UDC 378.937

DOI: 10.52534/msu-pp.7(4).2021.96-103

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Means of Optimising the Development of Critical Thinking of Students in German Universities

Article's History:

Received: 20.09.2021

Revised: 21.10.2021

Accepted: 22.11.2021

Suggested Citation:

Pylypiuk, K.M. (2021). Means of optimising the development of critical thinking of students in German universities. *Scientific Bulletin of Mukachevo State University. Series "Pedagogy and Psychology"*, 7(4), 96-103.

Abstract. The issue of developing and optimising critical thinking among students is on the agenda when developing programmes for the improvement of higher education systems. This aspect has become particularly relevant in the European space, in particular in Germany, which is explained by the priority of educating students and the development of such important skills as rapid response to a problem, its effective solution, as well as cognitive flexibility of the individual in critical situations. The purpose of this paper is to analyse the experience of Germany in the context of using tools to optimise the development of students' critical thinking, as well as to create recommendations for the development of the higher education system in Ukraine based on the results obtained. To achieve this purpose, the following scientific methods and tools were used in the course of the research: functional and dialectical approaches, method of logical analysis, synthesis, comparative analysis, analysis of scientific literature. The paper provides an overview of the general principles and scientific positions regarding the interpretation of the concept of "critical thinking", its nature and features. A comprehensive analysis of the tools and mechanisms that are actively used at this stage in German universities for the development of critical thinking among students is provided. Positive aspects from the experience of this country are identified and a strategy for their implementation in the activities of Ukrainian universities is formed. The prospects for further research are the implementation of a comparative analysis of modern mechanisms for optimising the process of students' critical thinking development used in universities of the United States of America and France. The practical significance of the study is conditioned upon the priority of its use in higher education reform in Ukraine and is also an important element in the development of methodological materials for teachers

Keywords: students' consciousness, higher education, strategy, reflexive thinking, teamwork

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INTRODUCTION

The presence of critical thinking plays an important role both in the student's learning process and directly in the implementation of their professional skills. The process of its development and consolidation in the consciousness of an individual is quite long and time-consuming since it requires the correct selection of means for its implementation. This is why it is necessary to analyse the existing and widespread mechanisms and tools used in higher educational institutions in Germany to determine their advantages and apply them in the future during the reform of Ukrainian universities [1].

To fully consider and study the issue, it is necessary first of all to identify the essence and direct content of the concept of critical thinking. Thus, this concept covers a multi-stage mental process that begins with attracting information

and ends with making a decision [2]. In addition, it can be described as a system of judgments, which primarily allows studying information in such a way as to make rational and effective decisions based on it [3; 4]. Based on the above analysis of the concept of critical thinking, it can be agreed that it is certainly one of the most important qualities of every person, regardless of their profession, age and gender. However, for the student, this personal quality is a priority, since it allows not only more thoroughly acquiring knowledge but also reproducing it more effectively [5]. Notably, in the process of critical reflection on a particular issue, the subject of thinking, namely the student, has the opportunity to come to the identification of such aspects that previously were invisible to them. Based on this, it can be stated that as

a result of this process, the primary idea of objects or processes can be confirmed, enriched, and concretised, or vice versa – change dramatically. Thus, critical thinking is characterised by the process of self-improvement, accompanied by scientific, technical and social progress [6].

As for Germany, most scientists there focus on the fact that critical thinking involves reflection and understanding of how knowledge is formed and consolidated [7]. In German universities, critical thinking skills are developed in the context of reflecting practical experience and practical projects, which are reflected in the process of developing new methodological recommendations. In addition, critical thinking in the field of higher education in this country actualises students' ability to adapt to new content and order of work, which, as a result, makes the learning process accessible for rational rethinking [8]. Notably, it makes it necessary to use such auxiliary tools and mechanisms as mathematical modelling, computer technology, mass media, heuristics, empirical testing, and project management [9].

