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Emotional aspects of school learning: what do students feel during lectures?

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Abstract. Starting from the point of understanding learning and teaching, which includes considering the role of emotional regulation in educational practice, the main goal of the research was to analyse students' emotional reactions to lectures and identify possible differences between students' emotional reactions in Serbia, Hungary and Germany. The sample consisted of 305 students between 14 and 19 years of age from Serbia, Germany and Hungary. The Shabot and Shabot (2009) *Questionnaire for self-assessment of emotional reactions in teaching* was used to collect data on students' emotional reactions. The results showed that students in the overall sample respond to lectures with weak and moderate emotional reactions. Statistically highly significant differences ($p < 0.001$) were found in the type and intensity of emotional reactions between students from Serbia and Germany, Serbia and Hungary, as well as Germany and Hungary in almost all emotional modalities. Significant differences ($p < 0.005$) were also found between the sexes and students of different ages in a small number of emotional reactions. The results indicate the importance of encouraging pleasant emotional reactions in teaching and the need to pay more attention to negative emotional reactions. Also, the research shows the need for further research in this area.

Keywords. Teaching, emotional reactions, improvement of high school teaching

1. Introduction

The main goal of school learning is to acquire permanent and applicable knowledge from various scientific fields, while the cognitive activity of students in the pedagogical process is a key factor on which learning depends (Ausubel, 1968). Scientific knowledge is an organized and regulated system of concepts, definitions, descriptions, laws, etc., which is obtained in a very special way, through scientific research. Scientific research, on the other hand, is a very special type of cognitive activity. Intellectual activity that takes place at the level of scientist's consciousness who is preoccupied with a problem, can be described as intense curiosity, focus and concentration, mental engagement. This type of knowledge is not acquired through direct experience, through contact with concrete objects from reality. This type of knowledge is acquired on a mental level, through thinking and through the use of symbols. It differs from the knowledge acquired in direct contact with reality. The activity required by school learning is, therefore, a cognitive activity whose goal is to create scientific concepts systematized into categories of knowledge from different scientific fields (Vygotsky, 1996). Being active in the pedagogical process implies mental engagement, the effort of students to notice scientific problems, to think about them, to understand connections and relationships, to classify, define,

set hypotheses, check, generalize, etc. In this sense, the prime goal of the pedagogical process would be to stimulate students' cognitive activity (Anderson, 2010; Linnenbrink-Garcia & Patall, 2016). However, we can ask a question: what are the real possibilities of the school to encourage students' cognitive activity. Is it possible for each and every student to learn in school in this way and adopt all the planned school contents? What are the sources of this type of student activity? Do these sources originate from the student himself (his personality, intelligence), from his social environment, the teacher's personality, the content of the subject or the concept of teaching? Taking into account personal and direct experience, the student's personality and its advantages and limitations, social and cultural context, etc., the fact that school learning is an institutionalized activity must also be taken into account.

2. Literature review

The role of the school is to encourage and create situations in which the student will be encouraged to think, i.e. situations in which he/she will be cognitively engaged (Lazowski & Hulleman, 2015). If we follow Vygotsky's thought, the essence of cognitive development during schooling is the process of development and formation of scientific concepts. In this process, the role of the formative factor belongs to systematic and institutional, school education. Although Vygotsky did not deal with the impact of the quality of the teaching process on the process of acquiring scientific concepts, he pointed out to sources of cognitive activity such as: planned pedagogical use of differences and discrepancies between students' direct experience and scientific knowledge (cognitive conflict), establishing connections and relationships between scientific concepts and knowledge, the potential of each subject to initiate a very specific form of activity (subject activity), the great potential of school subjects to initiate different forms of interaction around their content (cooperation, confrontation, exchange).

Based on these principles, a whole teaching approach related to the name Posner was developed in the 1980s, known in the literature as the "theory of conceptual change" (Posner et al, 1982). The main criticism of the proponents of this theory is the overemphasis on the cognitive aspect and almost complete ignoring of the emotional components of the learning process (Davis, 2001; Pekrun, 2014), which has led to a new way of understanding learning and teaching that includes considering the role of emotional regulations in educational practice. This approach is focused on emotions and its initial assumption is that emotions are integral parts of the teaching process (Gläser-Zikuda, 2013; Ćirković-Miladinović, 2018).

