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THE APPLICATION OF CRITICAL THINKING IN MATRICULATION EXAMINATION PAPERS IN THE SUBJECT OF BIOLOGY

Abstract: *Recent reforms in the Croatian national educational system due to the Republic of Croatia's accession to the European Union have as one focus to raise the level of critical thinking required by students. An important component of national education is the high stakes matriculation or 'matura' examinations. A study was made of biology examinations in both the countries of Australia and the Republic of Croatia. The comparison aimed to determine the level of critical thinking demanded based on the questions in the examination. This analysis of examination questions relied on the presumption of consequential validity of high stakes examinations; matriculation papers, where, if demanded by the examination, students will adopt certain skills, in this case, critical thinking. A hierarchical critical thinking taxonomy was subsequently developed based on similar taxonomies in existing literature to research the questions in the matriculation examination papers of biology in Australia and the Republic of Croatia respectively. The examination questions were classified according to this taxonomy and the results are displayed according to the level of critical thinking demanded in these examination papers.*

Keywords: *Australia, consequential validity, matriculation examination, subject of biology, the Republic of Croatia*

INTRODUCTION

In our opinion, the ability to think critically is an accepted and seemingly logical competence of life as a human being. However, is this reflected in educational systems?

We decided to start by firstly considering the official educational policy documents of both Australia and the Republic of Croatia. The Australian National Declaration on Educational Goals for Young Australians states that successful learners, among other characteristics, "...are creative and resourceful and are able to think critically, analyse information and solve problems" (The Ministerial Council on Education, Employment, Training and Youth Affairs, MCEETYA, 2008, p. 5). Similarly, the Croatian National Curriculum for Pre-school and Compulsory Primary and Secondary Education includes as one of its aims "...the developed ability to think critically" and "formulating judgements and problem-solving skills…" (Ministarstvo znanosti, obrazovanja i športa, 2011, p. 6) Therefore, both the Australian and Croatian school education systems, according to these respective education policy documents, purported that critical

thinking is an essential aim. However, our question, after teaching in both systems, is whether this is faithfully reflected in practice, or whether lip-service was merely being paid to it.

Australia falls into the category of a developed country and is ranked number 13 in the world according to the International Monetary Fund on the amount of gross national product (International Monetary Fund, 2021). The Republic of Croatia is a post-socialist transitional country and is in 78th place on this same list. Another comparison can be found by examining high school student performance internationally in PISA, acronym for Program for International Assessment, which implements international examinations surveying the knowledge and skills of high school students in several countries. The results for Australia and Croatia out of 57 countries were as follows, with Australia in 21st place and the Republic of Croatia in 37th place (Organisation for Economic Co-operation and Development, OECD PISA, 2018). It should be mentioned that PISA tests are developed under the auspices of the Australian Council for Research and could therefore influence the skills being promoted in national educational systems. However, PISA tests do not solely test subject matter, but skills needed for life-long learning and, according to PISA results, the Republic of Croatia is obviously lagging behind and needs to promote the inculcation of other skills in its educational system.

The discrepancy between Australia and the Republic of Croatia in economic and educational success placement on an international scale is the possible reflection of some discrepancy in the quality of what is taught and how it is taught. Indeed, Hanushek and Kimko state that in "...developed countries and in transition countries the quality of education is even more important than the quantity of education in determining economic growth" (2000, p. 15).

From the above premise that how and what students are being taught contributes to a better quality of life and a more competitive, competent workforce, reflected in the afore – mentioned economic success of the two countries of Australia and the Republic Croatia, it is logical to claim that the quality of education also influences student educational performance and success internationally. The data from PISA and the International Monetary Fund showed that there is a difference in the skills that are being displayed which could be influenced by what is being taught, encouraged and acquired in the two respective countries. Therefore, logically, there could be a difference in the type of skills acquired as demonstrated in the tasks being tested.

