# Work 4.0: Designing Competencies for the Employee of the Future

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**Abstract**

The purpose of the study is to develop the author's approach to the formation of professional competencies in accordance with the requirements of the Work 4.0 concept through the organization of itinerant practice-oriented educational schools. The paper systematizes the competence of specialists for the digital economy in the framework of the Work 4.0 concept. It is proved that for the formation of students' professional and supra-professional competencies that meet the requirements of the Work 4.0 concept, it is necessary to supplement the traditional learning process with the practice of conducting itinerant educational schools based on a cross-disciplinary approach. The authors highlighted the advantages of itinerant educational schools in the organizational and pedagogical context (intensification of the educational process, flexibility and adaptability, the possibility of constant adjustment of the format depending on the desired results, the use of collective mechanisms of responsibility, high public response). The authors put forward the concept of creating and implementing itinerant practice-oriented schools "Lewcamp" based on a cross-disciplinary approach. The authors proved the effectiveness of conducting itinerant educational schools based on the assessment of the formation of professional and supra-professional competencies by testing and questionnaire methods, drawing up diagnostic maps, and mathematical processing of the obtained data.

**Keywords**

Work 4.0 • Competencies • University • Training • Professional competencies • Supra-professional skills • Itinerant school • Cross-disciplinary approach

**JEL Code**

I23 • I25 • I26 • J24 • O33

## 1 Introduction

The intensification of digital development creates conditions for fundamental changes in the nature of work, the qualifications of specialists, and the content of their professional training. Public opinion is highly polarized in terms of evaluating the changes that are taking place. On the one hand, they open up new horizons of personal freedom, opportunities for realization, and creation of better jobs (Federal Ministry of Labour & Social Affairs of Germany, 2017). On the other hand, the changes that occur as a result of digitalization are characterized by a high degree of uncertainty and in the future may lead to the erosion of skills, loss of jobs, intensification of labor, as well as undermine the principles of stability and security of public life (Brynjolfsson & McAfee, 2014; Frey & Osborne, 2017; Gusev et al., 2020). In any case, society has to find effective tools to adapt to destructive and transformative digitalization (Fossen & Sorgner, 2019).

One of these tools is the training of specialists who meet the requirements of the Work 4.0 concept. Of course, the

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modern system of higher education is trying to follow the changes, adjusting the educational process to improve the quality of vocational training specialist, able to independently acquire knowledge, skills, exercise creativity, and initiative, ready to make decisions. However, the need for rapid adaptation in the context of socioeconomic changes in society, the development of new digital technologies, and the formation of new economic behavior require a review of higher education strategies in terms of expanding the existing educational space for training specialists with high professional erudition and developed personal potential.

## 2 The Theoretical Basis of the Study

Studies by Abele et al. (2015), Kagermann et al. (2013) assess the future prospects of the labor market, employee competence profiles, and their impact on employment. Enke et al. (2015) argue that there are different scenarios for the development of employee qualification requirements in the digital economy, but they all reflect the trend of increasing professional competence. The concept of competence is associated with the awareness and authority of a specialist, his knowledge in a particular field. In turn, competence should be understood as issues and phenomena where the employee has authority, knowledge, experience, and certain powers (Gheorghe, 2016; Hoffmann, 1999; Kohler, 2003). However, many authors recognize that educational practices are not enough to become a competent specialist. An equally important element in the process of becoming a professional is the ability to realize your potential (personal qualities, skills, knowledge, experience, etc.), the willingness to take responsibility for yourself, take the initiative, the ability to establish communication with other people, and continuously improve yourself (Tatur, 2004; Zymnaya, 2002). The formation of personnel for the digital economy is carried out primarily in the higher education system, since it is universities that are able to provide the maximum effect on the personal and professional development of students during their studies (Blinova, 2012; Ilyazova, 2011). The practice of non-formal education in the form of itinerant schools has recently become increasingly popular. However, methodological descriptions of their implementation are rare (Frumin, 1987; Sidorova, 2017).

## 3 Methodology

The purpose of the study is to develop the author's approach to the formation of professional competencies in accordance with the requirements of the Work 4.0 concept through the organization of itinerant practice-oriented educational schools.

H1: The formation of specialists' competencies for the digital economy within the framework of the Work 4.0 concept is difficult in terms of the traditional educational process in Russian universities. H2: It is necessary to supplement the traditional learning process with the practice of conducting itinerant educational schools based on a cross-disciplinary approach in order to form professional and supra-professional competencies that meet the requirements of the Work 4.0 concept. H3: Itinerant schools are an institutional structure that has the property of flexibility and adaptability, since they allow for constant adjustment of the format of the event depending on the desired results, use collective mechanisms of responsibility, operate with complementary educational and educational technologies, and have a strong public response.