What happens to students' cognitive abilities when they feel intense fear, anxiety, dread, or boredom? How do these conditions affect cognitive activity? The answer is known to us: we are all almost incapable of learning when we are tired, exhausted, upset, preoccupied with worries. In all situations, therefore, when we are more emotionally engaged, we are less able to focus, learn, and think clearly. Today, what everyone who went to school knows is scientifically proven: anxiety, fear and boredom are fatal for learning, and the more favourable the atmosphere, the more pleasant the feelings and the better the relationship with the teacher, the better the learning will be. Ćirković-Miladinović (2019, p. 98) came to similar data in her research which also showed that creating a positive climate for foreign language teaching contributes to making all teaching actors feel respected and comfortable, which all together results in a better learning and teaching process, therefore, at the same time more productive learning outcomes. The more tense and unpleasant the situation in the classroom leads to the greater level of the affective filter (Krashen, 1982, p. 31) and the significantly reduced cognitive ability.

Feelings of social endangerment, fear of bad grades, fear of being stupid in front of everyone, fear of ridicule, boredom, dissatisfaction, tension, anger, etc., as well as any other emotional

state, has its neurophysiological basis. This means that in such conditions, certain brain structures are activated, which also activate the secretion of certain hormones, and all this together moves the organism to a certain behaviour. Fear, for example, drives the body to escape, boredom to exclude and abandon the situation, shame also to abandon the situation, which disrupts the activity of brain mechanisms necessary for learning (Bishop, 2007). A student who feels shame, fear or boredom during school is a student whose nervous system is driven to avoid and abandon that pedagogical situation. Since the student knows that he must not leave the situation, he makes an effort to overcome, control and endure in a situation that he often perceives emotionally as unbearable. Staying in the situation one want to leave intensifies the emotional experience. All of this is exhausting and completely interferes with learning (Chaffar and Frasson, 2005).

The neurobiological basis of the described fear-control-exhaustion experience is the already mentioned neurophysiological mechanisms that are activated in the mentioned school situations: when fear is felt, for example, the neurobiological “programmes” are launched. These programmes are predicted in case of danger to prepare the organism for escape from a dangerous situation. The neural structure known as the amygdala, which is responsible for giving emotional value to a particular stimulus, blocks the executive parts (these parts react slower than some other parts of the brain) of the cerebral cortex that are responsible for thinking and planning. They then shift the responsibility to the “lower” parts of the brain in charge of automated actions, which are faster. The “higher” parts of the brain, therefore, give primacy to the “lower” parts of the brain, and this is one of the reasons why in this situation a person cannot think as he/she would be able in a normal emotional state. And that’s not all. At the same time, the parts of the brain that control the hormonal system are activated, which leads to the secretion of certain hormones. The hippocampus, a possible structure located in the midbrain and plays a very important role in learning (destruction of the hippocampus extinguishes the ability to learn) because it allows, among other things, to connect the new with what we already know and store information in long-term memory - hippocampus is very sensitive to hormones. While they interfere with the work of the hippocampus, these hormones simultaneously stimulate the work of some other brain structures, as a result of which attention is focused on what causes emotion, and not on the adoption of new information (Buckley and Saarni, 2009).

Neurobiological mechanisms activated by unpleasant emotions hinder the ability to plan, carry out intentions, direct attention, learn, and retain information. Under the influence of emotions, a person falls into a state called cognitive dysfunction according to the neuroscience. “The stronger the emotion, the weaker the cognitive efficiency. The more we are preoccupied with fear, worry, resentment, or sadness, the lower the levels of activation of the prefrontal cortex are, therefore, this situation makes it increasingly difficult for us to think. In the same way, boredom reduces the efficiency of the brain - as they wander, thoughts lose focus and motivation disappears” (Damasio, 2002).

Instead of remembering what the teacher said, the student would remember that he was upset or scared, he would remember how terribly bored he was. On the contrary, pleasant feelings, such as joy, pleasure, and contentment, act activating the “higher” prefrontal regions of the brain and stimulate cognitive functions. Unpleasant feelings can have the same effect if they do not exceed a certain level, that is, if they are moderate (anger, nervousness, anticipation, etc.). When something happens that is challenging for the student, the attention is focused and the student turns on, watches, listens, thinks and thus learns. Pleasant emotions stimulate neurobiological mechanisms to optimal work (optimal secretion of hormones and optimal level of activity of neural systems). If during the class students just sit passively without expecting anyone to ask them anything, the body secretes very low levels of hormones and the activation

of nerve structures is too low. This is associated with indifference and boredom, and thus with an inability to learn (Chica, Bartolomeo and Lupiáñez, 2013).

