



# AN EXPERIMENTAL VERIFICATION OF EFFICIENCY OF PEDAGOGICAL CONDITIONS FOR DEVELOPING TECHNOLOGICAL CULTURE OF VOCATIONAL TRAINING TEACHERS IN AGRICULTURE

Olena Shamraliuk,

a Methodist of the Scientific-methodological centre for vocational education and training and further training for engineering-pedagogical workers in Khmelnytskyi Oblast  
<http://orcid.org/0000-0002-0993-1149>. e-mail: [shol\\_nmc@ukr.net](mailto:shol_nmc@ukr.net)

## Abstract.

*Relevance:* the problem of technological culture development for industrial training masters of agrarian profile is determined by the need to modernize the professional (vocational) education and innovative changes in the agrarian sector.

*Materials:* in papers of local and foreign researchers (V. Radkevych, H. Romanova, L. Komisarova, V. Kovalchuk, M. Mykhniuk, N. Alova, V. Kuznetsov, R. Khoteieva and others) the issue on developing technological culture for industrial training masters of agrarian profile at regional training-methodological centres for vocational education and training (SMC for VET) is studied not enough.

*Aim:* to analyse the results of experimental testing the efficiency of offered pedagogical conditions for technological culture development for industrial training masters of agrarian profile in SMC for VET.

*Methods:* general scientific (analysis, synthesis, modelling, systematization and generalisation), diagnostic, pedagogical experiment, statistics.

*Results and discussions.* The ascertaining stage results of the experiment testified the lack of technological culture development for industrial training masters of agrarian profile in control and experimental groups. It is defined that after introducing pedagogical conditions while forming stage in the experimental group there are positive changes on rising the level of technological culture for industrial training masters of agrarian profile compared to the results of the ascertaining one. The share of teachers with sufficient and high level has risen from 57,1% up to 79,2%. In the same time, in the control group the industrial training masters demonstrated much more lesser dynamics of technological culture development. The share of respondents with high and sufficient level has risen only for 3,7%. The statistic difference of shared divide for industrial training masters of agrarian profile in experimental and control groups has been proved in the end of the experiment.

*Conclusions:* it is defined that the effect of changes in experimental group is reasoned by introducing the pedagogical conditions appropriate to the developed model and methodology.

**Key words:** *technological culture, technological culture development levels and components, industrial training masters of agrarian profile, experimental testing of pedagogical conditions efficiency.*

**Introduction.** The problem of developing technological culture for industrial education masters of agrarian profile is getting especially crucial under innovative transformations in the field of professional (vocational) education (Radkevych, 2018) and the equipment and technologies rapid development in

modern agriculture industry (Diomin, 2018). In this regard, there is the need in modernising regional methodological service of vocational education and training (VET) that meets the present demands and forms the information-educational environment for developing the technological culture of a modern

teacher of a professional (vocational) education institution (hereinafter: P(V)E institution).

In this context, the activity of regional training-methodical (scientific-methodical) centres (offices) for VET (hereinafter: SMC for VET) should be aimed at solving the following problems:

- creating conditions for self-realization and self-improvement, development of professional and personal qualities of teachers;
- providing adaptive methodological support for implementing by teachers the individual educational paths of technological culture development;
- creating conditions for developing and implementing modern educational technologies in the educational process;
- forming modern information and educational environment for continuous professional development of teachers;
- identification and disseminating best pedagogical practices for training future agrarian specialists,
- accumulating materials of creative teachers' innovative experience.

**Materials.** The theoretical analysis results of domestic and foreign scientists' scientific researches indicate the multi-vector nature of the study on the problem of improving P(V)E institutions teachers' technological culture. In particular, various aspects of the problem are disclosed in the papers by V. Radkevych (2010), H. Romanova (2014), L. Komissarov (2012), V. Kovalchuk (2014), M. Mikhniuk (2016), N. Alova (2013), V. Kuznetsova (1999), R. Khotieieva (2005). However, despite the significant scientific interest in the identified problems, the issues on technological culture development for industrial education masters of agrarian profile at regional SMC for VETs require research and scientific understanding.

**The article aims** to analyse the experimental verification results on efficiency of the proposed pedagogical conditions for developing technological culture for industrial education masters of agrarian profile in a SMC for VET.