Thus, the paper considers a still unexplored issue in scientific doctrine, namely the process of forming and consolidating critical thinking in the context of using special tools and methods, in particular in German universities. Based on this, *the main purpose* of the paper is to consider and evaluate modern mechanisms and systems underlying the educational process at German universities, as well as effectiveness of their impact on the process of forming and improving critical thinking skills among students. To achieve this purpose, the paper defines *the following tasks*: to establish the nature and features of the concept of critical thinking, to determine its features and properties, to study the features of the development and consolidation of such thinking among students, to analyse the position of German scientists on this issue, to consider the means that are actively used in German universities to develop this quality in students, as well as to form an effective strategy for introducing positive German experience in the process of reforming the higher education system in Ukraine.

MATERIALS AND METHODS

Since the issue under study is quite broad in its content and essence, a number of scientific and methodological tools and methods were used to consider it in the paper, in particular methodological approaches and methods for scientific research. Thus, to prepare and start the work, a functional approach was applied, which in turn allowed forming a purpose of the study, determining the necessary tasks, and developing a research plan. In addition, it should be noted that this approach provided the development of stages in the paper, which, accordingly, allowed considering the entire scope of the issue in depth. As for the dialectical approach, it is responsible for the logical structure of research since it is carried out from the general to the particular. That is, the beginning of the paper covers theoretical foundations of the issue, in particular the concept of critical thinking, and the end – the process of its development in the minds of German university students.

In addition, the method of logical analysis is extremely important in the paper since it helped to divide the general question into separate components, namely the concept of critical thinking, existing tools for optimising its development among students, and the use of such tools in German universities. Thus, based on this division, each element of the subject under study was analysed. Based on the synthesis method, a connection was established between the various components of this issue, namely, the properties of forming students' critical thinking in German universities were determined and modern approaches in this country to the priority of consolidating such thinking in future specialists from each industry were considered. As for the method of comparative analysis, the experience of Germany and Ukraine was compared on its basis and the common and distinctive features inherent in these countries were determined accordingly. In addition, due to its use, the role of students' critical thinking in the implementation of their professional skills was determined. As for the theoretical basis, it directly depends on the method of analysing scientific literature since it allowed studying and considering a number of relevant scientific materials and sources, which, accordingly, allowed analysing the current views of both Ukrainian and German scientists on this issue and forming the authors' own position.

The work was carried out in three stages, namely:

1. At the first stage, the structure and work plan were formed, the main issues that need to be considered were identified, and the purposes and objectives of the study were established. In addition, a theoretical component of the paper was considered, that is, the concept of critical thinking was analysed and its main features, properties and characteristics were established.
2. The second stage considered the issue from the practical standpoint, in particular, the experience of German universities was analysed and the main means for forming critical thinking among students were considered.
3. At the third stage, the results obtained were studied, based on which concise conclusions were formed, as well as recommendations for the development of the higher education system in Ukraine in the context of optimising the development of critical thinking among educational applicants.

RESULTS AND DISCUSSION

Theoretical aspects and features of the process of forming students' critical thinking

The ability to think critically has always been extremely important for every social group of people, including students, and in modern conditions it is virtually impossible to survive without critical thinking. Thus, the decisions that citizens make as individuals and as members of society relate to completely different spheres of life, in particular the economy, the conservation of natural resources, or the development of nuclear weapons, which for their part affects future generations around the world. As for students, this group of people actively applies critical thinking skills both in the course of mastering educational material and during its reproduction and control [10]. In addition, the priority of the process of forming

critical thinking among students is also conditioned upon the need to make various decisions on a number of important issues, which, for their part, are of both local (university) and private (personal) character [11].

