

Integration of teamwork and critical thinking skills in the process of teaching students

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Abstract

Reforms taking place in the educational process of higher professional school impose new requirements on the quality of training students. Today, graduates of higher educational institutions are required to have new professional thinking, high mobility, competence, tolerance and focus on intra-group activities carried out in teams. With the team form of the organisation of training, an environment is created that allows students to master not only the skills and abilities of business interaction and cooperation, but also to form their ability to think critically, which includes the ability to think creatively, use new information and apply the knowledge in practice. Theoretical justification jointly with quantitative and qualitative data obtained as a result of the experimental work carried out by the authors confirms the efficiency of team learning, which contributes to developing critical thinking skills in higher education students.

Keywords: Students, education, formation, interaction, critical thinking, team, skills, competences.

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1. Introduction

Critical thinking is a term that is given much discussion without much action. K-12 educators and administrators are pushed to teach the necessities as dictated by the standardised assessments in order to catch up the students to students of other countries. In this push for better, many students test scores are leaving the K-12 education system lacking the critical thinking skills that are necessary to succeed in higher education or in the workplace (Smith & Szymanski, 2013).

The formation of critical thinking, of course, depends on the natural abilities of man, the social environment, but still the main role in the process of formation belongs to teachers. Since the formation of critical thinking is the result of interaction between the teacher and the student, the level of its formation depends primarily on the correct choice of forms of training. The command form of the organisation of training is the most effective form of the organisation of training promoting formation of critical thinking of students.

The expositive discourse about the integration of facts in the prediction of an (abstract) rule has fomented purely technical behaviours, limiting the factual and social reality. The case study method proves to be an important tool for the development of critical thinking, allowing the understanding of reality, and the possibility of transforming it and, perhaps, reversing social asymmetries (Mimoso, Bravo & Gomes, 2018).

What is critical thinking, and why is it so important? The Critical Thinking Community defined critical thinking as 'the intellectually disciplined process of actively and skilfully conceptualising, applying, analysing, synthesising, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action' (Scriven & Paul, 2007, p. 1).

Forms of organisation of activities exist in all spheres of public life, including education. Since any form of organisation of activity (collective, frontal, group, individual; steam) arises as a result of existing certain conditions, and in conditions related to the need to address social and economic issues in society, in the conditions of market relations, there is a team form of organisation of training (as a group form of organisation of training).

Critical thinking is not a new concept. 'Throughout nearly 300 years of policymaking in the United States, educators have promoted eight broad goals of schooling: basic academic skills, critical thinking and problem solving, social skills and work ethic, citizenship, physical health, emotional health, the arts and literature, and preparation for skilled employment' (Rothstein, Wilder & Jacobsen, 2007, p. 8). Business education directly addresses work ethic and the preparation for skilled employment as well as critical thinking and problem solving. Yet, many teachers continually struggle to engage students in critical thinking activities (Tempelaar, 2006), and students seldom use critical thinking skills to solve complex, real-world problems (Bartlett, 2002; Rippin, Booth, Bowie & Jordan, 2002).

Justification of expediency of formation of critical thinking of students consists of two interconnected aspects. On the one hand, the formation of critical thinking through training in teams increases the efficiency of the educational process as a whole, and on the other hand, is an important condition for improving the General and professional training of specialists who will work in a group of like-minded people, each of whom is a creative person with a high culture of critical thinking.

It is necessary to clarify definition and interpretation of the term 'competence' in the context of the study. OECD (2005) defines competence as 'the ability to respond to the demands or carry out tasks successfully'. This concept refers to attitudes, abilities skills and performance abilities. As can be seen, the concept of competence includes knowledge, know-how and knowledge to be, so people acquire and develop skills to foster their development as individuals and as professionals.

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The 'professional competence' means the totality of a certain type of skills (intellectual, practical, communication, etc.), as well as the motivational attitudes and value orientations used in the professional practice activities that make up the essence of the concept. The process of formation of professional competence includes training of specific competencies, which can be identified with the skills based on knowledge and experience of their practical application in different situations. 'Skill—the ability to consciously perform a certain action—forms the basis of mastery' (Bell, Green, Fisher & Baum, 2001) and is the professional competence of the future expert. The pedagogy understands the 'skill' as a possession of activity means ability to apply knowledge (Makhmutov, 1997).