Let us finally remind ourselves that the concept of teaching determines the nature of pedagogical interaction, and pedagogical interaction determines the nature of students' activities. The concept that prevails in our country and in the world is the concept of the so called traditional school, which is made such by a certain model of interaction. What happens within this model of interaction is an attempt to transfer knowledge from the teacher to a student, and the basic methods of work are lectures. What students feel during the lecture is the first question we ask in this paper. In the second place, but no less important, is the question of whether there are differences in emotional reactions to lectures between students in Serbia, Hungary and Germany. Given the impact of emotional reactions on cognitive activity, we consider the answers to these questions relevant in the search for answers to the essential question of how to deal with the growing decline in motivation for school learning faced by almost all countries in the modern world. The first paragraph after a heading is not indented (Bodytext style).

3. Research rationale

The main research problem is the examination of students' emotional reactions to lectures. The main goal of the research is to analyse students' emotional reactions to lectures and to identify possible differences between students' emotional reactions in Serbia, Hungary and Germany.

3.1 Sample

The research was conducted in our country (Serbia) and in two European countries that are members of the EU - Germany and Hungary. The sample from Germany consists of students, from 14 to 19 years of age, from a private international school in the province of Schleswig-Holstein in northern Germany. All respondents, $N = 92$, at the time of the research were attending the older grades of the Gymnasium (germ. Oberstufe meaning higher level) which includes three-year education in grades 10, 11 and 12. In Germany, students prepare for graduation after 12th grade and graduation exam is an entrance exam for a university. The private bilingual school, referred to here, offers four educational profiles 1) Mathematics and natural sciences with a focus on the subjects such as mathematics, biology, chemistry and physics; 2) Linguistics with a focus on English and other foreign languages, the first foreign language - Spanish, the second foreign language of choice and French and Russian are offered as well; 3) Socio-economic profile with emphasis on the following subjects: economics, politics, history, and geography; 4) Sports profile offers sports and health sciences. The subjects that are mostly studied here are biology, sports, hygiene and history.

The examined students attended classes in German and English, and the school is considered by the competent ministry to be one of the best bilingual schools in the north of Germany. The goal of this bilingual teaching is to improve the knowledge of the English language.

The total sample of students (from 14 to 19 years of age) from Hungary was $N = 113$. For the purposes of this research, students from the Gymnasium in Budapest were examined, which as a general education institution offers students multiple opportunities for the acquisition of knowledge and provides a good basis for future academic education. The school has modern classrooms for all subjects and the focus is on the mother tongue (Hungarian), foreign languages (English and German), computer science, physics, biology and chemistry, history and geography, music education and fine arts, as well as modern physical education. In this institution as well, students can choose one of the directions of profiling, which are: mathematics and natural sciences, social sciences and philological sciences.

The research in Serbia was conducted at the Gymnasium Svetozar Markovic in Jagodina. It is a general education institution, which gives students a four-year education in the following educational profiles: Natural Sciences and Mathematics, Social sciences and Languages, Philology with an emphasis on English as the first foreign language, General Comprehensive department and Computing and Informatics. The examined students were also aged 14 to 19, and the total sample was $N = 100$.

It should be noted here that the total sample of 305 respondents was divided into students who belong to the group of younger adolescents from 14 to 16 years of age ($N = 203$), i.e. 66.6% and a group of older adolescents from 17 to 19 years of age ($N = 102$), i.e. 33.4%. In addition, to clarify the structure of the sample, it should be pointed out that of the total number of surveyed students, 36.7% or $N = 112$ were male and 63.3% or $N = 193$ female.

So, for the research purposes, a total of 305 students from three European countries, aged 14 to 19, were examined, and all students attended high school as a general secondary school in one of the offered profiles in that institution.