Considering the emergence of the issue of consolidating critical thinking among students, it should be noted that teachers, politicians and the public began to pay serious attention to it only in the last few years [7; 12]. Admittedly, this process is associated with the trend of reforming and improving the higher education system, based on which research on this phenomenon began, as well as factors that influence the development of students' critical thinking [9]. Referring to the meaning and essence of the concept of students' critical thinking, it can be defined as a set of knowledge, skills and dispositions that allow rationally analysing and evaluating information for reasoned decision-making. As for the main properties of critical thinking, they should include the following skills: make logical conclusions, make reasonable and rational decisions, evaluate the positive and negative manifestations of both the information received and the thought process itself, and direct efforts to obtain maximum results [13]. Based on this list, it should be stated that the main purpose of universities, in particular German ones, in the context of the development and consolidation of critical thinking among educational applicants, is the development of such students who can analyse social principles and develop the latest ideas to improve existing scientific achievements and developments; creative thinking; the development of a new culture and new humane values among young people. Thus, it can be argued that critical thinking is to some extent associated with reflexive thinking since it is the main quality of the former.

In addition, it is necessary to pay attention to the position of German scientists who believe that critical thinking to a certain extent contributes to the implementation of reflection by the student, and also provokes the development and awareness of how knowledge is fixed and then reproduced in the course of professional activity [14; 15]. As for the higher education system, namely German universities, they are characterised by the fact that the development of critical thinking in a student occurs during the reflection of their practical experience, developed practical projects, which are translated into the development of new methodological recommendations. Moreover, critical thinking in the context of German higher education contributes to the actualisation of the ability to adapt to new content and schedule, which, accordingly, makes it convenient for effective rethinking [16]. Notably, it is quite common for this process to use various tools that allow developing student's critical thinking skills, depending on the chosen professional specialisation. Such auxiliary tools can include programmes for mathematical design, various types of modern computer equipment, mass media, empirical testing and development of research projects. Notably, in Germany, critical thinking is considered part of a social process, the development of which, in turn, requires a separate educational community,

in which various forms of thinking, attitudes and values are developed accordingly [17].

It is necessary to pay attention to the fact that German universities have established that the seminar is the main means of integrating and implementing research in the course of training [18]. Based on this, to form and improve students' critical thinking, teachers are using various online encyclopedias, discussion forums, and computerised systems at seminars. In addition, various kinds of practice-oriented activities are becoming increasingly widespread and important, which, in turn, determine the implementation of project work both in the context of student-student and student-teacher. The relevance of a tool for optimising the development of critical thinking among students is provided for by the fact that the preparation of such projects allows developing and improving the collective and creative activities of future specialists [19]. In addition, the analysis of the development of critical thinking in German universities allows stating that this concept is disclosed there mainly in the context of a multidimensional and systematic academic discipline, which, for its part, is designed to master students' skills in constructing and evaluating correct arguments. In addition, it should be noted that a critical person should certainly take care that their views and decisions are clearly formed and logically substantiated. It is why the student needs to strive to search for new hypotheses and statements, alternative explanations, sources, conclusions; to be well informed in various subjects; to consider the opinions of opponents, those that are different from their own; to expand their worldview, as well as to strive for versatile awareness. Moreover, German educational approaches are based on the fact that a person who accordingly has a developed critical thinking is fully capable of clearly projecting both their position and the position of others, namely: clearly and accurately aware of the content of what is said and written, considering the features of the situation; concentrate on a particular formed conclusion or question, strive to adhere to the main topic of conversation; seek and take initiative in the course of substantiating their own position, while considering the whole situation in general, as well as understand their own beliefs [13; 20].

Notably, an important role in the development of critical thinking among students belongs to logic, in particular in the context of a philosophical discipline, which, for its part, develops the correct train of thought. Based on this, it is advisable to consider the technology of developing critical thinking as integrating one. This is explained by the fact that it contains the best practices and methods of many philosophical technologies, namely: it forms and improves both the student's thinking and communication abilities, as well as strengthens the skills of an individual's independent work. This philosophical method is used in higher educational institutions in Germany as one of the means to optimise the development of critical thinking among students [21]. It is characteristic of this country that many seminars and lectures are held directly in the form of dialogue and discussions. Thus,

this approach allows teaching students various methods and tools for solving different problems, analysing them and using a creative approach in the course of substantiating their position and behaviour, as well as critically perceive reality [22].