As it is shown by the literature analysis, the subject of studying the processes of critical thinking education, finding a way out of difficult situations and applying such skills in practice, is relevant and attracts the attention of a lot of researchers, including foreign. According to their view, the higher education institution students should have the integrative skills, ability to work in a team, think critically and realise their ideas in creative and innovative way (Eliasa, 2014; Laberge, 2013). Teamwork encourages the innovative spirit and creative ability to generate new knowledge, think productively and increase motivation of students and enthusiasm to learn and solve problems together (Yang, Huang & Wu, 2011).

A group of researchers (De los Rios Carmenado, Rodriguez, & Gajardo, 2012) from the Technical University of Madrid considers that teamwork is one of the abilities that today are highly valued in the professional arena with a great importance for various personal and interpersonal skills associated with it. At the beginning of their experimental work, they emphasised two factors: F1 – 'Teamwork' are clustered items related to 'teamwork' competence within the course project. The second factor, F2, was called 'teamwork support skills', bringing together other items related to the development of other abilities such as leadership, creativity and negotiation, which are necessary to develop good team work within a project. Eighty-two percent of the participants choose the development of creativity as team activities considered an important element in improving their abilities to think and act in an original and imaginative way to face the challenges of the project. Seventy-nine percent of students show the development of negotiation. Teamwork has been a means by which members have been able to resolve disagreements between them, to find solutions satisfactory to all.

2. Materials and methods

2.1. Design

This study was experimentally studied. Control group and experimental groups are included. (Buyukozturk, Cakmak, Akgun, Karadeniz & Demirel, 2017). The students were selected voluntarily. The study was conducted with 44 students. It is both a nite and a quantitative study. Two students did not participate in the qualitative study.

The aim of the experimental study, conducted by a group of scientists (Shariff, Johan & Jamil, 2013), was to evaluate the work performance of students in teams during the project execution, as well as to identify the skills, which are the most important for the team activities of the students. The obtained experimental results enable the researchers to create the following skills rating that match the most efficient teamwork of the students according to the results: leading skills—43%; the ability to think critically and solve the problems—36%; communication skills—34% and the ability to work in team—30%.

According to the above results, the researchers of the present article can make the following conclusion: in order to turn the group of students into a single entity, its members should possess certain qualities, namely, the integrative ability to think critically and to work in a team. Such qualities should be included in the professional competences of the future expert; their formation is

possible only at the targeted, systematic training of students in special courses and seminars using the interactive technologies of training of thinking and practical activities. These findings, in particular, have been confirmed by the results of the experimental research carried out by the authors of this article, which has had more complex nature than the above-mentioned.

3. Results and discussion

In the course of study made by the authors of this article (Plotnikova, 2015), the following objectives have been put forward: to determine the possibility of formation of critical thinking of students at the team form of training organisation, to conduct a statistical analysis of the experimental results and to analyse and evaluate the effectiveness of command form of training organisation in the process of preparation of the future experts in the higher education institution.

It has been made a survey between the students to receive the information on the compliance of the most essential aspects of critical thinking with the most meaningful team qualities. A specially designed questionnaire offered to the students enabled them to diagnose a variety of qualities of critical thinking personality necessary to work in a team, namely, curiosity, tolerance, ability to an objection, responsibility for the self-point of view, looseness, courage in the statements, communicativeness, mutual understanding, energy and tact.

Based on the questionnaire answers, it has been formed the incidence matrix, which reflects the relationship of elements that characterise the concepts of 'critical thinking' and 'team'. The author's method of cognitive representation of critical thinking criteria in the form of fuzzy frames has been chosen to highlight the integrative skills of team working from the standpoint of critical thinking of its members*. The content of the 'critical thinking' concept is revealed as a set of essential features that characterise this concept. An indication of the concept of 'critical thinking' of a student has been selected as the identity quality $x = \{x_i\}$, $i = n$, and an indication of the concept of 'team'—the ability to work together in a team $y = \{y_j\}$; $j = m$, where n is the number of rows and m is the number of columns in the 'incidence matrix' (Table 1).

