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Assessing Critical Thinking and Achievement in Foreign Language Learning at the University Level²

Abstract: The aim of this study is to examine the correlation between the critical thinking skills and the success rate of the English language acquisition modelled on similar research conducted in other academic settings. This paper presents an overview of previous research and conclusions on the role of critical thinking in education. The results of the quantitative study confirmed that there was a strong correlation between students' critical thinking skills and their abilities to learn foreign languages, and that better critical thinkers were far more successful in learning foreign languages. The correlation between the success rates of English language learning and the critical thinking test section devoted to deductive reasoning proved particularly significant. Further research should be done to determine the nature of this relationship as accurately as possible so that its practical application in the teaching process is of greater importance.

Key words: critical thinking, Cornell Critical Thinking Test, English language learning.

Introduction

In today's globalized world, students are faced with ever-greater demands with the aim of being as competitive participants in the labour market as possible upon finishing their studies. In addition to foreign languages and computer literacy, one of the essential demands is the skill of critical thinking. The research subject of this paper is the relationship between critical thinking skills and the success rate of the English language acquisition. This connection has been seemingly insufficiently researched in the Republic of Serbia and the Western Balkans. The phenomenon of critical thinking and its influence on learning foreign languages

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is presented in detail in this study. An overview is given of earlier research and conclusions on the topic of the role of critical thinking in education in general, and especially in teaching foreign languages.

For the purposes of this scientific research, the Cornell Critical Thinking Test (CCTT), Level X, is used as a tool for measuring the critical thinking of the students that participated in the research. This is a standardized test created by Ennis, Millman, and Tomko in 1985, and is based on the conceptual definition stating that “critical thinking is the process of reasonably deciding what to do and believe” (Rashid & Hashim, 2008, p. 375). This test has been employed around the world over the past several decades when determining candidates for master’s degree studies, as well as for job hiring (Ennis, Millman & Tomko, 2005). In order for the results to be credible, the author translated the test into Serbian, and adapted it to the local culture for the purpose of this research. Student performance in learning English is quantitatively expressed using grades from the subject of English (data provided by the IT system of Singidunum University in Belgrade). Descriptive statistics is used in order to analyse the relationship between variables.

Critical Thinking

In order to adequately analyse the student responses obtained through the Cornell Critical Thinking Test, a basic inspection must be made of the theoretical conceptualization of critical thinking. It is essential to understand the nature of this concept, its components and functions, and the potential implications of the process of advancing critical thinking through a variety of teaching activities, which is one of this research goals.

Nowadays, rarely do disputes arise over the use of developing critical thinking as one of the key goals of education, particularly at the tertiary level, in both developed countries as well as countries in development. In most countries, students must attend a critical thinking course prior to graduation, “while many textbooks which are primarily written using the problem-solving and dialogue-based learning methods, contain a special section of the didactic apparatus dedicated to fostering critical thinking” (Pešić, 2003, p. 415). Regardless, student results on tests that measure this skill are not satisfactory, not even in countries such as the U.S., where exceptional attention is dedicated to the development of this skill. Pešić rightly asks whether the problem lies in the insufficient quality of practical programs for the development of this skill, or in the fact that the very concept of critical thinking remains unclear and poorly defined. According to

Paul (as cited in Pešić, 2003, p. 416), “the key questions related to critical thinking are not satisfyingly articulated in either the theoretical level or, consequently, in the design of practical programs”.

There is no one definition of the term ‘critical thinking’, primarily because of its nature and the very complex relationships it has with intelligence, studying, personal characteristics, academic performance, etc. Some authors believe critical thinking to be a dominantly cognitive skill (Merriam & Caffarella, 1999). On the other hand, others believe critical thinking, although indeed the thought process of a higher order in which cognitive aspects doubtlessly come first, includes non-cognitive elements, such as opinions, feelings, values, fears, suspicions, and oppositions (Kvaščev, 1969; Norris 1985). Critical thinking is treated “as a key component of studying in traditional psychology, while in contemporary theories of learning among adults it is identified as transformative learning, that is, the process of transforming perspectives, as the most significant and deepest form of learning” (Orlović Lovren, Despotović & Bulajić, 2016, p. 47). Halpern defines critical thinking as the use of cognitive skills or strategies that increase the probability of the desired outcome. This way of thinking is “purposeful, reasoned, goal-driven and assumes problem-solving, formulating conclusions, assessing probabilities and making decisions, whereby valid and efficient skills are used for specific contexts and types of thinking tasks” (Halpern, 1998, p. 450). Brookfield describes critical thinking as “the process we use to uncover and check our assumptions” (Brookfield, 2007, p. 11). According to this author, critical thinking includes three interconnected levels. The first one is discovering the assumptions that guide our decisions, actions and choices. The second one is checking the accuracy of these assumptions by exploring as many different perspectives, viewpoints and sources as possible. The third one refers to “taking informed decisions that are based on these researched assumptions” (Brookfield, 2007, p. 11). Among constructivist developmental theories, critical thinking has deep ties to cognitive development, and is treated as its culmination. Ennis states that the main constituents of critical thinking are the skills of analysing and interpreting information, carrying out logically sound and acceptable conclusions, and assessing the validity and strength of arguments — evaluation (Ennis et al., 2005).

