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Developing Critical Thinking in the Next Generation of Teachers at Universities: A Comparative Research Study Conducted in Slovakia

Abstract

The world of education has changed. Information is available anywhere and at any time. It can be daunting to understand and assess it and to distinguish a hoax from objective reality. The training of future teachers at universities needs to be changed so that a graduate from a Faculty of Education will become a professional capable of teaching others how to learn. Teachers can no longer only transmit information and evaluate how students acquire it. They should make learning meaningful and guide learners toward critical thinking. The underlying assumption is that they themselves can think critically. The aim of the study is to compare the level of critical thinking in university students between two generations of students, Generation Y (Millennials) and Generation Z (the iGeneration).

Keywords: critical thinking, teacher training, future generation

Introduction

Teaching is the free choice to continuously work on oneself, a choice of lifelong learning and self-education. Teachers today cannot be satisfied with what is gained by graduating from a Faculty of Education. They should show interest in the latest findings in scholarship and technology. Teachers today cannot afford to rest on their laurels and be content with the fact that “the world has gone mad” and then continue to work as before. They must reflect on what is pulsating in the world, in society, and on social networks, too. The school must not close itself inside a cocoon and isolate itself from real life and current social topics. All those who are being educated (children, pupils, students, young people, adults, and seniors) live in two worlds: the real world and a virtual world. We live in an era when it is no longer possible to remain and function in only one of them. It is important to have an overview of events taking place in both reality and in virtual space. Although automation is making our lives easier and saves time, these time reserves often vanish when searching and surfing, preparing for the work of an educator, be it in the form of teaching, lectures, advising, creative activities, or others. The speed and dynamics of the change are unrelenting. The flow of information in the business sector is unbelievably fast. That which was true yesterday is no longer valid today, or it needs an *upgrade*. The business sector must react rapidly and flexibly to customer requests and the demands of the market and must present original ideas and solutions. Unfortunately, the same cannot be said about school and teaching. Present-day schools are unable to respond flexibly to the changing world, the new generation of children and students, or new trends in education. Only with difficulty can it throw off the shackles of conservative and transmissive teaching. The transfer of research findings from the field of neuroscience and psychodidactics into the didactics of teaching is a long process. Neuroscientific research has made progress in recent decades and at present it is essential to turn to neuroscientists to clarify the laws of human cognition, because the world of education has been altered by the determination of these changes in society.

In January 2015, an internationally connected group of intellectuals published a document titled *Manifesto 15*. The authors and signatories of this document, by means of its twelve points, formulated an image of the radical transformation needed in education. They do not only claim that education systems must change. In many points they point out that things have already changed and that there is no going back. The motivation for preparing *Manifesto 15* was the fact that even though it has long been clear that the current educational model based on education by obedience is no longer sustainable, almost nothing is happening to redress this disparity. Transformations in practices at schools are minimal and politicians refuse to take note of the necessary changes. One of the points of *Manifesto 15* is that the future is already here, but is distributed unevenly over different places of social life and the education system. Many schools and teachers are already teaching according to the new paradigm, but a large portion of school systems reject any changes. The key slogan of *Manifesto 15* is “The school of generation 1.0 cannot teach the children of generation 3.0. Thus, a school set to the demands of 18th- and 19th-century society is incapable of preparing children for life in the 21st century” (Feřtek, 2015, p. 19). The questions then arise of whether the quality of the training of future teachers at universities has changed and whether it reflects the fact that the future generation of teachers will be working with completely different people/students than before.

At present, when access to knowledge is easier than ever before and new information is available almost immediately, there is talk of the so-called meta-skills that will be essential to acquire in education and to develop over the lifespan. So, what should we be teaching? Many pedagogical experts argue that schools should switch to teaching “the four Cs” – critical thinking, communication, collaboration, and creativity. More broadly, they believe that schools should downplay technical skills and should emphasize general-purpose life skills. Most important of all will be the ability to deal with change – to learn new things and to preserve one’s mental balance in unfamiliar situations. To keep up with the world of 2050, one will have to do more than merely invent new ideas and products; above all, people will reinvent themselves again and again (Harrari, 2018).

Critical thinking is a stronger predictor of real-world outcomes than intelligence (Butler et al., 2017).