**Methods:** analysis and synthesis – to clarify the development state and level for the studied problem and substantiating the conceptual-categorical apparatus; modelling – to detail the author's vision of developing technological culture for industrial education masters of agrarian profile in a SMC for VET, systematization and generalization – to formulate conclusions and recommendations on developing technological culture for industrial education masters of agrarian profile; diagnostic – to study the state-of-arts technological culture development for industrial education masters of agrarian profile; pedagogical experiment – to obtain the data on implementation efficiency of pedagogical conditions on technological

culture development for industrial education masters of agrarian profile according to the developed author's methodology; statistical – to check the reliability of indicators differences for levels of technological culture development of industrial education masters of agrarian profile in the control and experimental groups.

The research hypothesis is based on the assumption that the development of technological culture for industrial education masters of agrarian profile will be more efficient under following conditions: increasing teachers' motivation to improve technological culture; updating further education content in the region; using blended learning technologies in the system of further education in the region; introducing adaptive methodological support for teachers' internship courses.

The technological culture in the conditions of professional (vocational) education modernisation is extremely important both in the aspect of pedagogical system designing and the state-of-arts of modern high-tech agrarian production. Under these conditions, the activity of an industrial training master of agrarian profile should be carried out through the use of professionally oriented teaching technologies based on a combination of socially and personally significant, pragmatic and spiritual values (Romanova, 2009).

The essence of the concept of “technological culture for industrial education masters of agrarian profile” is characterized as an integral professional and personal formation that covers a set of interconnected personal and professional qualities and competencies necessary for successful implementation of professional and pedagogical activities based on goal-setting, use of pedagogical, information-communication and production technology in accordance with the conceptual provisions of sustainable development for the society, economy and environment (Shamraliuk, 2019, pp. 11).

According to the analysis results of local and foreign scientists' papers and taking into account the specifics of activities for an industrial education masters of agrarian profile under modern socioeconomic conditions, it is proved that the technological culture for the teachers of this category is ensured by the unity of following components: motivational, axiological, cognitive, active, reflective. The selected components reflect the necessary professional and pedagogical level of industrial education masters of agrarian profile to perform functional duties by introducing innovative educational technologies taking into account modern trends in developing agrarian production and the latest technologies for growing crops.

Outlining the level of every component development is carried out by the criterion of the same name and its indicators. To clear up the criteria and indicators performance degree based on generalization

of actual data, four levels of technological culture development for teachers of the following category are identified: low, medium, sufficient and high.

At the same time, new regulatory environment, innovative educational technologies and pedagogical creativity developments determine objective changes in planning and organizing the regional methodological service to improve technological culture for industrial education masters of agrarian profile. In this context, the experimental study aims to verify the introducing efficiency of pedagogical conditions for developing the technological culture for industrial education masters of agrarian profile in the practice of SMCs for VET.

The generalised results for the ascertaining stage of the experiment indicate that the level of technological culture development for industrial education masters of agrarian profile in the control and experimental groups is not enough (Table 1).

Note that the obtained results on the level of technological culture development for industrial education masters of agrarian profile in the control and experimental groups do not differ statistically significantly ( $\chi^2_{emp.} = 0.058$ , which is less than  $\chi^2_{theor.} = 7.815$ ) with a 95% probability.

The results of the ascertaining stage of the study allow us to conclude that the real state of technological culture development for industrial education masters of agrarian profile does not fully meet modern socio-economic challenges, and therefore there is a need to ensure the pedagogical conditions of this process, and is provided for by the logic of the study.

During the forming stage, in the control group for advanced training of industrial education masters of agrarian profile, the regional SMC for VET worked in a usual manner and the experimental group implemented pedagogical conditions aimed at active developing of technological culture for industrial education masters of agrarian profile in accordance with the developed models (Shamraliuk, 2018b) and methodologies (Shamraliuk, 2018a). The proposed methodology implies the step-by-step implementation for following stages: motivational, practical and analytical. At each step the interaction between educational process subjects occurs both in full-time and in remote mode.

In particular, at motivation stage, the professional field of industrial education masters of agrarian

profile is determined and updated and the search for ways to improve his/her technological culture (internal and external) is encouraged through the use of methods such as problem situations modelling, case studies, benchmarking, discussion, communication and beliefs, delegation of authority, Buddying. Main interaction forms for SMC for VET methodologists and VET masters at this stage are counselling, conducting trainings, master-classes, round-table meetings, teachers' participation in competitive events, regional, national and international educational and industry exhibitions.

Training for industrial education masters of agrarian profile at practical stage is aimed at building and implementing individual educational paths, improving technological culture and is carried out differentially according to the rotation model of blended learning (for teachers with low and medium levels of technological culture) and the flex model (for teachers with sufficient and high levels of technological culture). That provides the variability of training content, forms and methods.