Although the development and transfer of the critical thinking skill has long been recognized as one of the primary goals of education, there is very little empirical evidence which could help teachers when deciding which teaching methods and techniques positively affect the development of said skill (Marin & Halpern, 2011). There are no strategies that will definitively lead to the development of the critical thinking skill, nor those that will never achieve this goal. Published research often mentions specific methods, procedures, and principles

that incentivize critical thinking skills. Those include academic writing, combined with the methods of groupwork and cognitive mapping (Parameswaram, 2007; Orlović Lovren et al., 2016), case studies, reflection on critical moments in the teaching process, urging open communication within the group, creative discussions in terms of re-evaluating one's own stances and beliefs, debates on real world problems and situations which, in this way, become a part of the teaching process, and others. The development of this skill leads to the mutual respect during classes, which facilitates the exchange of opinions, lessens tensions, and alleviates potential resistance towards the novelty, whether that be the content or the teaching method.

The availability of an enormous amount of information via the Internet has given importance to the development of critical thinking skills. Data must be selected, its importance assessed, and then applied at the given moment, learned, and evaluated as a source of information. If the development of critical thinking is not incentivized, we will find ourselves in a situation in which we are "...in danger of having all of the answers but still not knowing what the answers mean" (Halpern, 1998, p. 450). Within this context, critical thinking could be defined as a critical relationship towards information.

Cornell Critical Thinking Test

Critical thinking tests, also known as critical reasoning tests, are tests often used in graduate, professional and managerial recruitment. These tests evaluate person's capacity to logically analyse assumptions, arguments, deductions and inferences. According to AssessmentDay, the most popular critical thinking tests present on the market today, which candidates may encounter for recruitment, selection or development are: Watson Glaser Critical Thinking Appraisal (W-GCTA), SHL Critical Reasoning Test Battery, Cornell Critical Thinking Assessment, Cappfinity Critical Reasoning Test and Test Partnership Concepts Critical Thinking Test (<https://www.assessmentday.co.uk/>). W-GCTA is one of the most widely-used critical thinking tests on the market and it is seen as a successful tool to predict job success, as well as being used to select good managers and finding possible future leaders. It is also used in order to select the right person for a specific job role, especially for careers in the law (Watson Glaser Critical Thinking Appraisal, n.d.). According to The Critical Thinking Co.[™], the Cornell Critical Thinking Assessment is a test primarily used in educational settings with the aim of developing clear picture of students' critical thinking abilities (<https://www.criticalthinking.com/>). Due to the fact that CCTTs have been used in curriculum

and teaching experiments for appraisal of the critical thinking ability of a group, I decided to use this particular test in my research.

The results students obtain on this test should provide a clear picture of their critical thinking skills. Test X and Test Z exist: both are used to advance students' critical thinking skills, within the framework of courses that promote critical thinking, as well as a part of the entrance exams for master's studies programs, and upon hiring. Furthermore, the tests are a part of the required curricula in many high schools in North America. The creator of these tests is Robert H. Ennis, professor at Cornell University and the University of Illinois. Professor Ennis has, upon conceiving the test, and by his own admission, relied on Smith's definition of critical thinking (as cited in Ennis et al., 2005, p. 5): "Now if we set about to find out ... [a] statement means and to determine whether to accept or reject it, we would be engaged in thinking which, for lack of a better term, we shall call critical thinking". As we can conclude, according to Smith, the concept of critical thinking is not a concept of approval. The definition of critical thinking formulated by Ennis, and which this study author relies on is the following: "Critical thinking is reasonable and reflective thinking focused on deciding what to believe or do" (Ennis et al., 2005, p. 5). There is a great deal of division of critical thinking skills according to category, while the one the author opted for in this paper is Ennis' on inductive reasoning, deductive reasoning, and assessing the credibility of information/sources. The authors of CCTT particularly highlight the fact that noncognitive elements, such as opinions, feelings, and values, are not included in the test as well as that, with the aim of obtaining the most correct and fair results, personal characteristics and reasoning on the basis of political, economic, and social values, that is, the test-takers beliefs, cannot influence the test's final result.

"That set of emotional and motivational characteristics, to which some authors further add behavioural habits (intellectual integrity, a sense of justice, distrust of others' opinions, refraining from judging too quickly, taking precautions when interpreting facts, willingness to publicly declare stances, tolerance towards varying opinions, and others) is frequently referred to as critical stance or critical spirit" (Siegel, 1988, as cited in Orlović Lovren et al., 2016, p. 47), and is not included in the Cornell Critical Thinking Test.

