal ability to think divergently on account of intellectual, personal, motivational, emotional abilities, which determine in general the productivity and effectiveness of professional activity. The intellectual abilities that characterize creativity include: fluency, flexibility of thought, originality, curiosity, ability to develop a hypothesis. The motivational characteristics of creativity include: the desire to realize oneself, to use one's capabilities, to perform new unusual activities, to apply new ways of activity, readiness to risk and to check the limits of one's possibilities.

The progress in development of creative activity characteristics is subjected to the right choice of the interdisciplinary work product. The virtual reality program is an ideal educational environment for learning a foreign language, because of its multimodality. VR development is a creative process that affects the technical area, including audio, textual, spatial (graphical) resources to ensure the multidimensional transmission and perception of information. The content aspect of this process is aimed at activating cognitive abilities, adaptive skills in changing conditions and anticipation in professional activities.

References

- Aleksandrov, A., Feodorov, I., & Medvedev, V. (2012). Engineering education today: problems and solutions. *Higher Education in Russia*, 11, 30-40.
- Aybatyrov, K., & Magomedova, Z. (2015). Scientific and pedagogical rationale of professionally-oriented creativity. *Vestnik KazSUKI*, 3. Retrieved 5 August 2015 from <https://cyberleninka.ru/article/n/nauchno-pedagogicheskoe-obosnovanie-kategorii-professionalno-orientirovannaya-kreativnost>
- Barysheva, T. (2005). *Psychological structure and development of creativity in adults* (Doctoral Dissertation). Saint Petersburg: St. Petersburg State University.
- Blokhovtsova, G. (2011). Sociocultural potential of humanitarian creativity in art, science and education (Doctoral Dissertation). Rostov-on-Don, Russia: Southern Federal University.
- Bryakova, I. (2009). The development of personal creative abilities in the open education system. *A man and society*, 1. Retrieved June 29, 2018, from <https://cyberleninka.ru/article/n/razvitie-kreativnyh-kachestv-lichnosti-v-sisteme-otkrytogo-obrazovaniya>

- Fenollera, M., Lorenzo, J., Goicoechea, I., & Badoui, A. (2012). Interdisciplinary Team Teaching. *DAAAM International Scientific Book, 11*, 585-600. DOI: 10.2507/daaam.scibook.2012.49
- Hadzigeorgiou, Y., Fokialis, P., & Kabouropoulou, M. (2012). Thinking about Creativity in Science Education. *Creative Education, 3*(5), 603–611.
- James Jacob, W. (2017). *Interdisciplinary Trends in Higher Education*. Retrieved February 19, 2018 from: https://www.researchgate.net/publication/273294632_Interdisciplinary_Trends_in_Higher_Education
- Kirillov, N., & Leontjeva, E. (2014). Practice of students and teachers' creative potential development. *PUSS, 11*. Retrieved 14 July 2018 from <https://cyberleninka.ru/article/n/opyt-razvitiya-tvorcheskogo-potentsiala-studentov-i-prepodavateley>
- Kruck, S., Faye, P., & Teer (2009). Interdisciplinary Student Teams Projects: A Case Study. *Journal of Information Systems Education, 20*(3), 325-330
- Mynbayeva, A., Vishnevskaya, A., & Sadvakassova, Z. (2016). Experimental Study of Developing Creativity of University Students. *Procedia - Social and Behavioral Sciences, 217*, 407 – 413
- Perry, B., & Stewart, T. (2005). Insights into effective partnership in interdisciplinary team teaching. *System, 33*(4), 563-573
- Richardson, C., & Mishra, P. (2018). Learning environments that support student creativity: Developing the SCALE. *Thinking Skills and Creativity, 27*, 45-54
- Rzheutskaya, S., & Kharina, M. (2017). Interdisciplinary interaction in the integrated informational environment of the technical university education. *Open education, 21*(2), 21-28
- Rowland, J.R. (1996). Interdisciplinary team teaching. *Technology-Based Re-Engineering. Engineering Education Proceedings of Frontiers in Education FIE'96 26th Annual Conference, 3*, 1291-1294 <https://dx.doi.org/10.1109/FIE.1996.567861>
- Sautwik, F. (2013). Opinion: university education suppresses creativity. *Problems of social systems management, 5*(8), 62–65
- Shaheen, R. (2010). Creativity and Education. *Creative Education, 1*(3), 166–169
- Sokóła, A., Figurskab, I., & Blaškovác, M. (2015). Using the internet to enhance teaching process at universities for the development of creativity competencies. *Procedia - Social and Behavioral Sciences, 186*, 1282 – 1288
- Sorokina, I. (2007). *The development of civil officers' professional creativity in autopsychological competence* (Doctoral Dissertation). Russian Academy of Civil Service under the Russian Federation President. Moscow.
- Tretjakova, T. (2010). Aspects of application technology “Virtual Reality” in vocational training system. *Vector of science TSU, 2*(12), 205-208
- Ulyanova, O. (2012). Interdisciplinary approach as a key principle of developing technical students' professional competence. *Professional education in Russia and abroad, 4*(8), 65-68
- Vishnyakova, N. (1996). *Psychological foundations of creativity development in professional acmeology* (Doctoral Dissertation). Moscow: Russian Academy of Education, Institute of Psychology.
- Why Teach with an Interdisciplinary Approach? (n.d.). Retrieved June 15, 2018 from: <https://serc.carleton.edu/econ/interdisciplinary/why.html>
- Whitehead, A. (1990). *Selected works on philosophy*. Moscow: Progress.
- Zhurakovskiy, V. (2013). On some results and prospects of the national research universities activities. *Higher education in Russia, 12*, 8–20