The Level of Critical Thinking in Future Teachers Compared With the Previous Generation

Different people are born and raised in different conditions. William Strauss and Neil Howe, authors of several books on generational cycles in America, are also known for labelling the generation of people born between 1980 and 1995 as Generation Y, or Millennials (Horovitz, 2012). This generation of Millennials, which grew up with digital technologies and at a time when social media was being developed, is currently establishing itself on the job market. These are people who can be online 24 hours a day, 7 days a week. What has influenced this generation the most is technological progress. They have technologies in their genes and Generation Y completely identifies with the arrival of iPhones, laptops, and tablets (Buchtík, as cited in Koníčková, 2020). No other generation has been offered so many opportunities for good education, studying abroad, and travelling around the world. Perhaps this is why Generation Y is self-confident, ambitious, fluent in foreign languages, and focused on performance. They have high expectations from their employers. These people long for meaningful projects. When necessary, they don't even distinguish between working hours and leisure time. Members of Generation Y like working in a team, but require a team leader. Millennials are pragmatic and capable of multitasking, but they are less interested in politics and the environment than any generation before them. Generation Y does not have a problem working overtime, as long as it is properly rewarded. This generation is interested in perspective and growth. They ask more questions and don't immediately nod in approval when doing a job. Work is not everything for them, though; they work so that they can have fun. Their job expectations are sometimes unrealistic. They do not call on the telephone; they use various software applications for communication. They express a lifestyle through food. Given their unrestricted access

to information, they have a tendency to be assertive and hold strong opinions. They are not true to values and their flexibility is influenced by the speed of the internet (Skalická, 2018).

Generation Z, also known as the iGeneration and consisting of people born between 1996 and 2009, is currently studying at high schools and universities. The exact boundaries defining this generation are not yet set. According to demographers, it should be from the mid-1990s to the first years of the 21st century. What is significant for this generation is the extensive use of internet technologies. They begin with them from a very early age, and so members of Generation Z are identified with technology and interactions on online social networks, which represent a significant part of their social life. Their interests extend beyond family and state borders, to the world of technology and multitasking, without geographical limits. We have here an online generation that has never experienced a world without the internet, a world of continuous updates. They have excessively caring parents who make decisions for their children that should be left to them. Therefore, they feel the need, for example, to consult with their community on a social network about a job offer. They are more than saturated with brand names. They are focused on the whole world, visually engaged, transformed educationally, and absolutely defined socially. Generation Z moves rapidly and efficiently between work and play, with multiple distractions in the background, working on multiple tasks at once. It is estimated that the traditional path of higher education will not be of interest to them and they will instead complete school online, if at all. More than 70% of Generation Z want to be entrepreneurs (Skalická, 2018).

The end of the 1990s saw the appearance of the first mobile phones and simple “chat apps,” along with the use of email and the internet, which changed not only the educational environment but also the quality of life in all forms and areas. This means that by the time Generation Y entered the virtual world during their university study, Generation Z was being born into a world of excessive information.

Critical Thinking

Critical thinking intervenes into such problem areas as scientific thinking, formal and informal logic, probabilistic thinking, assessing the quality of information, generating and selecting alternatives and goals, and analyzing arguments, enabling adequate conclusions to be drawn (Ruisel, 2008). The literature dealing with critical thinking offers several definitions. The common denominator of different understandings of critical thinking is that it is a *skill*, an antipole of knowledge. This skill can arise and develop through practical activity. Critical thinking is therefore not innate. A person can develop it and use it spontaneously, when they are in life situations that compel them to deal with various issues. Critical thinking is the social construction of cognition. This statement is founded on the fact that critical thinking comes from constructivism, where the learner does not merely accept ready-made knowledge in meaningful learning. The knowledge acquired is the result of complex mental activity. The foundation is received information, but the student does not simply store it directly and mechanically in his or her memory. On the contrary; they transform the original information, reassesses it, relates it to their existing knowledge of the world, and uses it to construct their own interpretation of the world. With meaningful learning, what is presented to the student and what the student learns is never completely the same. The student brings their own view of phenomena to learning (Shuell, 1986). According to Schafritz et al. (1998, as cited in Gavora, 1995, p. 17) critical thinking is "a mental process that serves for obtaining and evaluating information and finding logical and objective conclusions". This definition implies three components of critical thinking. The first is the input and acquisition of information (searching, selecting, and sorting). This searching also necessitates the use of evaluation criteria. Therefore, this definition also contains the second component – evaluation, forming one's own opinion. The third component is the drawing of conclusions, which corresponds to the objective truth.