3.2 Research instruments

To collect data on students' emotional reactions, the Shabot and Shabot (2009) *Self-Assessment Questionnaire* was used. The questionnaire was constructed from items describing emotional reactions related to six basic categories of emotions (fear, anger, sadness, contempt, surprise and joy). The examined student was instructed to respond with a ten-point scale in accordance with his emotional reactions, ranging from weak (grade 1) to strong (grade 10) emotional reactions. Out of a total of 18 offered emotional reactions, three are related to each basic category of emotions as follows: I felt: scared, worried, and insecure (fear); anxious, irritable, impatient (anger); disappointed, discouraged, sad (sadness); tired, distrustful, bored (contempt); astonished, amazed, impressed (surprise); satisfied, optimistic, confident (joy). The Alpha Cronbach's coefficient, as an indicator of internal homogeneity, for this scale is 0.768, so we may state that the internal consistency of the scale is satisfactory and that the scale has satisfactory validity.

3.3. Procedure

Data on students' emotional reactions were collected in 2019 and 2020. After the lessons of English, history, geography, and natural sciences, the students were asked to answer the questions from the questionnaire. The goals of the research were explained to each student group and all the questions students had were answered by the researchers themselves.

3.4 Analysis procedures

Data processing included methods of descriptive statistics (measures of average and variability, frequencies and percentages), as well as methods of analytical statistics to assess the significance of differences: Mann-Whitney Test (statistical significance with respect to gender and age) and Kruskal-Wallis Test (statistical significance with regard to nationality).

4. Results and discussion

In order to determine the type and intensity of students' emotional reactions to lectures, an average grade was calculated for each emotion in a certain category based on their grades (on a scale from 1 to 10) (see Table 1).

Table 1. Average grades of students' emotional reactions (scale from 1 to 10) in the total sample

Category	Emotion	N	M
Fear	scared	305	0,7607
	worried	305	1,6262
	insecure	305	1,9475
Anger	anxious	305	1.8918
	irritable	305	1,5311
	impatient	305	3,7180
Sadness	disappointed	305	1,7705
	discouraged	305	1,4230
	sad	305	1,5869
Contempt	tired	305	4,2066
	distrustful	305	1,2557
	bored	305	4,4459
Surprise	astonished	305	2,1705
	amazed	305	2,4656
	impressed	305	2,6426
Joy	satisfied	305	4,8590
	optimistic	305	4,6033
	confident	305	5,3311

The results show that the examined students reacted to the lessons/lectures with different emotional reactions of low and moderate intensity. On a scale of 1 to 10, average scores range from 0.76 to 5.33. The groups of emotions that are the subject of this research belong to primary emotions. Ekman (2011) discovered that each of these emotions can be found in all the cultures he researched regardless of race, language, religion or customs. Thanks to Ekman, researchers from different cultures have been able to investigate the nature of emotional reactions, their triggers and the behaviours they provoke. Today we know that fear is caused by danger and leads to running away from that danger, further, anger is associated with obstacles to achieving a goal and triggers an attack, sadness is associated with loss and causes us to withdraw, surprise is activated in unexpected situations and triggers exploration, contempt occurs in an aversive situation and leads to a reaction of rejection while, on the other hand, joy occurs in situations that are desirable and leads to a reaction of approach and inclusion. Primary emotions are the basis from which they develop through learning secondary emotions such as insecurity, anxiety, self-confidence (Cabanac, 2002).

This finding coincides with the results of other research that confirms that students in schools experience a variety of emotions: fear, boredom, sadness, suffering, pleasure, dissatisfaction, etc. (Buckley & Saarni, 2009). Also, the findings goes along with an available research conducted by Bognar et al. (2004). Their research was done on a large sample of high school students in Slavonia and Baranja according to which the dominant emotions in teaching are boredom and nervousness, anxiety and fear, which are, again, modalities of anxiety and fear. The Table 2. shows the ranking list of students' emotional reactions to lectures in the total sample.