Thus, at the methodological level, the technology and means for the development and consolidation of critical thinking fit into a single system of philosophical techniques and strategies, which, in turn, cooperate with the available methodological techniques depending on the chosen specialisation of the student. In addition, the main purpose of modern higher education is to form an innovative personality that can fully adapt to the conditions of a constantly changing world. This is why the use of various methods and tools for the development of critical thinking in educational applicants in the course of training is necessary for improving the higher education system since these techniques contribute not only to the assimilation of knowledge but also to the development of critical and reflexive thinking, which are necessary qualities of a competent specialist in each industry [23].

Modern means of optimising the development of critical thinking among German university students

Having considered the theoretical component of the paper, as well as having studied the features of such a process as the development of students' critical thinking, it would be advisable to study modern methods and means for its implementation used in Germany. In addition, this process will allow determining the level of effectiveness of such tools, which as a result will be useful for forming recommendations for the development of the higher education system in Ukraine, in particular, in the context of preparation of training programmes aimed at developing students' critical thinking. Therefore, one of the most common ways to develop critical thinking is to use dialogue. This is explained by the fact that when organising the educational process of various disciplines, a teacher needs to actively use dialogics since this approach contributes to the full development of student's critical thinking and even an improvement in the quality of training. In addition, when the teacher asks students certain questions aimed at understanding both new and previously studied material, these actions contribute to the systematic and effective assimilation of the entire course. Thus, the teacher to a certain extent helps students not only to master new material but also to connect it with previously studied information to comprehend and rethink the information received [24].

However, when a teacher uses such a tool to optimise the development of students' critical thinking, it should be noted that it is necessary to choose special questions for its effective result. This is conditioned upon the fact that during the dialogue it is necessary to get not just reproductive feedback but also to establish complete communication, which will help to examine and explore the educational material being studied more deeply [9; 25]. In addition, during communication between the teacher and the student, both one and the other have the opportunity, in the context of discussion and acquisition of new knowledge, to be critical of

previously studied and known, which accordingly provokes these individuals to engage in scientific and cognitive activities and explore such contradictory phenomena or objects.

Notably, the above questions should have a special form, which will encourage the student to rethink the information received, as well as concretise or practically apply it in the future. In addition, the use of such a tool as dialogue for the development of critical thinking among German university students is aimed at developing their ability to predict, find relationships between the concepts, phenomena, or objects under study [26]. Thus, based on the use of a separate system of such questions, the teacher has the opportunity to help students be critical of both new and previously learnt information, including those obtained from textbooks or online resources [27].

The above forms of questions that provoke the development of student's critical thinking can be divided into several groups. Thus, such a question as "Give an example..." is aimed at concretising the student's existing knowledge, as well as abstracting them from previously known phenomena that are similar to a particular subject of discussion. Based on the question "How can one use...", the information obtained is summarised, as well as assumptions and analysis of the future practical implementation of the obtained data and skills. Due to the question "What happens if...", the student has the opportunity to form their own assumptions, hypotheses, ideas and views, which certainly provoke their involvement in educational and cognitive activities. Due to such a question from the teacher as "What is meant by...", the student's mind analyses the information obtained, as well as concretises it, which is an extremely important process in the context of critical thinking development [28].

After analysing these examples, it is necessary to identify the distinctive feature inherent in the use of dialogue in German universities. Thus, the process of forming and asking a question is aimed at ensuring that the students can independently or with the help of a teacher get to its essence, and most importantly, provide a correct and thorough answer. In addition, they should also freely ask themselves and others questions that will help to establish stable connections in the course of solving a problem or complex issue that is interesting to them, that is, not to avoid such tasks, but to explain to themselves and others how to solve it [29]. As for the teacher, during the seminar, they mostly only choose the route of the dialogue and set ways for its development [30]. Therewith, another advantage of German universities in the development of critical thinking among students is that such dialogics does not imply uncontrolled expression of student's own position, opinion or view, that is, when they want it. Thus, this process is regulated, in particular, the teacher at their own discretion allocates a certain period of time at the seminar, during which students can freely discuss, ask questions and answer them. In addition, the advantage of using such a tool is that the teacher can rationally correctly direct students' mental activity in the classroom through the questions [31].