A four-component model of critical thinking and cognition (Ruisel, 2008) has come to the forefront of interest among experts. It includes

motivation for the demands made by critical thinking; knowledge of critical thinking skills; structural training to facilitate the transfer between contexts; and meta-cognitive monitoring. Critical thinking requires appropriate motivation for handling the demanding mental effort resulting from specific cognitive and affective activities. Antidogmatism, flexibility, a willingness to assess information objectively, and an understanding of the differences between rationalization and reasoning are assumed. These non-cognitive aspects of critical thinking presuppose the ability and motivation to assess an issue from manifold perspectives and to tolerate ambiguity and uncertainty. Strategies of critical thinking overlap with affective components. Cognitive and emotional processes operate in specific relationships. Instructions enabling the development of critical thinking place an emphasis on planning, suppressing impulsivity, and using situational and social contextual variables. Critical thinking skills, sometimes also called *higher order abilities*, differ from simpler abilities such as mechanical repetition or routine counting. They require appraisal, assessment, analysis, synthesis, and the search for associations.

Research Methodology

In the period 2019–2021, we carried out (and are still carrying out) research at the Pedagogical Faculty of Prešov University in Prešov, Slovakia aimed at examining the correlation between students' ability to think critically, to implement individualistic and differentiated teaching, and to reflect professionally on their own activities in continuous pedagogical practice. In this study, we present the results from the first phase of research, in which it was necessary to identify and analyze the level of critical thinking in 60 master's degree students in the field of teaching for primary education (testing) at the Pedagogical Faculty of Prešov University. We want to compare the data with the results of testing in 2003 among 60 students of the Pedagogy Department of the Faculty of Humanities and Natural Sciences at the University of Prešov, that is, over a time span of 17 years. The aim of this comparative study is to identify

whether an increase or decrease in the ability to think critically has occurred across the generations (a generational shift) in students of teaching. We set out the following research question: What is the level of critical thinking among future teachers compared to the previous generation?

Since the decade between Generation Y/Millennials and Generation Z/iGeneration caused diametrically different settings in their perceptions of the world, relationships, education, and the job market, our intent was to test whether these generational changes also extend to levels of critical thinking for university students (future teachers). We predicted that when tested in 2018, the level of critical thinking among the students would be higher than in 2003.

In order to determine the level of critical thinking ability, we used the Watson–Glaser Critical Thinking Appraisal Form C. The test consists of a series of five test exercises, each of which requires that analytical reasoning skills be applied to statements that represent a wide range of written and spoken materials that we often come across in everyday situations at work or study. The exercises contain the kind of information we commonly see in newspapers, magazines, or the media and include comments and statements that a person should not accept blindly, without critical assessment.

The first subtest (judgment) focuses on evaluating the validity of judgments based on a series of facts. The second subtest (recognition of assumptions) tests the identification of unspoken assumptions or assumptions from a series of statements. The aim of the third subtest (deduction) is to determine whether conclusions really do follow from the information contained in the given statements and premises. The fourth subtest (interpretation) is a test of the respondent's ability to consider facts and decide on the legitimacy of generalizations and conclusions derived from the given data. The fifth subtest (assessment of arguments) is focused on distinguishing between arguments which are strong and substantial with respect to a given problem and weak, insignificant arguments. These five subtests are intended to measure different but interrelated aspects of critical thinking. The test tasks require consideration of a series of statements (judgments, assumptions, conclusions, and arguments) related to

a given statement. The test subject's role is to study each statement and to evaluate the adequacy or validity of these statements.

The Critical Thinking Appraisal test (CTA) has been used frequently in the United Kingdom for many years now. Older American editions, which pioneered the detection of critical thinking, have been modified and adapted to the needs of selection procedures at several large companies and organizations. Thus, a suitable and verified form of the CTA Form C was created by the company Psychodidaktika a. s., Bratislava (2000).