### Research methods

The method of comparative analysis was used to compare the competencies of University students and the competencies of specialists in accordance with the Work 4.0 concept. The assessment of the formation of professional and supra-professional competencies of university students was carried out using the diagnostic method based on testing (in the all-Russian system of quality control of education "FEPO" and "I-exam") and questionnaires, as well as the principle of drawing up diagnostic maps (Table 1).

The results of the survey are processed using a matrix for evaluating indicators of the level of formation of professional and supra-professional competencies (Table 2).

The matrix of assessment of indicators of the level of formation of professional and non-professional competencies shows that there are four levels of competence formation in the student:

- Critical level;
- Acceptable level;
- Optimal level;
- Creative level.

## 4 Results

(1) The digital economy development leads to sustainable changes in the labor market. The new degree of flexibility and digital networks require innovative qualification solutions (Maksaev et al., 2020; Molchan et al., 2019; Yakovleva et al., 2020). The tool that provides digitalization is the Work 4.0 concept, aimed at transforming economic sectors and activities, creating new markets and new forms of work through digital platforms, the emergence of a new range of work related to big data processing, the confrontation of human and machine labor. Thus, the concept of Work 4.0 defines

**Table 1** Diagnostic map of the formation of professional and supra-professional competencies in a university student (example)

| Indicator | Indicator value |
|---|---|
| Formation of professional competence | Average score-36<br>Low level |
| Academic performance (GPA) | The average score—3.9<br>Optimal level |
| Ability to self-organize and self-educate (Osnitsky et al., 2009) | Critical level |
| Adaptivity | Low level |
| Ability to work in a team | Low level |
| Ability to solve non-standard tasks | Low level |
| Ability to cross-cultural interaction | Low level |
| The formation of digital skills | Optimal level |

*Source* Compiled by the authors using the method of Gheorghe (2016)

**Table 2** Matrix for evaluating indicators of the level of formation of professional and supra-professional competencies

| Indicator/Level assessment | Critical | Acceptable | Optimal | Creative |
|---|---|---|---|---|
| Formation of professional competence | Low—up to 50 points | Below average-55–65 points | Average—66–79 points | High—80–100 points |
| Academic performance (GPA) | Below 3 points | From 3 to 3.5 points | From 3.5 to 4.5 points | Above 4.5 points |
| Ability to self-organize and self-educate | Low level—up to 10 points | Below average 11–16 points | The average level 17–23 points | High level 24–30 points |
| Adaptivity | 1–2 points | 3–5 points | 6–8 points | 9–10 points |
| Ability to work in a team | Low—up to 10 points | Below average-11–16 points | The average—17–23 points | High—24–30 points |
| Ability to solve non-standard tasks | Low—up to 10 points | Below average-11–16 points | The average—17–23 points | High—24–30 points |
| Ability to cross-cultural interaction | 1–2 points | 3–5 points | 6–8 points | 9–10 points |
| The formation of digital skills | Low level up to 10 points | Below average 11–16 points | The average level 17–23 points | High level 24–30 points |

*Source* Compiled by the authors using the method of Gheorghe (2016)

the framework conditions for continuing education and training in universities, related to the formation of the following competencies and skills (Shevyakova et al., 2020):

- Professional competencies and skills (depending on the employment profile);
- Cognitive competencies and skills (self-development, orderliness, management skills, achieving results, solving non-standard tasks, adaptability) (World Bank, 2016);
- Social and behavioral competencies and skills (communication skills, interpersonal skills, cross-cultural interaction, digital skills (system creation, information management)) (BCG REVIEW. 2017);
- Digital skills (the ability to apply information and communication technologies in professional activities). Cognitive, social, and behavioral competencies and digital skills and competencies are supra-professional, but they are integral and increasingly important. Currently, the Federal educational standards of higher education of the Russian Federation focus on the development of both professional and supra-professional competencies and skills, but the effectiveness of the formation of the latter remains low (Table 3).

(2) The emergence of new competencies and skills required in the digital economy, as well as the task of avoiding and eliminating the digital gap between high- and low-skilled workers, require a transformation of the structure of the educational process (Fig. 1).

Currently, the educational environment of the university is not enough for the formation of supra-professional competencies (Nekrasova, 2016). This is indicated by the study of students' development of professional skills and the results of ascertaining diagnostics (Table 4).