It is also important to focus on the fact that improving

the learning process and simultaneous development of critical thinking in student is also possible based on modification and corresponding strengthening of the significance of its components. This is conditioned upon the fact that educational activities in their improved form should certainly contain a reflexive component. As for reflexive activity, it should be understood as an activity that is implemented in the course of solving a cognitive problem by a student, which has both the course of solving the problem and the process of thinking as its subject. Thus, reflection is primarily aimed at the process of thinking and improving or optimising it, as well as at manifesting critical thinking [32]. Accordingly, if the teacher has formed such a purpose and it is accepted by students, this is how critical thinking develops. Notably, this process is accompanied by the fact that students' attention should be directed to certain components of their scientific activities to fully understand the acquired material [33].

Based on the above, it should be noted that one of the most effective means of optimising the development of students' critical thinking, in particular in German universities, is educational cognitive tasks. The main function of such tasks is development. This allows disclosing their essential content, namely that they are aimed at developing students' critical thinking, forming the necessary qualities that are characteristic of scientific thinking. As for particularly educational cognitive tasks that develop critical thinking, the most common among them are reflexive-critical tasks, which, accordingly, are one of the tools for optimising the development of critical thinking [34].

Therefore, it would be advisable to consider the focus area of such reflexive-critical tasks and their role in the educational process. Thus, the main purpose of using such tools by teachers during the training of students is to increase the efficiency of using the system of educational tasks, in particular as a didactic tool for stimulating, organising, implementing, and self-monitoring the cognitive activity of educational applicants [2]. As for the broad meaning of such a concept, it should be understood as certain tasks that contribute to the activation of reflection, understanding and comprehension of the process of students' thinking and the course of solving problems of various levels of complexity in educational activities [33]. In addition, it is worth paying attention to the fact that reflexive-critical tasks certainly help students in the process: highlighting various kinds of connections and relationships between the selected components of knowledge; generalisation and systematisation of knowledge; modelling and designing the studied ways of solving problems and methods of organising actions; developing various criteria and rules based on which they can effectively regulate and carry out their own educational activities; activating critical thinking, acquiring skills to fully understand their own algorithm for solving educational problems, the established course of reasoning, the degree of development of certain skills and abilities, as well as the results of educational activities in general, that is, by implementing and maintaining feedback during the organisation and implementation

of educational activities [35]. In addition, when considering this method for the development of critical thinking among students, which is actively used in German universities, it is appropriate to note that reflexive and critical tasks are mainly aimed at drawing the attention of the applicant to the work performed by them so that they can independently determine the level of effectiveness of their work. In addition, in the process of applying such a tool in the educational process, there is an active understanding or even rethinking of knowledge, possible ways to solve problems, the course of reasoning, position, and particular conditions of activity [36]. As for the results of such activities, they are related to changes in student's direct cognitive sphere, namely in the context of identifying new connections and interdependencies between the studied concepts; levels of its generalisation; expansion or limitation of ways to solve such problems; changes in the chosen position that the student has or argumentation of the correctness of the choice; reassessment of the results of their activities; the development of various skills that allow not only carrying out educational but also cognitive activities [37].

As for the construction of reflexive-critical tasks as educational and cognitive tools and one of the possible types of didactic material, this binding undoubtedly belongs to the important methodological skills of a teacher in any of the disciplines. It is the reason why the teaching methods used in the development of critical thinking should be quite specific and effective at the same time [38]. Based on the experience of Germany, it would be advisable to form a list of such methods that are promising for the development of curricula in Ukraine, in particular, their improvement in the context of the development and consolidation of critical thinking [39; 40]. The most effective among them are the following: problem-search methods (those which should be perceived by a student as a task that needs to be solved in a difficult situation); reflexive methods, which consist in reviewing, analysing, evaluating, setting the student's consciousness to critical thinking, analysing a particular situation or an algorithm for solving a particular problem. In addition, the methods of expansion of thinking are quite common in the European educational space and promising for Ukraine. These involve the use of various forms of expansion of thinking in educational activities, as well as the above method of dialogue, in which a reflexive-critical position is cultivated, a criterion analysis takes place, critical issues are considered, and a simulation of a crisis situation is implemented, which is associated with the identification of positive and negative. In addition, there is the argumentation of various positions, as well as improving the ability to draw conclusions from the results and recognise assumptions and conclusions, in particular, to assess the strength of arguments. Thus, the use of the methods formed and proposed above in the process of developing critical thinking among students at Ukrainian universities will not only purposefully improve the quality of students' critical thinking but also contribute to improving the quality of their training and knowledge level.