Results

The level of critical thinking in the sample of respondents who studied general education teaching in 2003 at the Department of Pedagogy (n = 60; the 2003 respondents) was 2,714 points in the overall crude score on the Watson–Glaser test. On average, respondents achieved a total crude score of 45.23 points. The highest total crude score was 58 points out of 80 possible. The lowest score in the group was 24 points (Table 1).

Table 1. The level of critical thinking among university students studying teaching in 2003 (2nd and 3rd year)

Subtest	Highest score	Lowest score	Average score	Total points
Judgement (max. 16)	11	1	6.4	384
Recognition of assumptions (max. 16)	14	4	10.1	606
Deduction (max. 16)	13	4	8.56	514
Interpretation (max. 16)	13	0	9.72	583
Assessment of arguments (max. 16)	15	0	10.45	627
Total crude scores (max. 80)	58	24	45.23	2,714

The level of critical thinking in the sample of respondents who studied primary education teaching in 2018 (n = 60; the 2018 respondents) was 2,603 points in the overall crude score on the Watson–Glaser Test.

On average, the respondents achieved an overall crude score of 43.38 points. The highest total crude score was 57 points out of 80 possible; the lowest score was 30 points (Table 2).

Table 2. Level of critical thinking in university students studying primary education teaching in 2018 (4th year)

Subtest	Highest score	Lowest score	Average score	Total points
Judgement (max. 16)	11	0	6.28	377
Recognition of assumptions (max. 16)	14	4	9.92	595
Deduction (max. 16)	12	3	8.08	485
Interpretation (max. 16)	14	3	9.17	550
Assessment of arguments (max. 16)	15	0	9.92	595
Total crude scores (max. 80)	57	30	43.38	2,603

As Tables 1 and 2 show, the 2003 respondents achieved a higher level of critical thinking in terms of the overall crude score (2,714 points) than the 2018 respondents, in whom we recorded a lower level of critical thinking (by 111 points). These total crude scores in the study groups are a surprising finding, because we predicted that current students of teaching, for whom the world of information technology and excessive information is well-known, would have a higher ability to think critically than students 15 years ago. The results, however, suggest that the current generation of future teachers is worse in this regard.

When processing the results of the individual subtests, comparing the average values among the respondents, we arrived at some interesting findings. The 2003 respondents were the least capable in the first subtest, judgment, where they obtained 6.4 points out of a maximum of 16 (the maximum number of points in each subtest was 16). Here it was necessary to demonstrate whether they are able to come to a logical conclusion based on observed or assumed data and facts. They achieved the second-lowest average score – 8.56 points – in the third subtest, deduction, where it was necessary to judge the veracity of each of the conclusions in the test.

In the fourth subtest, interpretation, where it was necessary to assess whether or not the given conclusions are based drawn logically on the text provided (Conclusion follows or Conclusion does not follow), the 2003 respondents achieved an average of 9.72 points. In the recognition of assumptions (what we assume or consider to be true, guaranteed, and appropriate to a given situation; it is an opinion, a hypothesis, or an assumption), they achieved an average of 10.1 points. The 2003 respondents achieved their highest average score (10.45 points) in the assessment of arguments (the ability to judge the value of arguments and to distinguish which arguments are strong or weak with respect to the given problem).

The 2018 respondents, that is, students who graduated from university in July 2020 and entered into teaching practice, achieved on average the lowest number of points in the judgment subtest (6.28 points). However, their score was 0.12 points lower than that of the 2003 respondents. The nominal values indicate that university students have not improved in making judgements. Over a period of 15 years, the ability of university students to make deductions did not improve, which we consider to be a surprising finding. We therefore state that in both of the monitored groups the biggest problem for university students is coming to a logical conclusion based on data and facts.

In the 2018 respondents, we recorded the second-lowest value in the subtest deduction (8.08 points), which was 0.48 points lower than that of the 2003 respondents. On the ability to interpret, that is, to assess whether or not the given conclusions are drawn logically on the information given in the text, the respondents achieved on average 9.17 points, which was 0.55 points lower than the 2003 respondents. The 2018 respondents achieved their highest number of points (9.92) in both the recognition of assumptions and the assessment of arguments subtests. Both nominal values, however, were lower than those of the 2003 respondents: by 0.18 points in the recognition of assumptions and by 0.53 points in the assessment of arguments.