With the rotational model, the day-time and distance learning cycles are sequentially combined. And the organization of educational process in accordance with flex-model involves more on-line training. It is complemented by eye consultations, group projects, and the work of creative groups. While practical stage for both models, teachers master the author's special course "Fundamentals of technological culture for industrial education masters of agrarian profile". Also, they actively participate in the work of the regional professional section, and get the adaptive methodological support for internship in the workplace.

To ensure the efficiency for teachers training, it is advisable to use productive technologies, in particular: design, training, case technologies, technology of scientific and methodological support and pedagogical coaching. The improvement of technological culture for teachers is facilitated by the preparation of educational and methodological complex that includes a special course program, an electronic resource "Fundamentals of Technological Culture", and a methodological manual "Technological culture for industrial education masters of agrarian profile".

For successful application in practice of SMC for VET the technology of blended learning, an information educational environment for the advanced

Table 1

*Technological culture development levels for industrial education masters of agrarian profile (ascertaining stage)*

Group	Level, %				$\chi^2$
	low	medium	sufficient	high	
control	12,5	31,4	38,1	18,0	0,058
experimental	11,6	31,3	39,4	17,7	

training of VET teachers has been created, including online resources with limited and open access.

At analytical stage the analysis is made for conformity self-assessment and external evaluation of educational process in SMC for VET to improve the technological culture for industrial education masters of agrarian profile, correction chosen by teachers on professional paths and building a plan for further career growth. The main organizational forms at this stage are practical exercises, round-table meetings, experience exchange conferences, trainings, consultations with use of technologies for mutual recognition and self-presentation of teachers' educational results.

Thus, the author's methodology for developing the technological culture for industrial education masters of agrarian profile at SMC for VET is aimed at teachers' personal self-development, creating conditions for self-realization and self-determination, establishing the subject-subject relations for SMC for VET methodologist and VET masters.

Let us analyse the development dynamics of individual components of technological culture for industrial education masters of agrarian profile in the control and experimental groups based on the results of the ascertaining and formative stages of the experiment.

The frequency indicators of distribution for industrial education masters of agrarian profile by the levels of technological culture components development convincingly testify the disagreement between representatives of the two groups. In particular, for the motivational component in the experimental group, we observe a significant decrease in the number of production masters with low (-13.7%) and medium (-10.1%) levels, amid an increase in the share of teachers with a sufficient (+14.3) and high (+ 9.5%) levels of technological culture. Accordingly, the control group recorded a decrease in the indicator at a low level (-9.6%) with a simultaneous slight increase in the average (+ 4.2%), sufficient (+ 3.0%) and high (+ 1.8%) levels of development motivational component of technological culture.

Compared with the ascertaining experiment results, the number of respondents in the experimental group with a high level of development of the axiological component increased by 19.1%, while the number of teachers with a low, medium, and sufficient level decreased by 3.0%, 6.0%, and 10.1, respectively % According to the control group, the differences in indicators are insignificant: a decrease in the proportion of teachers with low (-3.6%) and sufficient (-4.8%) levels and an increase with the average (+ 5.3%) and high (3, 1% ) levels.

The teachers of experimental group showed rapid positive dynamics in the development of technological culture cognitive component: the number of

industrial education masters of agrarian profile with low (-12.5%) and medium (-21.4%) levels, while increasing the proportion of teachers with sufficient (+ 16.1%) and high (+ 17.8%) levels. But in the control group, the indicator for the low level of development of the cognitive component decreased by 7.1% and the indicators for the average, sufficient and high levels increased by 2.3%, 1.8% and 3.0%, respectively.

The representatives of the experimental group on the technological culture activity component experienced the following dynamics of its development levels: the proportion of teachers who reached a sufficient (+ 15.5%) and high (+ 10.1%) levels increased, while the share of teachers with an average level (- 20.8%). The industrial education masters in the control group showed a slight increase in the average (+ 2.4%), sufficient (+ 3.0%) and high (+ 1.8%) levels of the activity component while reducing the share of teachers by 7.2% low level.

By the reflective component of technological culture in the experimental group, we observe an increase in the proportion of respondents with high and sufficient levels by 11.9% and 6.0%, respectively. At the same time, the share of industrial education masters with low (-11.3%) and medium (-6.6%) levels decreased. The teachers of the control group on the reflective component showed a decrease of 9% at a low level, an increase of 3.6% and 5.4%, respectively, at an average and sufficient levels. However, the high level of change did not happen.