**Table 3** Comparative characteristics of the content of professional and supra-professional competencies and skills in the Work 4.0 concept of and the educational standard of higher education of the Russian Federation

| Competence/ skill | Digitalization trends that lead to the transformation of the labor market | Content of competencies and skills in the Work 4.0 concept | Content of competencies and skills in the educational standard of the Russian Federation |
|---|---|---|---|
| Professional competencies and skills | – Intensification of the use of cloud technologies and mobile applications, artificial intelligence technologies;<br>– Growing range of robotics and automation;<br>– The emergence of new production technologies;<br>– Development of cyber-physical systems;<br>– Changing consumer preferences;<br>– New conditions of competitiveness determined by inclusion in the processes of digital transformation;<br>– Strengthening the role of digital platforms for providing services | Narrow specific professional skills due to the nature of the work performed and professional standards | (1) The ability to use information and communication technologies to solve typical tasks<br>(2) The ability to collect, analyze and process data necessary<br>(3) The ability to apply a suitable tool for processing economic data<br>(4) The ability to make managerial decisions |
| Cognitive competencies and skills | | (1) Self-development<br>(2) Organization<br>(3) Management skills<br>(4) Achieving results<br>(5) Solving non-standard tasks<br>(6) Adaptability: working under uncertainty | (1) The ability to self-organize and continuous self-education<br>(2) The ability to use the foundations of philosophical knowledge to form a worldview position |
| Social and behavioral competencies and skills | | (1) Communication<br>(2) Interpersonal skills<br>(3) Cross-cultural interaction | (1)The ability to organize interpersonal and intercultural interaction in Russian and foreign languages. (2) The ability to organize team work |
| Digital competencies and skills | | (1)Creation of systems<br>(2)Working with a large array of data and information management<br>(3)"Outside-in" thinking | The ability to apply information and communication technologies in professional activities on the basis of information security |

*Source* Compiled by the authors according to Sharipova (2019); Federal Ministry of Labour & Social Affairs of Germany (2017); Ministry of Education & Science of the Russian Federation (2015); The Boston Consulting Group (2017)

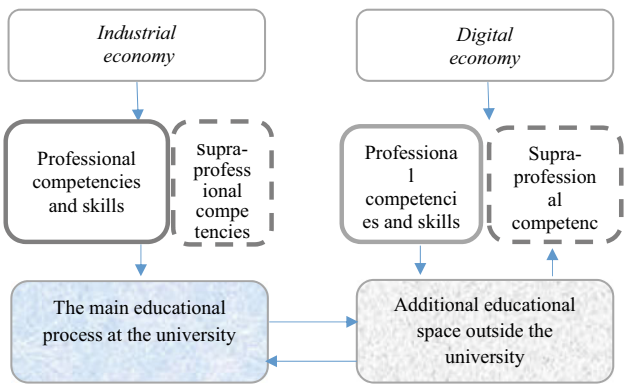


**Fig. 1** Transformation of the structure of the educational process for the formation of professional competencies in accordance with the requirements of the Work 4.0 concept. *Source* Compiled by the authors

(3) These tables show that there is a need to strengthen the role of independent activity of students, develop the ability to learn, self-develop, self-educate, creatively apply the knowledge gained in the process of self-realization, adapt to professional activities in the team, as well as improve digital skills. It is necessary to create an additional educational space outside the main educational process implemented at the university in the form of itinerant practice-oriented educational schools based on the Lewcamp principle (Fig. 2).

The principle of building Lewcamp programs is "camp-constructor," when each shift is constructed from a certain set of modules, depending on the tasks set and the need to form a specific competence (Table 5).