Based on our teaching experiences, our impression is that, in the two countries of Australia and the Republic of Croatia, there is a different approach to and encouragement of critical thinking and problem-solving skills which was reflected in the above mentioned PISA results. Having taught in both systems, it was our experience that Croatian students preferred closed ended activities or 'busy work' as these tasks were named in teacher jargon or answering questions that were either wrong or right, as opposed to the students one author taught in Australia who responded to opened ended tasks. Within class discussion sessions, Australian students were happy to proffer their opinions whereas the Croatian students would not respond or would wait to hear what the teacher thought and often made that opinion their own. Due to the far-reaching consequences of developing critical thinking skills, it was further our impression that the differences in educational and economic success on an international scale could be attributable to the difference in approach to education which includes development of critical thinking skills.

In both countries, successful completion of school leaving matriculation examinations forms an essential part of the prerequisites for entry into university which makes them high stake examinations (Wall, 2006). Additionally, what these examinations demand from students influences in schools what is taught and how it is taught (Frederiksen, 1984; Heyneman & Ransom, 1990). These examinations contribute to the promulgation of skills that are determined as being important and shape student profile in terms of what skills are considered as being crucial for entry to and success at university. University in turn extends and develops these skills preparing people for the workplace or at least providing them with socially recognised qualifications for the workforce (Bailey et al., 2004). Completing a university education opens the door to

work positions that tend to be more influential, especially on other members of society, better paid and more esteemed in society compared to those positions that do not require a university education. What and how these graduates have been taught throughout their education is likely to influence their performance and results in the workforce.

As a concrete example to demonstrate the extent to which critical thinking processes are being promoted in Australia and the Republic of Croatia respectively and to provide further insight into what is being asked of students, the aim of our research was to analyse the questions in the high school matriculation examination papers of the two countries, Australia and the Republic of Croatia in the subject of biology. Therefore, the matriculation examination chosen for research in both Australia and the Republic of Croatia was biology. This analysis of the school leaving examination questions in the subject of biology was to ascertain the degree to which critical thinking processes are demanded of students and rewarded by external examination bodies in school leaving examination questions.

WHAT IS CRITICAL THINKING AND WHY IS IT A VALID SKILL?

From the copious amounts of information that have been written about critical thinking, we attempted to pinpoint what was most relevant to our research which was related to analysing questioning that encourages critical thinking in order to provide a definition that summarises what critical thinking is. Despite and perhaps due to the proliferous mention of critical thinking in the literature, attempting to provide a single definition of what critical thinking was difficult, because critical thinking intertwines a variety of skills and processes resulting in the non-existence of a single definition. Consequently, an attempt had to be made to reach an understanding of the concept of critical thinking from the literature.

Another vital aim regarding our research was to extract from the literature vocabulary that defined critical thinking and that demonstrated how critical thinking was revealed in questions. For example, both the Australian and Croatian policy documents previously mentioned note problem solving as a key critical thinking skill. So, as we analysed the literature relevant to our area of research interest, we decided to highlight the diction that contributed to the definition and demonstration of critical thinking skills with the aim of later using this vocabulary to more accurately analyse critical thinking in high school leaving examinations.

Even before defining and describing what critical thinking is and considering it in terms of questions that promote critical thinking is the issue of whether critical thinking is really necessary in human beings' lives. What support is there for the purposeful promulgation of critical thinking at all? In addition to critical thinking being mentioned in the Republic of Croatia and Australia's education policy documents, there is much literature supporting the encouragement of critical thinking as a positive and necessary attribute in both ones' social and educational life from ancient times to this very day (Bloom et al., 1956; Noddings, 2006; Paul, 1995; Scriven, 1985; Walsh & Paul, 1988). The perennial relevance of critical thinking is summarised by Michael Scriven and Richard Paul as the following. "Everyone thinks; it is our nature to do so. But much of our thinking, left to itself, is biased, distorted, partial, uninformed or down-right prejudiced. Yet the quality of our life and that of what we produce, make, or build depends precisely on the quality of our thought. Shoddy thinking is costly, both in money and in quality of life. Excellence in thought, however, must be systematically cultivated" (in *Critical thinking*, 1987). This representative quotation leads to the presumption that critical thinking should be developed in all areas including education and is indelibly related to the standard and quality of life.