CONCLUSIONS

After the study, the results were formed, which can be divided into two parts: theoretical and practical. Thus, the essential concept of critical thinking was analysed, which should be understood as the ability to analyse information from the standpoint of logic and personal psychological approach to apply the results to both standard and non-standard situations, questions, and problems. In addition, the main features of this thinking were formed in the paper, including: flexibility; logic; social orientation; validity; impartiality; consistency; independence.

It is established that at the moment critical thinking occupies an advanced position in the context of a student's comprehensive development, which is extremely important for the performance of their professional duties in the future. In addition, it was established that the level of optimisation of the development of students' critical thinking depends not only on their personal development and ability to quickly make effective decisions but also on the level of knowledge. This factor determines the positive impact of

such thinking on students' knowledge and the entire higher education system of the country since a person independently analyses their skills and compares the level of their own training with others. As for Germany, it uses a whole system of tools to optimise the development of students' critical thinking. However, two of them were thoroughly considered in the paper, namely dialogue and reflexive-critical tasks. Thus, it was identified that it is the dialogue that allows establishing successful communication between the teacher and the student, which as a result, provokes the process of reasoning and discussing complex and contradictory issues between these subjects.

Reflexive-critical tasks are also particularly effective since they model a critical situation for the student, which affects their consciousness and requires active use of both new and long-acquired knowledge. In future research, it is necessary to identify common and distinctive features in the process of forming students' critical thinking in the United States of America and France since these countries have different approaches and views regarding this subject.

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Засоби оптимізації формування критичного мислення студентів в університетах Німеччини

Анотація. Питання щодо формування й оптимізації критичного мислення у студентів все частіше постає на порядку денному під час розробки програм з розвитку і вдосконалення систем вищої освіти. Особливої актуальності даний аспект набув у європейському просторі, зокрема в Німеччині, що пояснюється пріоритетністю виховання студентів і формуванням у них таких важливих навичок як швидкого реагування на проблему, її ефективного вирішення, а також когнітивної гнучкості особи в критичних ситуаціях. Метою даної статті є проведення аналізу досвіду Німеччини в контексті використання засобів для оптимізації формування критичного мислення у студентів, а також створення рекомендацій для розвитку системи вищої освіти в Україні на основі отриманих результатів. Для досягнення встановленої мети в ході дослідження були використані такі наукові методи та засоби: функціональний і діалектичний підходи, а також метод логічного аналізу, метод синтезу, метод порівняльного аналізу, метод аналізу наукової літератури. У статті надається огляд загальних засад і наукових позицій вчених щодо тлумачення поняття «критичне мислення», його природи та особливостей. Надається всебічний аналіз засобів і механізмів, що активно використовуються на даному етапі в університетах Німеччини для формування критичного мислення у студентів. Визначено позитивні аспекти з досвіду даної країни й на їх основі сформовано стратегію щодо їх впровадження в діяльність українських університетів. Перспективами подальших досліджень є здійснення порівняльного аналізу сучасних механізмів для оптимізації процесу формування критичного мислення студентів, що використовуються в університетах Сполучених Штатів Америки й Франції. Практична цінність дослідження зумовлена пріоритетністю її використання у ході реформування вищої освіти в Україні, а також є важливим елементом під час розробки методичних матеріалів для викладачів

Ключові слова: свідомість студентів, вища освіта, стратегія, рефлексивне мислення, колективна робота