The translated and culturally adapted test is made up of 49 questions. The first 23 questions in the test which was distributed to the students for the purpose of this research test their inductive reasoning skills, the second 15 questions test the reliability and credibility of information/sources, while the final 11 questions test deductive reasoning skills. It must be noted that, although there is a clear division of questions, that is, the test itself, into three parts, in relation to the aspect

that is being graded, much overlap and interconnectedness exist among these aspects in the actual process of critical thinking. Generally, the publishers of these tests recommend Test X be used when testing high schoolers, with Test Z to be used when testing adults, as well as exceptionally talented students. The author of this research opted for the so-called easier test, solely because the students participating in the aforementioned research had never faced this type of testing before, nor had they attended courses aimed at developing critical thinking in the past. The reliability coefficient of Test X ranges from 67 to 90% (Ennis et al., 1985).

Cornell Critical Thinking Test, Level X – Significant Correlation with Other Variables

Ennis states that there is no significant correlation between critical thinking and the gender of his participants based on 14 realized studies (Ennis et al., 2005). Based on 23 published studies that Ennis cites, there is a significant correlation between the range of vocabulary that the individual actively uses and the critical thinking skills whose coefficient reaches up to 51% (Ennis et al., 2005). Within the context of significance, the coefficient correlation between reading skills and critical thinking must be mentioned, reaching a high 49%, while the lowest correlation testing knowledge of punctuation, the use of capital letters, and types of sentences within critical thinking skills reaches a mere 28% (Ennis et al., 2005).

Intelligence is undoubtedly a determining factor for critical thinking, that is, its component, yet critical thinking and intelligence cannot be treated as equals. Intelligence tests do not measure critical thinking skills. Deeper consideration of the relation between intelligence and critical thinking demonstrates that critical thinking could be defined as intelligence enriched by knowledge and experience (Despotović, 1997).

Few studies dealing with the relationship between socio-economic factors and critical thinking skills exist. The three that Ennis had insight into do not demonstrate a significant correlation factor between the aforementioned variables (Ennis et al., 2005).

On the other hand, researchers have demonstrated far greater interest in the relation between personal characteristics and critical thinking skills. The greatest correlation exists between independence, in the broadest sense of the term, and critical thinking. Several studies have shown, though not very significant, but still an existing correlation between a positive relation towards the educational institution and critical thinking. Extensive studies carried out by Isabel Myers Briggs on 668 subjects demonstrated that “a significant difference exists in

terms of intuitiveness — rational reasoning in favour of intuition” (Isabel Myers Briggs, as cited in Ennis et al., 2005, p. 27). Myers Briggs reaches the impressive conclusion that students who rely more heavily on intuition tend to be superior critical thinkers compared with those who rely on reason. To date, four Cornell Critical Thinking Tests, Level X, have been published (Follman, Hernandez & Miller, 1969; Follman, Miller & Hernandez, 1969; Landis & Michael, 1981; Michael, Devancy & Michael, 1980). Follman, Miller, and Hernandez observe parts of test X as separate units for analysis, while analysing other critical thinking tests, such as the Watson Glaser Critical Thinking Appraisal Test, and reach the conclusion that parts of the CCTT function as a whole, as is the case with five separate parts of the Watson Glaser test.

Due to the complexity of the relationship between critical thinking and intelligence, personal characteristics, age, studies, and gender, there is still no consensus on the definition of critical thinking. Disagreements normally arise and prevail because of the origin and character of critical thinking which lead to its entirely different conceptualization (Orlović Lovren et al., 2016).

Overview of Previous Research on the Relationship Between Critical Thinking and Success in Foreign Language Learning

Nearly all research into the phenomenon of the relationship between critical thinking and success in foreign language learning is based on the conviction that these two parameters are essential to the success of future graduates when seeking jobs, as well as being crucial to success in professional careers, regardless of occupation. Most researchers (Zhang & Kim, 2018; Rashid & Hashim, 2008; Keihaniyan, 2013; Hosseini et al., 2012; Ishikawa, 2017; Elder & Paul, 2004) focus on the broad perspective, that is, the claim that successful individuals, those who speak foreign languages and who are capable of critically considering the social, economic, and political phenomena that surround them, are of critical importance for society as a whole to progress.

It appears that the spark that lit researchers' interest into the field of critical thinking is the same as the world's greatest companies spark, primarily those of Europe and North America, who seek an educated workforce, which is lacking on the market worldwide. They simultaneously express distrust in educational systems and their capacity to prepare future graduates for the skills needed in the labour market in the globalized world. This critique primarily refers to “countries in development, which attempted to replace these faults in their school systems and, as such, to become more competitive in the job market, struggling to attract

the attention of foreign investors” — something which is all too familiar in our own country (Rashid & Hashim, 2008, p. 373).