The comparative analysis results of the ascertaining and formative stages show that in the experimental group there were significant positive changes to increase the development levels of technological culture for industrial education masters of agrarian profile. After introducing pedagogical conditions in the activities of SMC for VET, the percentage of high-level teachers increased by 13.7%, a sufficient level – from 39.4% to 47.8%, the share of vocational training masters with low and medium levels decreased by 9.1%, respectively and 13.0%. But for the industrial education masters in the control group, the changes are less significant.

In general, in the experimental group, after the introduction of pedagogical conditions, the majority of industrial education masters of agrarian profile (79.2%) achieved a sufficient and high level of technological culture (Table 2), 22.1% more compared with the results of the stating experiment. In the control group, this indicator increased from 56.1% at the beginning of the experiment to 59.8% after the formative stage. That is, the established system of work of the regional methodological service does not fully ensure the development of technological culture for industrial education masters of agrarian profile at a high and sufficient level.

Table 2

*Technological culture development levels for industrial education masters of agrarian profile (formative stage)*

Group	Level, %				$\chi^2$
	low	medium	sufficient	high	
control	5,2	35,0	39,8	20,0	9,438
experimental	2,5	18,3	47,8	31,4	

Validation of obtained results is carried out by Pearson's criterion, which according to the results of the calculations is 9,438. It is higher than its theoretical value (7,815). That is, the empirical distributions of industrial education masters of the experimental and control groups by technological culture development levels are statistically different at the end of the experiment. This testifies the successful influence of pedagogical conditions on improvement of technological culture cognitive component: the number of industrial education masters of agrarian profile and the expediency of their introduction into the system of work of the regional methodological service.

**Conclusions.** The statistical processing and qualitative characterisation of experiment results

convincingly testify to the significant increase in the levels of technological culture cognitive component: the number of industrial education masters of agrarian profile in the experimental group in comparison with the control one.

The positive dynamics of the phenomenon under this study is caused by introducing in practice of the SMC for VET the following pedagogical conditions in accordance with the developed models and methods: increasing teachers' motivation to improve technological culture; updating further education content in the region; using blended learning technologies in the system of further education in the region; introducing adaptive methodological support for teachers' internship courses.

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# Експериментальна перевірка ефективності педагогічних умов розвитку технологічної культури майстрів виробничого навчання аграрного профілю

Олена Шамралоук,

методист Науково-методичного центру професійно-технічної освіти та підвищення кваліфікації інженерно-педагогічних працівників у Хмельницькій області

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## Реферат.

*Актуальність:* проблема розвитку технологічної культури майстрів виробничого навчання аграрного профілю детермінована необхідністю модернізації професійної (професійно-технічної) освіти та інноваційними перетвореннями в аграрній галузі.

*Мета:* проаналізувати результати експериментальної перевірки ефективності запропонованих педагогічних умов розвитку технологічної культури майстрів виробничого навчання аграрного профілю в НМЦ ПТО.

*Методи:* загальнонаукові (аналіз, синтез, моделювання, систематизація й узагальнення), діагностичні, педагогічний експеримент, статистичні.

*Результати.* Підсумки констатувального етапу експерименту засвідчили, що рівень розвиненості технологічної культури майстрів виробничого навчання контрольної та експериментальної груп є недостатнім. З'ясовано, що в результаті запровадження педагогічних умов під час формувального етапу в експериментальній групі відбулися значні позитивні зміни щодо підвищення рівня технологічної культури майстрів виробничого навчання в порівнянні із результатами констатувального етапу. Частка педагогів із достатнім і високим рівнем технологічної культури зросла з 57,1% до 79,2%. Водночас, у контрольній групі майстри виробничого навчання продемонстрували значно нижчу динаміку розвиненості технологічної культури. Питома вага респондентів із високим і достатнім рівнем зросла лише на 3,7%. Доведено статистичну відмінність частотних розподілів майстрів виробничого навчання аграрного профілю у експериментальній та контрольній групах наприкінці експерименту.

*Висновки:* встановлено, що ефект змін в експериментальній групі зумовлений запровадженням педагогічних умов відповідно до розроблених моделі і методики.

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**Ключові слова:** технологічна культура, компоненти і рівні розвиненості технологічної культури, майстер виробничого навчання аграрного профілю, експериментальна перевірка ефективності педагогічних умов.

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