Table 2. Ranking list of students' emotional reactions to lectures in the total sample

Rank		Category	M
1.	Joy	Confident	5.33
		Satisfied	4.85
		Optimistic	4.60
2.	Contempt	Tired	4.44
		Bored	4.21
3.	Anger	Impatient	3.71
4.	Surprise	Amazed	2.17
		Astonished	2.46
		Impressed	2.64
5.	Fear	Insecure	1.94
6.	Sadness	Disappointed	1.77
7.	Fear	Worried	1.62
8.	Sadness	Sad	1.58
		Discouraged	1.42
9.	Fear	Scared	0.76

In the ranking list gotten on the basis of average grades of students' emotional reactions, showed that the emotional reactions placed in the first place were from the category of joy (self-confident, satisfied and optimistic). Satisfaction is an emotion that mainly reacts to the fulfilment of needs and desires. The importance of satisfaction in the context of upbringing and education has already been discussed. This finding is encouraging also because positive emotions create a good basis on which constructive interaction and communication can take place in the educational process (Ainley et al. 2005).

In the second place are emotional reactions that belong to the category of contempt (tiredness and boredom). Boredom is the feeling with which a person reacts to those situations which, in his opinion, do not offer him the possibility of satisfying any of his needs. Boredom moves a person to leave the situation and for that reason students who are bored in class become sleepy or leave the class (Yeager et al, 20014). Research on the educational process shows that unpleasant emotions are mostly registered in teaching and that fear and boredom dominate among them (Bognar and Dubovicki, 2012).

In the third place in the Table 2. are placed emotional reactions in the category of anger (that is, impatience). The emotion of anger, which can vary in intensity from impatience, through irritability to strong anger, even rage, appears as a reaction to frustration, as a person's response to prevention in satisfying a certain motive. If take a school situation into consideration, for example, students may react to some of the varieties of anger when they do not want to be in class but are still forced to stay there or when they are asked to do something they do not want to do at that time (Patall et al. 2010).

In the fourth place of the ranking list are emotional reactions from the category of surprises (amazement, astonishment and impression). Since these emotions are related to curiosity, which is the very essence of intrinsic motivation, low average grades (slightly more than two on a scale of 1 to 10) are disturbing.

It is encouraging that in the bottom of our ranking list dominate emotions of fear and its modalities (insecurity, worry and scariness). It has long been known in science that students who are prone to stress, fear and anxiety have learning difficulties. Seipp (1991) conducted a

meta-analysis of papers dealing with the impact of fear and anxiety on learning success. She studied 126 studies performed on samples from a total of 36,000 students. It turned out that the more worried the student is, the lower the success. However, only recently have scientists begun to discover the mechanisms underlying this process. The researchers concluded that attention and perception are the first cognitive processes affected by fear and anxiety. Under the influence of these emotions, the focus and tenacity of attention weakens and perception becomes superficial (Rudrauf, 2003).

At the bottom of the list are the modalities of sadness (discouraged and sad). It is encouraging that the average score in all modalities of grief is very low (below 2) given the role of grief in the development of numerous psychopathological phenomena in childhood and adolescence (Mercer & Littleton, 2007).

Table 3. Comparison of students' emotional reactions to lectures in Serbia, Germany and Hungary.

Emotional reaction	SRB M	DEU M	HUN M	Σ M
Scared	,7300	1,0109	,5841	,7607
Worried	,9700	2,6630	1,3628	1,6262
Insecure	1,4300	3,3587	1,2566	1,9475
Anxious	1,2000	3,4348	1,2478	1,8918
Irritable	1,3200	2,6087	,8407	1,5311
Impatient	4,6700	3,3913	3,1416	3,7180
disappointed	1,3800	2,5217	1,5044	1,7705
Discouraged	,9300	2,7065	,8142	1,4230
Sad	1,9100	1,6522	1,2478	1,5869
Tired	6,1300	3,1413	3,3717	4,2066
Distrustful	1,1500	1,9348	,7965	1,2557
Bored	6,0000	4,5435	2,9912	4,4459
astonished	1,8100	3,1739	1,6726	2,1705
Amazed	1,3900	3,4891	2,5841	2,4656
Impressed	1,4000	3,6630	2,9115	2,6426
Satisfied	3,5900	5,4022	5,5398	4,8590
Optimistic	2,8300	5,5761	5,3805	4,6033
Confident	4,1100	6,3043	5,6195	5,3311

Comparing the results of gained from students from different countries, it can be noticed that the average grades of students from Germany are higher than the average grades of students from Serbia and Hungary for almost all of the listed emotional reactions. The exceptions are emotional reactions of tiredness, boredom and impatience. The average grades of students from Serbia are noticeably higher than students from Germany and Hungary when it comes to these emotional reactions. In other words, students from Germany and Hungary are more emotionally engaged in lectures than students from Serbia, except when it comes to emotional engagement with boredom, tiredness and impatience. It is also obvious that students from Germany feel more confident than students from Serbia and Hungary, as well as that they react to lectures with a certain dose of amazement, admiration and impression.