Research carried out by university professors from Malaysia, Rashid and Hashim, on a sample of 280 university students demonstrated that there was positive correlation between critical thinking and success in mastering the English language (Rashid & Hashim, 2008). The tools used in the research included the Cornell Critical Thinking Level X Test, as well as two national tests that assessed the level of language proficiency. One of the conclusions was that Malaysian students did worse on the critical thinking test when compared with their peers in the U.S. The reasons for these results included the students’ habit in the Malaysian schools to learn materials by heart, rote learning without thinking about what they are listening to, in a system in which *ex-cathedra* continues to dominate as the most popular teaching method (Rashid & Hashim, 2008). The valuable contribution that language proficiency may make to the undergraduates’ critical thinking ability is further reinforced by the results produced through the one-way analysis of variance (ANOVA) procedure which showed that students of the highest English proficiency level also obtained high scores on the CCTT (Rashid & Hashim, 2008).

A similar study carried out at a university in Iran based on a sample of 100 university students achieved nearly identical results to the aforementioned study in Malaysia (Keihaniyan, 2013). The same tools were used in this research, the Cornell Critical Thinking Test, level X, and a national test to establish English language proficiency. Once again, the students obtained poorer results on critical thinking tests when compared with their American peers, while the authors cited the same reasons as to why, and suggested changes to those of their colleagues in Malaysia for the Iranian educational system. Likewise, the study confirmed a positive correlation between critical thinking skills and foreign language acquisition, while the correlation coefficient was highest amongst those students who demonstrated a high degree of knowledge of the English language; without exception, they were the ones who obtained high results on the critical thinking test as well (Keihaniyan, 2013). The average success rate of the students in Malaysia who took the aforementioned test comes out to 38.17%, while for those in Iran it is 30.17%. On the other hand, the average success rate of their American counterparts on the Cornell Critical Thinking Test came out to 52.2%. The average success rate of the students on the aforementioned test within the framework of the research this author carried out at Singidunum University in Belgrade came out to 62.7%. It should be emphasized that the aforementioned average results are of the second-year undergraduate studies students in the U.S., while the participants in Serbia were third- and fourth-year undergraduate studies students,

as the age difference as well as educational and knowledge level, could be an important factor in explaining the higher results among students in Serbia. On the other hand, as already mentioned earlier, this was the first time Singidunum University students had faced CCTT test-taking, and had not had any experience developing their critical thinking skills over the course of their schooling, unlike students in the United States, where a great deal of attention is paid to the development of this skill when putting curricula together.

Research carried out with the same goal, that is, establishing the connection between critical thinking and success in mastering languages, at Kobe University in Japan in which 74 students participated demonstrated a clearly positive correlation between listening skills and critical thinking, while the correlation did not prove significant among other language skills (Ishikawa, 2017). After the aforementioned and similar studies, the authors unequivocally recommended the concept of critical thinking to be introduced into the teaching curriculum and study program for English as a Second Language at the tertiary level of education in Japan. They suggested that other important characteristics, including creativity, cooperation, and communication skills, can be developed alongside critical thinking skills, and that foreign language classes are the most appropriate for the application of such methods.

It is important to mention a very interesting study, in which 89 first year students at the School of Educational Sciences at South African University participated, which was carried out with the same aim as the aforementioned studies. At the very beginning of the research, the question is postulated as to whether students in South Africa are even exposed to the teaching methods that would spur their problem-solving skills, as well as those of critically analysing information, efficient use of modern technology, and making decisions while relying on creative and critical thinking (Grosser & Nel, 2013). The group of students was very heterogenous, with pronounced differences in gender, socio-economic status, mother tongue (English, Afrikaans and African languages), and types of high school education. The degree of language ability is numerically presented upon processing the national language recognition test, while the critical thinking skills were measured using the Watson Glasser Critical Appraisal Test. The obtained results showed that “the overall achievement of all the students was poor” (Grosser & Nel, 2013, p. 9). In addition, significant correlations between academic language proficiency and critical thinking as a general competency, were noted. The average performance of a student on the aforementioned critical thinking test came out to 34.19%. Grosser and Nel agree with the authors of similar studies (Elder & Paul, 2004; Lun, Fischer & Ward, 2010), who state that the average first-year university student in South Africa does not understand what they read

in English. “It is well-known that the majority of learners in South Africa are English second language learners and that this negatively influences their academic achievements” (Grosser & Nel, 2013, p. 5).

On the other hand, the authors agree that excellent knowledge of the language is a crucial factor which makes a difference in the results of critical thinking tests. The authors pointed out the fact that significant differences among participants regarding their home language and different teaching and learning backgrounds in particular, may influence the results. In addition, “in the absence of a local norm group, the authors decided not to compare the results of the participants to other international norm groups” (Grosser & Nel, 2013, p. 5). The authors believe “more meaningful results will be obtained if a norm group for South African pre-service teachers existed against which the present results could have been compared” (Grosser & Nel, 2013, p. 12). They also acknowledge that the validity of the WGCTA could be enhanced with a test instrument constructed for South African conditions. In particular, the critical thinking abilities of the Afrikaans-speaking students need to be determined with texts in their home language. A clearer distinction has to be made between English home language speakers and English first or second language speakers to obtain a more reliable picture on the link between critical thinking and language abilities (Grosser & Nel, 2013).