In Table 3 we present a comparison of the average values on the individual subtests in the groups of respondents as well as their respective order or placement from highest to lowest average number of points in the subtest.

Table 3. Comparison of points obtained in individual subtests and their order in the groups of respondents

Subtest		Judgement	Recognition of assumptions	Deduction	Interpretation	Assessment of arguments
Respondents (2003)	order	5*	2	4	3	1*
	points	6.4	10.1	8.56	9.72	10.45
Respondents (2018)	order	4	1	3	2	1*
	points	6.28	9.92	8.08	9.17	9.92

1* – first place, most points; 5* – last place, fewest points

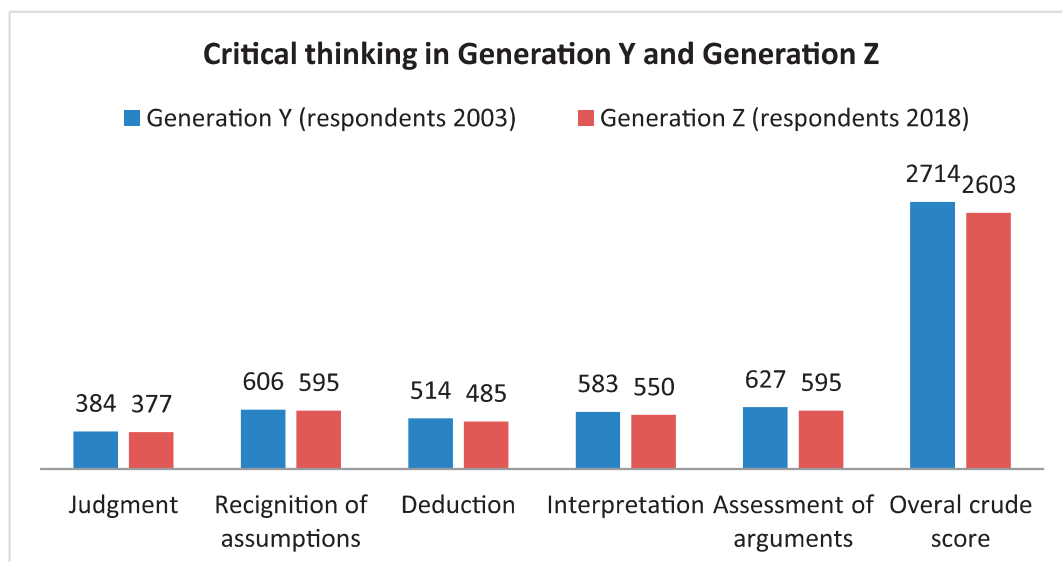
The ability to assess arguments came first (10.45 points) among the 2003 respondents. This was the same for the 2018 respondents, but the former had a higher average score. The ability to recognize assumptions was also in first place among the 2018 respondents, with the same number of points (9.92). The recognition of assumptions ranked in second place among the 2003 respondents (10.1 points), while the ability to interpret was second among the 2018 respondents. Third place for the 2003 respondents was occupied by the ability to interpret (9.72), while the 2018 respondents finished third in deduction. Deduction was in fourth place among the 2003 respondents, with 8.56 points, while judgment was fourth among the 2018 respondents, with 6.28 points. Finally, the fifth and final place among the 2003 respondents was the held by the ability to make correct judgments, with 6.4 points.

Both groups of respondents achieved the most points in the assessment of arguments and the fewest points in making judgments. If we compare the monitored groups in the scores achieved on the individual subtests, that is, based on the data in Table 3, they indicate that the 2003 respondents achieved a relatively higher point score in all of the subtests (argument assessment, assumption recognition, interpretation, and deduction).