Table 4. Ranking list of students' emotional reactions to lectures (comparative overview).

Emotional reaction	SRB M	DEU M	HUN M
Scared	18th place	18th place	18th place
Worried	16th place	12th place	11th place
Insecure	8th place	8th place	12th place
Anxious	13th place	7th place	14th place

Irritable	12th place	14th place	15th place
Impatient	3th place	9th place	5th place
Disappointed	14th place	15th place	10th place
Discouraged	17th place	13th place	16th place
Sad	7th place	17th place	13th place
Tired	1st place	10th place	4th place
Distrustful	15th place	16th place	17th place
Bored	2nd place	5th place	6th place
Astonished	9th place	11th place	9th place
Amazed	11th place	6th place	8th place
Impressed	10th place	4th place	7th place
Satisfied	5th place	3rd place	2nd place
Optimistic	6th place	2th place	3rd place
Confident	4th place	1st place	1st place

By analysing the ranking list, we can see that students from Germany and Hungary positioned the emotional reaction self-confidence in the 1st place (the highest average grades). Satisfaction, optimism and self-confidence are emotional reactions that take the first three places in the ranking list among students from Germany and Hungary. It is encouraging that the self-confidence of students from Serbia is also in the high 4th place. Due to the feeling of self-confidence and security, let's recap, the tendency to think about alternatives increases, which expands the repertoire of behaviour. Thinking is more creative and productive, the number of incentives to act increases (Chaffar and Frasson, 2005) and after stress physiological functions quickly return to a state of rest (Lyubomirsky et al. 2005).

However, the fact that the emotional reaction of tiredness is on the 1st place to the students from Serbia and to the students from Hungary on the 4th place (to the students from Germany on the 10th place) is worrying. Boredom is ranked 2nd (in Serbia), 5th (in Germany) and 6th (in Hungary). Boredom and tiredness are emotional reactions by which the subject reacts to situations that do not offer him the possibility of satisfying any desire. The purpose of boredom and tiredness is to initiate activity in order to leave a situation in which there is no satisfaction or stimulation (Rimé, 2007). Boredom, like fear in upbringing and education, is an undesirable and harmful emotion, and in that sense, recognizing the facial expression of boredom and fear is of inestimable importance in communication with students (Rothwell, 2004).

What all students have in common is the emotional reaction "scared", which is in the last place with the lowest average grades. This finding is encouraging given the fact that fear in education is an undesirable and harmful emotion. What is more, fear is an innate emotion that arises as a reaction to a real or imagined threat of injury, fear blocks cognitive functions and narrows the repertoire of possible reactions to a single one: running away from a situation that is perceived as threatening. In addition, physiological processes that are an integral part of fear may result in the development of psychophysiological disorders (Rothwell, 2004).

Kruskal-Wallis and Man-Whitney tests showed that there are statistically significant differences in the emotional reactions of students with regard to their nationality, gender and age.

Values and levels of significance of differences in emotional reactions between students from Serbia and Germany are given in Table 5.

Table 5. The significance of differences in emotional reactions of students from Serbia and Germany.

Emotional reactions Serbia vs. Germany	Z	Asymp. Sig. (2- tailed)
Scared	-2.255	,024
Worried	-4,962	.000
Insecure	-5,001	.000

Anxious	-5,899	.000
Irritable	-5,211	.000
Impatient	-2,413	.016
Disappointed	-3,930	.000
Discouraged	-5,867	.000
Sad	-,437	.662
Tired	-5,818	.000
Distrustful	-3,357	.000
Bored	-3,055	.000
Astonished	-3,892	.000
Amazed	-5,685	.000
Impressed	-6,117	.000
Satisfied	-3,727	.000
Optimistic	-5,570	.000
Confident	-3,883	.000

The applied tests showed that there are highly significant differences ($p < 0.001$) in the intensity of emotional reactions between students from Serbia and students from Germany in almost all modalities. The only exceptions are the reactions “I feel scared” and “I feel impatient” where significant differences were found ($p < 0.005$). In order to emphasise this, the emotional reaction “scared” received the lowest average grade and is at the bottom of the ranking list for all three groups of students. The only emotional reaction in which no significant differences were found is the reaction “sad” (both examined groups reacted with equally low intensity of emotions from this modality). When it comes to modalities of fear, German students react highly significantly ($p < 0.001$) more “worried” and more “insecure” than students in Serbia.