A particular challenge was placed before foreign language teachers, who had the most difficult task — to influence the moulding of individuals capable of critically considering the world around them, the constant changes that take place, and to influence their flow. The requirement and challenge placed on foreign language educators, particularly English language teachers (given their status), to further educate themselves when dealing with methods for developing critical thinking skills in foreign language classes is the subject of numerous studies (Ketabi, Zabihi & Ghadiri, 2012; Mok, 2010; Murcia, 2012; Marin & de la Pava, 2017).

The author of this paper believes it is important to compare the results of the participants of this research with those of similar research carried out in the U.S.A. (Ennis et al., 2005). The first such study encompassed 50 first-year liberal arts college students from the north-eastern region of the U.S. The average result from the Cornell Critical Thinking Test, level X, as a whole came out to 61.05%. The second study included 634 first-year liberal arts students from a small state university in upstate New York. This group’s average result came out to 61.45% (Ennis et al., 2005). This group was especially interesting in that the researchers decided that the participants be re-tested upon having completed a one-semester course called “Analytical Thinking.” However, the results on the repeated test were almost the same, in that the average result ended up being only slightly higher, at 61.71%. The third test, in which 20 teachers in the outskirts

of Chicago participated, was particularly interesting. The testing took place after the completion of one-semester course called “Critical Thinking.” The average result of this group was the highest, at 73.03%, which may be explained by the age (and maturity) of the students, but also thanks to the course which they had the opportunity to attend prior to taking the test itself (Ennis et al., 2005). The fourth study included 187 first year education students at a Pacific coast state university. Their average result on the test was 68.68% (Ennis et al., 2005). The participants of this study, 3rd and 4th year students at Singidunum University studying IT, obtained an average result of 62.7% on the Cornell Critical Thinking Test as a whole.

Research Methodology

Research hypotheses

Upon finalization of research, the author expects the proposed hypotheses to confirm:

- Based on the available research carried out in other academic environments (Rashid & Hashim, 2008; Rezaei, Derakhshan & Bagherkazemi, 2011; Ishikawa, 2017; Elder & Paul, 2004; Gao, 2013), the hypothesis is that there is a strong relation between critical thinking skills of students and their success at learning foreign languages.
- It is hypothesized that those students who possess critical thinking skills are more successful at learning foreign languages.

Sample

The research was carried out on a sample of the student population of undergraduate studies from Singidunum University in Belgrade. Singidunum University is a private university in Serbia with the highest number of students in the Republic of Serbia (Gajić, 2020). Some of them are former students of public universities, thereby constituting a unique combination of students of both public and private universities. It is important to mention that students from Singidunum University hail from all Serbian cities, not only Belgrade, as well as from regional countries, particularly from Bosnia and Herzegovina, and Montenegro. The author believes that the sample is generalizable to a wider student population and can, as such, be considered relevant.

For the purposes of carrying out the Cornell Critical Thinking Test, a total of 50 selected respondents were included, out of which 30 were male and 20 were female. The majority of the respondents belong to the Faculty of Informatics and Computing — 42 in total — followed by 6 representing the Faculty of Electrical Engineering and Computing, and finally the Faculty of Engineering Management, with 2. Students from these three faculties belonging to Singidunum University all attended both courses, English 3, that is, English 4, as required subjects. These students followed the C1 Complete Advanced coursebook, published by the Cambridge University Press, which at the same time prepared students to take the internationally recognized CAE certificate.

Procedure

The research took place in one of the classrooms at Singidunum University in Belgrade. All of the participants were told that their results would be highly valued while their identities would not be disclosed to anyone except the researcher. They confirmed that they understood their role in the research. Before carrying out the test, the students were informed about the way they were to approach its various parts. While taking the first two parts of the test, the questions had to be answered in the order in which they were set up. Once a question was answered and the student continued to the next, they were no longer allowed to return to any earlier questions. The third part of the test is not limited in such capacity. The author read the instructions for each part of the test and analysed several examples of questions giving the correct responses in order to ensure that all participants understood exactly what was expected of them. Particular attention was given to the questions that needed to be responded to as if all given information were true, and to never debate the validity of the information itself. Finally, when the author determined that there were no further ambiguities, and that all general conditions requested by the author of the test were fulfilled, the participants were allowed to start taking the test.

Research Results and Discussion

The results obtained by carrying out the Cornell Critical Thinking Test, level X, were processed quantitatively through descriptive statistics. The test was statistically processed in its whole, after which each of the three parts of the test was processed individually.