**Table 4** Assessment of the formation of professional and supra-professional competencies of university students

| Indicator | The value of the indicator for students of the control group | |
|---|---|---|
| | 1st year (25 people) | 2nd year (27 people) |
| Formation of professional competence | The average score is less than 50<br>Critical—30%<br>Acceptable—70%<br>Optimal—0%<br>Creative—0% | Average score-67<br>Critical—24%<br>Acceptable—50%<br>Optimal—26%<br>Creative—0% |
| Academic performance (GPA) | The average score of the group is 3.9<br>Critical—0%<br>Acceptable—16.5%<br>Optimal—72.9%<br>Creative—10.6% | Average score—4.0<br>Critical—0%<br>Acceptable—14%<br>Optimal—68%<br>Creative—18% |
| Ability to self-organize and self-educate | Critical—41%<br>Acceptable—59%<br>Optimal—0%<br>Creative—0% | Critical—22%<br>Acceptable—52%<br>Optimal—26%<br>Creative—0% |
| Adaptability | Low—71%<br>Below average—29%<br>Average—0%<br>High—0% | Low—32%<br>Below average—58%<br>Average—10%<br>High—0% |
| Ability to work in a team | Critical—38%<br>Acceptable—60%<br>Optimal—2%<br>Creative—0% | Critical—30%<br>Acceptable—66%<br>Optimal—4%<br>Creative—0% |
| Ability to solve non-standard problems | Critical—53%<br>Acceptable—56%<br>Optimal—1%<br>Creative—0% | Critical—25%<br>Acceptable—52%<br>Optimal—23%<br>Creative—0% |
| Ability to cross-cultural interaction | Low—70%<br>Below average—20%<br>Average—10%<br>High—0% | Low—52%<br>Below average—40.5%<br>Average—7.5%<br>High—0% |
| Formation of digital skills | Critical—35%<br>Acceptable—65%<br>Optimal—0%<br>Creative—0% | Critical—26%<br>Acceptable—53%<br>Optimal—21%<br>Creative—0% |

*Source* Compiled by the authors based on the survey data

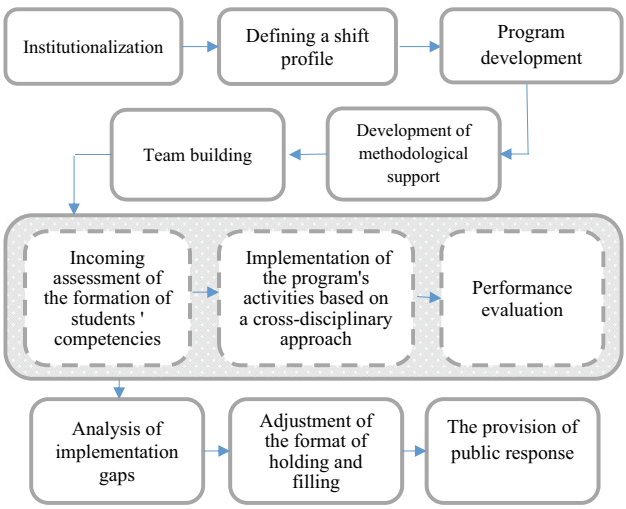


**Fig. 2** Concept of creation and implementation of itinerant educational practice-oriented schools "Lewcamp". *Source* Compiled by the authors

The following forms of organization and conduct are used for conducting educational shifts of itinerant schools: performing end-to-end professional tasks based on the storytelling principle; conducting interactive lectures, workshops, master classes for participants; organization of specialized games, business games, quest rooms, business simulators; carrying out the competition of social projects for the participants; organization of discussion platforms; organization of sightseeing trips; organization of health-improving procedures. The key methods of implementing itinerant schools are:

- Gamification of the educational process;
- A practice-oriented approach to training;
- Methods and techniques of research and project activities;
- Tutoring as a method of including the participants of the itinerant school in a single educational, scientific, and social space;

**Table 5** The principle of building "Lewcamp" programs as a camp-constructor

| The module name | Content | Emerging competence |
|---|---|---|
| Language | English Language Learning Module | Cross-cultural interaction (cross-disciplinary interaction, foreign languages) |
| Economics | The module is focused on the formation of professional competencies and skills in the field of economics | The narrow specificity of professional skills is determined by the work performed and the current professional standards |
| Math and digital technologies | Model of formation of knowledge and skills in the field of mathematics and econometrics, work with information and communication technologies | Ability to choose tools for processing economic data in accordance with the task, analyze the results of calculations and justify the conclusions |
| Networking | Module of training in the techniques of organizing effective communications, revealing personal potential, as well as forming teamwork skills | Self-development, organization, management skills, achieving results, solving non-standard tasks, adaptability, communication, interpersonal skills, intercultural interaction |
| Sports and Health | The module of sports events to improve the health characteristics of participants, as well as the development of forms of team interaction, leadership qualities, the formation of self-organization skills | Orderliness, communication |
| Culture | Module for learning the peculiarities of the culture of the interacting parties, including visiting cultural places during excursions | Self-development, management skills, achieving results, solving non-standard tasks, adaptability, communication, intercultural interaction |
| Leisure | A module of events aimed at strengthening informal communication between participants, including through thematic evenings | Self-development, adaptability, communication, interpersonal skills, intercultural interaction |

*Source* Compiled by the authors on the basis of practical experience

– Modern methods of extracurricular activities aimed at the formation of supra-professional competencies (working "vertically," working with small groups, intersubject and interprofessional interaction).