Also, they react significantly more often with the emotion “discouraged” and “anxious”. However, it is important to emphasize here that despite the fact that these differences are statistically significant in both cases, the average scores on these emotional reactions are low. Reactions such as “amazed”, “impressed”, “satisfied” and “optimistic” are emotional reactions with which German students react significantly more often to lectures than their Serbian peers. Students from Serbia react significantly more intensively with impatience, tiredness and boredom ($p < 0.001$). Whether these differences can be discussed in the context of attitudes towards learning and cultural differences, differences between the specific schools from which the sample was examined or situational factors (topic of a lesson, teaching method) remains an open question. In any case, the more intensive reaction of German students to lectures with positive emotions is evident and deserves further research. Of course, the fact that Serbian students react with extremely weak emotions deserves further research as well, and when they do, they react with boredom, tiredness and impatience. We believe that in this way we can act in the direction of improving teaching that would provoke a positive emotional response and thus greater cognitive engagement of students.

Table 6. The significance of differences in emotional reactions of students from Serbia and Hungary.

Serbia vs. Hungary	Z	Asymp. Sig. (2-tailed)
Scared	-1,217	.224
Worried	-,386	.700
Insecure	-1,578	.114
Anxious	-,550	,583



Irritable	-1,764	,078
Impatient	-3,140	.002
Disappointed	-,792	,429
Discouraged	-,491	,624
Sad	-2,418	.016
Tired	-5,558	.000
Distrustful	-1,766	.077
Bored	-6,002	.000
Astonished	-,994	.320
Amazed	-2,668	.008
Impressed	-3,735	.000
Satisfied	-3,781	.000
Optimistic	-4,788	.000
Confident	-2,435	.015

When it comes to students from Hungary and Serbia, highly significant differences were found ($p < 0.001$) in only three modalities of emotional reactions, namely in the modalities “impressed”, “optimistic” and “satisfied” in favour of students from Hungary. Significant differences ($p < 0.005$) also in favour of students from Hungary were found in the modalities “amazed” and “confident”. Highly significant differences between students from Serbia and Hungary in favour of students from Serbia were found in the modalities “tired” and “boring”. It can be noticed that, compared to students from Germany, a smaller number of modalities of emotional reactions show a statistically significant difference. Even in ten emotional modalities, no significant differences were found between students from Serbia and Hungary, which leads to the conclusion that students from Serbia differ less from students from Hungary than from students from Germany in the way they react emotionally to lessons/lectures.

Table 7. The significance of differences in emotional reactions of students from Germany and Hungary.

Germany vs. Hungary	Z	Asymp. Sig. (2-tailed)
Scared	-3,541	.000
Worried	-4,242	.000
Insecure	-6,023	.000
Anxious	-6,160	.000
Irritable	-7,084	.000
Impatient	-,799	.425
Disappointed	-4,380	.000
Discouraged	-6,309	.000
Sad	-2,961	.003
Tired	-,070	.944
Distrustful	-5,001	.000
Bored	-3,461	.001
Astonished	-4,662	.000
Amazed	-2,793	.005
Impressed	-2,354	.019
Satisfied	-,498	,618
Optimistic	-,016	,988
Confident	-,867	,386

When it comes to students from Germany and Hungary, no significant differences were found in all three modalities of joy. Students from both countries feel equally satisfied, optimistic and self-confident at the lectures, but also equally tired and impatient. Significant and highly significant differences were found in all other examined modalities. German students feel more frightened, worried, insecure, upset and irritable than students from Hungary. The intensity of distrust, boredom, astonishment, amazement and impression is also significantly higher among students from Germany.

Table 8. The significance of differences in relation to gender.