Through correlational analysis or, to be more precise, simple linear regression, the author aimed to examine whether a correlation existed between the dependent and independent variables, in this case, grades from the English language course, and the results obtained by carrying out the critical thinking test. If it did exist, the goal was to discover how significant it was, or rather, in what way the critical thinking skill affected the outcome of grades from English course. The analysis demonstrated that there was a correlation between the two aforementioned variables, as well as the existence of an agreement measure between the dependent variable-grades from English class-and each of the three individual parts of the critical thinking test. It was demonstrated that the regression coefficients were at a significance level of 5%, and that the model itself was valid. It is particularly important to emphasize that the first part of the test, that of inductive reasoning, can explain about 10% of the English language grade (table 1), that the second part of the test, that of observation skills and credibility of information/source, is practically the same, at somewhat over 10% (table 2) while the third part, that of deductive reasoning, can explain the grade by up to 30% (table 3).

Table 1. Regression Statistics — Inductive Reasoning

Multiple <i>R</i>	<i>R</i> Square	Adj <i>R</i> Square	<i>F</i>	<i>p</i> -value	<i>B</i>	<i>SE</i>	β	<i>t</i>	<i>p</i>
0,313593	0,098341	0,079556	5,24	0,026	0,027	0,0119	0,00205	2,28	0,026

Table 2. Regression Statistics — Observation skills and credibility of information/source

Multiple <i>R</i>	<i>R</i> Square	Adj <i>R</i> Square	<i>F</i>	<i>p</i> -value	<i>B</i>	<i>SE</i>	β	<i>t</i>	<i>p</i>
0,313655	0,098379	0,079596	5,23	0,026	0,0265	0,01158	0,001958	2,28	0,026

Table 3. Regression statistics — Deductive reasoning

Multiple <i>R</i>	<i>R</i> Square	Adj <i>R</i> Square	<i>F</i>	<i>p</i> -value	<i>B</i>	<i>SE</i>	β	<i>t</i>	<i>p</i>
0,55582	0,308936	0,294539	21,45	0,00002	0,028	0,00621	0,00111	4,63	0,00002

Considering how many different factors can explain grade formation in higher education, particularly upon the introduction of the Bologna Declaration, including midterms, active participation in classes, additional assignments through semester projects, and others, the author finds this percentage very high, and thus believes particular attention should be paid to deductive reasoning upon analysis.

Table 4 demonstrates the statistically processed data gathered by analysing the results the students obtained on the CCTT. The results are expressed in percentages. The average performance of the students on the aforementioned test comes out to 62.7%. The mode is 60%. The standard deviation in this case

comes out to around 11%. The minimal result obtained on this test is 44%, while the maximal is 94%, on a sample of 50 students.

Table 4. Student Performance on the Cornell Critical Thinking Test as a Whole

<i>M</i>	<i>SEM</i>	Med.	Mode	<i>SD</i>	Sample Variance	Kurt.	Skew.	Range	Min	Max	Σ	<i>N</i>
62.7	1.58	62	60	11	125.2	-0.23	0.18	50	44	94	3133	50

Table 5 demonstrates the statistical measures obtained through analysing the results of the students on the first part of the critical thinking test, which assesses inductive reasoning skills. The average performance of the students in the aforementioned part of the test comes out to 62.14%, which differs very little from the average success on the test when viewed as a whole.

Table 5. Student Success on the First Part of the Test — Inductive Reasoning

<i>M</i>	<i>SEM</i>	Med.	Mode	<i>SD</i>	Sample Variance	Kurt.	Skew.	Range	Min	Max	Σ	<i>N</i>
62.14	1.86	65	69	13	172.4	0.21	-0.52	65	26	91	3107	50

Table 6 shows the statistically processed data obtained through analysing the results of students in the second part of the critical thinking test, which assesses observation skills and assessment of information/sources credibility. The average success of the students in the aforementioned part of the test comes out to 57.22%. The value is smaller when compared with the first part (inductive reasoning), as well as when observing the test as a whole.

Table 6. Student Performance on the Second Part of the Test — Observation Skills

<i>M</i>	<i>SEM</i>	Med.	Mode	<i>SD</i>	Sample Variance	Kurt.	Skew.	Range	Min	Max	Σ	<i>N</i>
57.22	1.92	60	46	13	184.9	-0.27	0.14	60	33	93	2861	50

Table 7 shows the statistically processed data obtained from analysing the results of the students in the third part of CCTT, which assesses deductive reasoning skills. The average performance of the students on the aforementioned part of the test comes out to 69.88%. The value is higher compared to the test when observed as a whole (62.7%), as well as when compared with the first part (62.14%), while it is palpably higher than the second part (57.22%). The most frequent result so far is 80%, by far the highest in comparison with the previously tested parts and the test as a whole, while the standard deviation is around 22.2%. Minimal performance on the third part of the test is 20%, and maximal

100%. These results are very interesting if we recall that a female student obtained both the best and the worst result on this part of the test.