Table 1. Ranked incidence matrix

Qualities $x = \{x_i\}$	Skill $y = \{y_j\}$								
	y1	y2	y3	y4	y5	y6	y7	y8	y9
	formulate the skills, assessments independently of the others	formulate the self-problems	find a way out of the situations	contribute ideas and set goals	have a command of the emotions	openly express the self-opinion	change the point of view under the effect of arguments	clearly express the self-opinion	be able to listen to others
x1 (curiosity)			4						
x2 (tolerance)			3		1				2
x3 (ability to an objection)	3	3		3		2	2	3	
x4 (responsibility for the self-point of view)		1		1		1			
x5 (looseness)						2		3	
x6 (courage in the statements)	2	1		1		2		2	
x7 (communicativeness)	1						1	1	1
x8 (mutual understanding)			1	3	2				
x9 (energy)	2	2	2	2		2			
x10 (tact)		3		3	2	3			3

Many of the skills identified are consistent with those used to characterise the concept of ‘critical thinking’, i.e., their joint formation is capable to give a new quality—integrative ability to think critically in the process of developing effective ideas and solutions in a team of professionals.

The information obtained enabled to use it as the input information for a computer programme (Paul & Elder, 2008), which carries out the following operations with the original data: (1) performs content analysis; (2) computes all the matrix elements under the comparison algorithm and (3) performs the hierarchical clustering mechanism (defines the similar elements and groups them). As a result of these actions, the command structure has been obtained from the perspective of critical thinking.

The results of summative stage of the experiment showed that it is necessary to use the method of critical thinking formation. The construction of student team and the creation of the problem situation enabled the team members to be in a constant search for the right options for solutions and answers to the questions, to form such mental operations as analysis, synthesis, comparison and summing up. This problem has been solved at the formative stage of the experiment.

The foreign researchers (Elder & Paul, 2010; Kelemen, 2014; Rodzalan, 2016) dealing with this issue note that teaching the students of critical thinking, namely, in the teams, enables them to use the theoretical knowledge obtained during the seminars, trainings in real life and identify the following stages in the formation of critical thinking:

- problem definition;
- systematic observation;
- brainstorm;
- beginning of the problem solution;
- setting short-term goals;
- argumentation based on the qualitative indicators;
- feedback and self-assessment.

Based on the theoretical and practical knowledge of a number of researchers Dede (2010) related to the issues of studying the stages of the formation of critical thinking, the authors of this article also believe that the implementation of critical thinking and hence its formation are possible to some extent at all stages, wherever there is a problematic situation.

The experimental work carried out by the authors of this article had a productive, creative nature and was based on business communication and included the elements of critical thinking: the students were taught to put the right tasks and to do them, to make the appropriate decisions, to think critically over them, to solve the problems, and the results obtained enabled to suggest that such skills of team members as ‘assessment independence’ and ‘finding the way out’ are the most important (see Table 2) for the development of such qualities as communicativeness (17.8%), curiosity (15.8%), courage in the statements (12.4%) and tact (10.2%) (see Table 3).

Table 2. Model responses of major sides of the ‘team’ concept (experimental group)

No.	Team attributes	Model of team sides	
		Weight, %	Rank
1	Independence of estimates	23.2	1
2	Problem formulation	8.0	6
3	Acceptance of arguments	8.6	5
4	Goal setting	8.0	6
5	Accessibility of the opinion statement	8.4	8
6	Openness to criticism	9.4	4
7	Listening skills	6.5	7
8	Finding way out	18.0	2
9	Having command of the emotions	13.3	3

To form the skills of independence of estimates, it is necessary to have all of the above characteristics of critical thinking. However, for the independence of estimates, according to the students, the most important qualities of critical thinking are communicativeness and curiosity, which, according to the rank scale, take the first and the second places.

Table 3. Model responses of major sides of the ‘critical thinking’ concept (experimental group)

No.	Team attributes	Model of the critical thinking sides	
		Weight, %	Rank
1	Communicativeness	17.8	1
2	Courage in the statements	12.4	3
3	Ability to an objection	5.8	7
4	Energy	5.0	8
5	Responsibility	9.0	4
6	Tact	10.2	3
7	Tolerance	8.2	5
8	Mutual understanding	8.2	5
9	Looseness	7.5	6
10	Curiosity	15.8	2

The third place is taken by tact and courage in the statements. The students formulate their estimates and beliefs independently of the others, and only the individual, independent character makes the thinking critical. Thinking occurs when the team members are put in front of a number of problems, where an independent thinking process begins. Once the students begin to deal with a specific problem, they certainly correlate their viewpoints, discuss ideas in a team and find answers to their questions. To achieve the expected results, the team members shall not only process the facts, ideas, information and subject them to critical reflection, but they shall be able to express their thoughts, to master the discussion culture. It can be assumed that having command of the emotions requires the ability to listen to the interlocutor, to appropriately conduct a conversation and using the pause, to master a discussion culture.