	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
Amazed	8973,000	27694,000	-2,596	,009
Impressed	8415,500	27136,500	-3,370	,001
Optimistic	9257,000	27978,000	-2,121	,034
Confident	9299,000	28020,000	-2,061	,039

Applied tests to calculate the statistical significance of differences between male and female students showed that there were significant differences ($p < 0.005$) only in the modalities of emotional reactions “amazed”, “impressed”, “optimistic” and “confident” in favour of male students. Namely, the young men reacted with somewhat more intense emotions from the modality of surprise and joy than the girls. No significant differences were found in all other modalities. Table 9. shows the values of the applied tests to examine the significance of the differences between the group of younger and the group of older students.

Table 9. The significance of differences in relation to gender.

	Younger students (14-16)/ Older students (17-19)			
	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
Anxious	8993,500	29699,500	-2,063	,039
Disappointed	8454,000	29160,000	-3,011	,003

As we can see, significant differences ($0 < 0.005$) were found between younger and older adolescent students in only two emotional modalities, in the “upset” and “disappointed” modalities. In other words, older adolescents reacted with somewhat more intense reactions of anxiety and disappointment than younger adolescents. Considering that out of 18 offered modalities, only two differ significantly ($p < 0.005$), the obtained finding can be considered irrelevant.

Furthermore, taking into account the obtained results, all research in this area confirms that the mood of students in the classroom is closely related to their learning (Shabot and Shabot, 2004). If nothing attracts their attention in class, if they are bored, if they are not satisfied, if they are scared, and so on, they will acquire very little of the content discussed in class or will not pay attention at all (Terry & Burns, 2001; Schunk et al. 2014). It is important to emphasize that students differ according to the level of stress they can endure and remain cognitively active. Some students may be very scared, but in front of the white board or on the cognitive ability test, they will remain in function, undiminished. These students can ‘manage’ themselves, listen

to the most boring lecture and learn the most boring content. But, unfortunately, there are fewer of them. There are many more students whose cognitive abilities decline even with very weak emotions (Ćirković-Miladinović, 2019).

Finally, despite the shortcomings (unknown student success, unknown teaching method applied in class, appropriate sample, etc.), we consider the findings of this research relevant because they show the level of emotional engagement of students during lectures and indirectly indicate the way to go in search of lecture models that trigger positive emotional reactions from students. Teaching models that carry novelty, unusualness, and avoidance of routine trigger emotional reactions that provide cognitive involvement (Rimé, (2007); Brackett & Rivers, 2014). Since the results of this research showed that students from all three countries react to lectures with a large number of unpleasant emotions, it is necessary to remind that this may be the result of an unpleasant emotional climate which is usually an indicator that teaching is not in line with students' interests and needs. This could also be connected to the economic, technological and science constant changes that not only bring novelties but also difficulties in everyday life. These everyday life difficulties are especially visible in Serbia in the period of pandemic.

5. Conclusion

Starting from the way of understanding learning and teaching in which the basic premise is that emotions precede learning and that there is a direct connection between learning opportunities and students' emotional state, the aim of this research was to analyse students' emotional reactions to lectures and identify possible differences between students' emotional reactions in Serbia, Hungary and Germany. The results showed that students in the overall sample responded to lectures with emotional reactions of low and moderate intensity. Considering the role of emotions in cognitive activity, this finding points to the conclusion that students are insufficiently involved in lesson activities. Despite the low intensity of emotional reactions, highly significant differences were found between students from Serbia, Germany and Hungary. Students from Germany reacted with significantly more intense emotions from almost all examined modalities in relation to students from Serbia and Hungary, except when it comes to boredom, tiredness and impatience. Students from Germany reacted to the lectures significantly more intensively with optimism, satisfaction and impression in relation to their peers from Hungary and Serbia.

Feelings of tiredness and boredom are also registered with students from Germany, but highly significantly less intense than their peers. Whether these differences can be discussed in the context of attitudes towards work and cultural differences, differences between the specific schools from which the sample was examined or situational factors (lecture topic, teaching method, current emotional state of students) remains an open question. Since we believe that the emotional state of students in the classroom should be a guide in the search for innovative teaching methods and ways of communication that trigger a positive emotional response, we consider these results relevant. In addition, emotions are not a simple part of the educational process, but are its basis and essence. Relying on the previously said, we also hope that these results have the capacity to launch some new research.

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