Discussion

The fact that students of teaching achieved a higher level on a critical thinking test 17 years ago in comparison with current students is alarming. The modern age, in which it is very easy to access information because it is ubiquitous and available, is no guarantee that students will be able to work with information, verify it, or attribute value to it. The assumption that we made – that the level of critical thinking among students of teaching would be higher in 2018 than in 2003 – was not confirmed. The ability to think critically, according to the overall crude score of the Watson–Glaser Test for the 2018 respondents (Generation Z/iGeneration) was 111 points lower than that of the 2003 respondents (Generation Y/Millennials) (Figure 1).

Figure 1. Comparison of the average values of the total crude score and the five subtests of the Watson–Glaser critical thinking test



When interpreting the test scores for the individual subtests and comparing them between the groups of respondents (Figure 1), we emphasized that the ability to think critically can be taught to a certain extent and that this has long been a desirable goal in the educational process. Several experimental studies carried out at elementary and secondary

schools and universities demonstrate that critical thinking skills can be improved through targeted training. The data in Figure 1, however, suggest that when we compare two generations of students of teaching who studied at the same university 15 years apart, the level of critical thinking has remained relatively the same, if not fallen. We could look for the causes of this unflattering result at all levels of education. The results indicate that Generation Y/Millennials, that is, students who studied at the university in 2003, have in five higher aspects of critical thinking a relatively higher average score than Generation Z/iGeneration, who completed their studies at the Faculty of Education in June 2020 (they were tested in 2018). This means that university students who were preparing for the teaching profession 17 years ago scored better than students today in this regard.

The iGeneration, in comparison with the Millennials, did not score higher on a single subtest. In judgment, the iGeneration (current students of teaching) received a total subtest score of 377 points, while Millennials scored 7 points more on average (384 points). We can also consider this invariable, that is, that the nominal values in this subtest are almost the same, which means that students have neither improved nor deteriorated in the 15 years in regard to their ability to draw logical conclusions based on observed, assumed, and derived facts. The stagnation is evident. The fact is that this ability creates a problem for students, because in both groups of respondents the average score on the judgement subtest was the lowest of all subtests.

In the subtest for assumption recognition, the difference between the groups of students was 11 points in favor of the Millennials, who scored 606 points, while the students of Generation Z totaled 595 points. In the subtest for deduction, the point difference between the groups of respondents was 29 points, again in favor of the Millennials, who scored an average of 514 points versus the iGeneration's 485 points.

The greatest differences in the average score of subtests between the groups of respondents were seen in the subtests for assessment of arguments (32 points difference) and interpretation (33 points difference), again in favor of the Millennial generation.

The ability to assess arguments means evaluating whether or not conclusions are drawn logically on the information provided in a given text. The finding that current students of teaching are worse than their peers from 15 years ago in this regard is alarming. In the age of social networks, hypertext media, and the internet, it is essential that future teachers have the ability to argue on the basis of facts and data and to distinguish between opinion, thought, and fact-based information. Closely related to this is the ability to interpret, that is, the ability to distinguish strong arguments from weak ones in regard to the problem being solved.

Conclusion

Critical thinking for 21st-century teachers is a necessary skill that they should have and develop over their lifetimes. We support this statement with the pedagogical premise of “from oneself to others.” If a teacher does not think critically, it is likely that they will not be able to develop this same ability in their students either. In the study, we tested future teachers – students of teaching at the university – in order to determine whether over the course of 17 years critical thinking has improved, or has seen an increase in the overall crude score on the Watson–Glaser Critical Thinking Appraisal test. We compared the resulting values for the total crude critical thinking score and the individual attributes of critical thinking as tested through five subtests (judgment, recognition of assumptions, deduction, interpretation, and assessment of arguments) between two groups of respondents. The first group was made up of 60 students from the Department of Pedagogy at the Faculty of Humanities and Natural Sciences of the University of Prešov, Slovakia who were tested in 2003 and represented Generation Y/Millennials. The second group of respondents consisted of 60 students of primary education teaching at the Faculty of Education of the University of Prešov, who were tested in 2018 and represented Generation Z/iGeneration.

On the basis of the results, we can state that the ability of students to think critically has not increased between the generations. On the

contrary, the data suggest that critical thinking among students of teaching is stagnating. We did not record any differences in the overall crude score or in the values of the individual subtests that would indicate that current students are better than students 15 years ago. The average scores in overall crude critical thinking and in the five subtests in Generation Z were in fact lower relative to Generation Y.

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