The team members do not only tactfully criticise someone else’s opinion, expressing their own one, but, as shown by the results of the lessons carried out, they can take the opinions of others as their own, and if the point of view of one member of the team is the same with the other one, then it only proves that they are right. In the second place, the students put the ability to find a way out that is consistent with the fact that when asking the questions and clarifying the problems, the team members show their curiosity. After a series of classes, this quality has been identified as major by the students of the experimental group. As it has been already noted, the curiosity level was very low in the students of the control group. This fact suggests that the university professors do not give problems to the students, and if they even give them, the student group includes only two or three students, who are involved in the work, i.e., the problem does not cover all the students, taking into account that all the team members shall be involved in solving the problem. As the results of the experiment conducted show that doing a specific problem, the student team begins to collect data and necessary information, to compare alternative points of view and to seek and find answers to these questions, using the command discuss opportunities.

Next skill, in order of importance, is the ability required to work in a team—it is the ability to have a command of the emotions, for the formation of which a curiosity has a special importance. In the process of finding a solution to the problem, exchange of ideas, an important condition for the student is having command of the emotions during the discussion and during communication with the teachers. It can be assumed that having command of the emotions assumes the ability to listen to the interlocutor, to appropriately conduct a conversation, i.e., to master a discussion culture.

Based on the results of experimental study and methods of forming critical thinking of university students, the authors of the present research developed a plan for the formation of critical thinking of students.

1. Objectives: formation of critical thinking of university students.

Tasks of critical thinking formation:

- Acquirement of knowledge of logical, problematic and creative thinking by students;
- Teaching students basic logical concepts: reflexion, negation, criticism, criticality, self-criticism, argumentation, proof, refutation, evaluation, self-esteem-evaluative judgment;
- The formation of students' ability to build critical judgments in the form of critical reasoning of a tolerant character;
- Teaching students to identify logical errors in the critical evaluation of the phenomenon, behaviour.
- Didactic conditions for students' critical thinking development:
- Determining conditions for the critical thinking development, taking into account the age and individual characteristics of students, the accumulated experience;
- Determination of the level of critical thinking formation;
- Familiarity with the logical structure and methods of critical attitude to various sciences;
- Use of critical thinking techniques by the teacher when presenting new teaching material;
- Fulfilment of tasks for students, including elements of critical thinking;
- The formation of generalised methods and techniques of critical analysis of statements in the course of solving group problems.

What does the teacher's activity consist of?

1.1. Course Content:

1. Inclusion of matters requiring critical understanding by students in new academic topics.
2. Inclusion of various forms and types of criticism in the academic information and material proposed to team members.
3. Arrangement of group tasks and problems requiring that critical thinking is applied as a part of the training process in various subject areas.
4. Thematic distribution of the training session materials with the purpose of developing critical thinking in accordance with the tasks of developing critical thinking of team members.
5. Determination of the level of students' critical thinking.

1.2. Forms of teaching:

1. Use of critical thinking in group problem solving taking into account individual traits of team members.
2. Teamwork while solving problem-based and cognitive situations aimed at developing critical thinking abilities and skills.
3. Group work taking account of the distribution of roles among members of a team for the execution of tasks aimed at developing critical thinking.

1.3. Teaching methods:

1. Using rating systems to determine students' readiness to acquire teaching material and information, and choice of a pedagogical technology in accordance with the level of students' ability to learn.
2. Motivate students to critically comprehend the content of training sessions and cultivate a critical attitude towards statements and actions.

3. Establishing the level of development of critical thinking ('low', 'middle' and 'high') within the structure of pedagogical technology.

4. Conclusion

Possessing the skills of constructive criticism and self-criticism as a means of effective thinking, students-future specialists will be able to clearly formulate their thoughts, ideas, quickly navigate the flow of information and find the main thing, see the mistakes of others and not repeat them and have a clear idea of their place in life.

The results of the experiment conducted indicate that the training students in teams promotes the formation of critical thinking. The quantitative and qualitative data of experimental work confirm this conclusion as training students in teams requires the systematic inclusion of critical thinking in the process of training and education of higher education institution students to critically reflect their environment, to be able to fix the traditions and experience, and to influence on the course and results of social and economic reforms aimed at the development of the country and society.

5. Recommendation

According to findings obtained from the research,

1. Students in different countries can be subjected to critical thinking skills.
2. Teachers' qualifications can be measured.
3. Attitudes towards teamwork can be measured with different group of students.

Conflict of Interest

The author confirms that the data presented do not contain any conflict of interest.

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