Table 7. Student Performance on the Third Part of the Test — Deductive Reasoning

<i>M</i>	<i>SEM</i>	Med.	Mode	<i>SD</i>	Sample Variance	Kurt.	Skew.	Range	Min	Max	Σ	<i>N</i>
69.88	3.14	75	80	22	492.9	-0.59	-0.47	80	20	100	3494	50

The author wished to examine whether the students who had the greatest mastery of the English language (with a quantitative result of grade 10) were also the best critical thinkers (quantitatively expressed with the results from the aforementioned test and percentages). Table 8 confirms that there was a significant difference even between students with a grade of 10 and those with a grade of 9. Students with the highest grade in English realized an average result on CCTT of 77.43%, while students with a grade of 9 realized a significantly lower result, that of 63.46%. This difference is even greater if we analyse and compare the average results of the tests of students with grades of 8, 7, or 6 (Table 9). The result of students with a grade of 8 was 60.21%, while students with a grade of 7 or 6 came out to 57.69%. It is very interesting to observe that the results of students with grades 8, 7, and 6 do not differ much from one another. On the other hand, the difference is drastically noticeable when it comes to students who have a grade of 10 in English, even when compared with those peers who have a grade of 9, and particularly in comparison with those who have a grade of 8, 7, or 6.

Table 8. Performance on the Test as a Whole among Students with Grades 9 and 10

	Performance 10	Performance 9
Mean	77.43	63.46
Variance	59.62	133.44
Observations	7	13
Pooled Variance	108.83	
Hypothesized Mean Difference	0	
Df	18	

Table 9. Performance on the Test as a Whole among Students with Grades 8, 7, and 6

	Performance 8	Performance 7 and 6
Mean	62.21	57.69
Variance	63.41	89.29
Observations	14	16
Pooled Variance	77.28	
Hypothesized Mean Difference	0	
Df	28	

Considering how the treatment of deductive reasoning particularly stands out within the framework of the test as a whole, and that it explains the grades from the English class with a high 30%, the author deemed it necessary to particularly examine the type of connection existing between students with grades of 10 and their results on this part of the test. As can be seen in Table 10, students with a grade of 10 obtained an average result on the part testing deductive reasoning of a staggering 94.28%, which once again confirms the significance of this correlation, and goes in favour of the thesis that exceptional attention must be paid to the nature of this link in further research. On the other hand, students with a grade of 6 realized an average result of 46.66% on this part of the test, which is a far better result by these students in comparison with the test as a whole, and as such is even more significant (Table 11).

Table 10. Performance on Deductive Reasoning Part of the Test among Students with Grade 10

	Grade 10	Deductive Reasoning
Mean	10	94.28
Variance	0	61.9
Observations	7	7
Pooled Variance	30.95	
Hypothesized Mean Difference	0	
Df	12	

Table 11. Performance on Deductive Reasoning Part of the Test among Students with Grade 6

	Grade 6	Deductive Reasoning
Mean	6	46.66
Variance	0	633.33
Observations	3	3
Pooled Variance	316.66	
Hypothesized Mean Difference	0	
Df	4	

All of the aforementioned confirms the author's second hypothesis, and proves that those with better critical thinking skills are significantly more successful in learning of English language in the context of formal curriculum, i.e., have better grade in English language course. The question is raised as to what extent the grade is a relevant variable to this research. The participants of this study attended a general English language course at the C1 level. All of them had, prior to registering for their third year of studies, that is, prior to this research realization, attended English 1 as first year students, and English 2 as second year students (at a B2 level) at Singidunum University. Differences do indeed exist among them in terms of knowledge, conditioned by talent, motivation, and dedication. Many factors affect the grading process, particularly since the introduction of the Bologna Declaration, including attendance and participation in class, as well as projects, etc. It should be mentioned that the students sit for the exam both in writing (grammar and vocabulary test, a short essay, reading comprehension and listening to a short dialogue on topics covered throughout the duration of the course), as well as orally (a conversation on one of the topics covered throughout the duration of the course), hence that the grade reflects the students' accomplishments in all language skills. The author believes that the students' grades from the course in English can be considered a relevant parameter for this research.

Limitations and Obstacles to Research

The most significant obstacle the author faced was the complicated process of obtaining consent for using the Cornell Critical Thinking Test which lasted several months. It bears mentioning that the tests are not free, despite the author's clearly expressed aims to use them exclusively for research purposes, which represents a good example of the commodification of education.

The students consistently and patiently followed the instructions for carrying out the test, while the fact that this was the first time they had taken this type of test did not have negative consequences. On the contrary, it aroused interest among the students, who experienced it as a kind of challenge.

One of the research limitations was the relatively small number of participants—50, as well as insufficiently diverse educational profiles—with all students studying IT in some capacity.