As Sidorova (2017) notes in her study, when comparing the participants' impressions with the subjective assessment of the novelty and benefits of participating in an itinerant educational school, there is an effect of enthusiasm for the educational process. Frumin (1987) calls this effect an intensification of the educational process. This is achieved through the possibility of discussing joint work among teachers, tutors, and participants of the itinerant school, which gives students freedom, initiative, and influence on the organization. Evaluation of the results of the school activities done by conducting internal testing of regular participation in the itinerant schools (4 times) (Table 6).

Thus, the results of the control diagnostics showed a positive dynamics of all indicators, which confirms the hypothesis put forward by the authors about the intensification of the educational process in the framework of itinerant schools and increasing the effectiveness of the formation of supra-professional competencies of participants. Thus, in the experimental group (participants of itinerant schools), the average score in the group significantly increased, the critical level of professional competence formation decreased, and students appeared who demonstrated a creative level of professional competence formation (13% and 23% in the 1st and 2nd year, respectively). The academic performance of the participants of the itinerant schools increased from 3.9 to 4.2 points (1st year), and from 4.0 to 4.3 points (2nd year), which demonstrates the authors' assumption about creating an effect of enthusiasm for the educational process in the process of participation in itinerant schools. The level of formation of digital skills has increased, as well as the level of development of supra-professional competencies. One of the phenomena of the existence of itinerant schools is the lack of goal-setting and development strategy of the organization, which allows a group of designers to be receptive to the context, to new trends (Ministry of Education & Science of the Russian Federation, 2015). The presentation of the work of the itinerant school becomes a regularly recurring task and a separate constant activity of the organizers, which causes a significant public response.

**Table 6** Control assessment of the formation of professional and supra-professional competencies of students of the university

| Indicator | The value of the indicator for the group of participants of the itinerant school | |
|---|---|---|
| | 1st year (25 people) | 2nd year (27 people) |
| Formation of professional competence | Average score—73<br>Critical—0%<br>Acceptable—12%<br>Optimal—75%<br>Creative—13% | Average score-81<br>Critical—0%<br>Acceptable—10%<br>Optimal—67%<br>Creative—23% |
| Academic performance (GPA) | The average score—4.2<br>Critical—0%<br>Acceptable—11.5%<br>Optimal—63.5%<br>Creative—25% | The average score—4.3<br>Critical—0%<br>Acceptable—8%<br>Optimal—60%<br>Creative—32% |
| Ability to self-organize and self-educate | Critical—0%<br>Acceptable—16%<br>Optimal—77%<br>Creative—7% | Critical—0%<br>Acceptable—12%<br>Optimal—78%<br>Creative—10% |
| Adaptability | Low—0%<br>Below average—12%<br>Average—67%<br>High—21% | Low—0%<br>Below average—9%<br>Average—65%<br>High—26% |
| Ability to work in a team | Critical—2%<br>Acceptable—35%<br>Optimal—53%<br>Creative—10% | Critical—0%<br>Acceptable—33%<br>Optimal—51%<br>Creative—16% |
| Ability to solve non-standard problems | Critical—20%<br>Acceptable—33%<br>Optimal—42%<br>Creative—5% | Critical—18%<br>Acceptable—29%<br>Optimal—45.5%<br>Creative—7.5% |
| Ability to cross-cultural interaction | Low—21%<br>Below average—19%<br>Average—58%<br>High—2% | Low—18%<br>Below average—32%<br>Average—45%<br>High—5% |
| Formation of digital skills | Critical—15%<br>Acceptable—56%<br>Optimal—24%<br>Creative—5% | Critical—19%<br>Acceptable—27%<br>Optimal—46%<br>Creative—8% |

*Source* Compiled by the authors

## 5 Conclusions

The paper analyzes the requirements for the competence of professionals of the digital economy in the Work 4.0 concept. A comparative analysis of the competences of professionals for the digital economy and build skills of students in the universities of the Russian Federation, allowed the authors to draw a conclusion about the necessity to supplement the traditional educational process in universities the practice of conducting itinerant schools based on the cross-disciplinary approach. The authors systematized the advantages of itinerant schools in organizational and educational context, pointed to the achievement of intensification of the educational process, their flexibility, and adaptability, the ability to continuously adapt the format depending on the desired results, and the use of collective mechanisms of accountability and high public resonance. The authors proposed the concept of creating and implementing itinerant practice-oriented schools "Lewcamp" on the basis of a cross-disciplinary approach and also described the forms, methods, and principles of organizing the educational process within the framework of itinerant schools.

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