Further Research Recommendations

In conjunction with the aforementioned obstacles and limitations to research, the recommendations for further research primarily refer to a greater number of educational profiles and participants. It would be particularly interesting and helpful if students from the social sciences and humanities faculties were to participate in the research, as would conducting particular analysis, that is, a comparison of participant responses from those who study different areas within information technology. One of the recommendations is that the same or similar research be carried out among the high school population in order to establish whether significant differences exist concerning the issue of developing critical thinking skills according to the age of the participants. Additionally, a small number of participants might limit the generalizability of the results.

Furthermore, the author believes that it would be particularly useful to carry out similar research on teachers of foreign languages based on those conducted in other academic environments, as well as research carried out by the Cambridge and Oxford Publishing Houses on the importance of developing critical thinking skills during foreign language classes (Gajić, 2020). As a particular challenge was placed before language teachers, who have the most difficult assignment—to influence the moulding of individuals, capable of critically consider the world around them, constant changes taking place and impacting their flow, it is necessary to establish what attitude foreign language teachers have towards this issue. Specifically, it is necessary to uncover whether they believe that they are sufficiently trained for the application of teaching methods that would incentivize critical thinking during classes, and whether they have the appropriate resources at their disposal in order to carry out such plans into action.

This type of research should absolutely not be limited to tertiary level education alone. Considering the success of the participants of this research—upon taking test X, the author believes it would be suitable to have students take test Z. The nature of the correlation of gender and critical thinking skills could be a topic for further research, given that both the minimal and maximal result of critical thinking skills were obtained by an individual belonging to the female gender. In the end, the results that clearly demonstrated the most significant correlation exists between success in mastering the English language and the critical thinking portion of the test regarding deductive reasoning led to the conclusion that this relation ought to be a topic of future research to determine its nature as precisely as possible. In that way, practical application in the teaching process would become ever more significant.

Conclusion

Going from the concept of critical thinking and the ever-greater presence of this skill in the context of foreign language learning, the subject of this research represents quantitative description of how critical thinking predicts achievement in mastering English as a foreign language. It is a particular challenge that so few studies on this topic exist in the Republic of Serbia, or in the former Yugoslav republics.

The results of the research confirmed the first hypothesis that a strong connection exists between the critical thinking skills of students and their success in learning foreign languages. The analysis has demonstrated that the correlation exists between the two aforementioned variables, as does a degree of matching between the dependent variables, English language course grades, and each of the three individual tests of critical thinking, as well as the test as a whole. The first part of the test covered inductive reasoning, which can explain about 10% of the grade in the English class, the second part of the test, assessing observation skills and credibility of information/sources was nearly the same, with somewhat over 10%, while the third part, the deductive reasoning, can explain the grade by a full 30%. The second hypothesis of the paper, that those students who possess critical thinking skills are more successful at learning foreign languages, is absolutely confirmed. The analysis proved that there were significant differences between the three parts of the test and their influence on grades in the English language class, yet also that further research was needed in order to arrive at more concrete information to be applied in the teaching practice. What can be stated with certainty at this point is that students who have excellent mastery of the English language, that is, have a grade of 10, are the best critical thinkers, that is, have realized a far greater average result on the Cornell Critical Thinking Test as a whole—77.43% of their peers who have a grade of 9, and who have obtained an average result of 63.46%. This difference increases when we compare them with students who have a grade of 8, and whose average result is 60.21%, that is, a grade of 7, and 6, with 57.69%. Students boasting a grade of 10 have an average result—94.28%, on the third part that tests deductive reasoning, particularly when the result is compared with the average result achieved by students with a grade of 6—46.66%.

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Procena kritičkog mišljenja i postignuća u nastavi stranih jezika na univerzitetskom nivou⁴

Apstrakt: Cilj ove studije jeste ispitivanje korelacije između veština kritičkog razmišljanja i stope uspešnosti usvajanja engleskog jezika, po uzoru na slična istraživanja koja su sprovedena u drugim akademskim kontekstima. Ovaj rad nudi pregled prethodnih istraživanja i zaključaka o ulozi kritičkog razmišljanja u obrazovanju. Rezultati kvantitativne studije potvrdili su da postoji značajna korelacija između veština kritičkog razmišljanja studenata i njihove sposobnosti da uče strane jezike, kao i da su studenti sa razvijenijim veštinama kritičkog razmišljanja bili daleko uspešniji u učenju stranih jezika. Naročito je značajna korelacija između stopa uspešnosti u učenju engleskog jezika i učinka na testu kritičkog razmišljanja koji je posvećen deduktivnom zaključivanju. Treba sprovesti dodatna istraživanja kako bi se utvrdila priroda ovog odnosa što je preciznije moguće, tako da se njegovoj praktičnoj primeni u procesu podučavanja prida veći značaj.

Ključne reči: kritičko razmišljanje, test kritičkog razmišljanja Univerziteta Kornel, učenje engleskog jezika.

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