In both the Republic of Croatia and Australia, government agencies have been created to combat corruption. It is interesting to note that, in the literature on combating corruption in the Republic of Croatia, a country in which corruption is a significant problem and was marked as a serious barrier for the Republic of Croatia's entry into the European Union, one of the recommend steps against corruption is encouraging

skills, including inquiry, analysis and transfer of information, critical thinking and problem solving, rational planning and organisation, management of time, finances and other means, creative and planned action and cooperation, independence, responsibility for one's own actions, communication and cooperation, clarifying misunderstandings and conflicts in a constructive way (Miškulin, 2008). Miškulin's thought supports the belief that developing critical thinking is related to combating corruption.

Furthermore, Clement and Lochhead claim that we "should be teaching students how to think. Instead, we are teaching them what to think" (1979, p. 28). Others who share this view include Dewey (1933) and Scriven (1985). The promulgation of skills based learning and questioning is favoured here as opposed to content based memorisation of facts, the latter being characteristic of learning in the Republic of Croatia's education system. Furthermore, Pithers and Soden (2000) state that it is in the interests of national governments and employers for education to produce good thinkers, which in turn produces better citizens. Scriven and Paul (1987) too place critical thinkers into the category of good thinkers because according to him these thinkers the think about their thinking.

Comparatively, in the Republic of Croatia, Kalin states that contemporary education is above all characterised by developing the ability to think and that is should not be focussed on acquiring knowledge (1982, p. 8). He goes on to say that developing creativity is of the utmost importance and one of the high order thinking skills. Therefore, if critical thinking is seen as including thought process that are important for development, creativity could certainly be one too. This interestingly conflicts again with the Republic of Croatia's education system's high emphasis on reproducing excerpts of text from set textbooks. Therefore, it can be presumed that possessing high levels of critical thinking is officially viewed as having positive effects on one's life in education and in society as whole. Indeed, from the above, it can even be concluded that critical thinking and a quality standard of living is connected. As Paul states, "those countries with the foresight to systematically cultivate the critical thinking of their citizens of all ages, through the educational systems in schools and the workplace, will enjoy a significant competitive advantage over countries that do not make this effort" (1995, p. 4). Paul came to this conclusion based on the need to cope successfully with work of the future which he believed involved work of the intellectual mind, to be a reactive and not a habitual thinker. All this he believed is inextricably tied to critical thinking (Paul, 1995).

Again, this links quality and standard of living as being commensurate with the level of developing critical thinking. Paul talks at length in his book entitled *Critical thinking: how to prepare students for a rapidly changing world* (1995) about critical thinking as being essential for society which is in constant change. This is especially true for countries like the Republic of Croatia which have changed from communist to being transitional countries. However, Paul believes that all societies are in constant change. Therefore, promoting critical thinking applies to all. In Paul's opinion, the higher the level adopted of critical thinking, the higher the standard of quality of life for that country's' society in general. Here the concept of levels of critical thinking arose and was reflected during this research into examination questions. Hence, critical thinking is not only valid, but indispensable for society. Consequently, in addition to our personal experience, the literature led us to the firm belief that researching critical thinking in an educational context is also not only valid, but indispensable. Hence, our research on questions in school leaving examinations of Australia and the Republic of Croatia as a feasible attempt to develop insights into critical thinking, education and educational effects became an indispensable reality.

We were unable to locate any research to date that has already been carried out covering our area of research interest entailing analysing high school leaving examination questions in terms of critical thinking, which further encouraged us to do just that, in the hope of shedding more light on critical thinking and examination questions.

There are a variety of ways that research has been conducted into critical thinking, including interviews, analysing responses, case study, pre and post testing. Examples of critical thinking research were cited on the Foundation for Critical Thinking's web site (see Scanlan, 2006). Research topics included

an application of Richard Paul's model of critical thinking into a history course at college, interviews of students and teachers about the critical thinking qualities the teachers and students believed were important, research on instruction into critical thinking in various schools, providing profiles of teachers who were strong or weak in critical thinking, the application of a model of critical thinking within a school that had adopted a particular critical thinking model, research on the relationship between critical thinking and success in SAT examinations, research on the benefits gifted children received from doing critical thinking activities, improving the critical thinking skills of students and research on whether universities prepare graduates to be adept in critical thinking instruction.

The methodologies for the above research included:

1. Qualitative – Interviews of students which involves preparing questions and categorising answers.
2. Action based – Pre and post testing – students completing responses to questions before critical thinking training/lesson and then doing a similar task after the training/lesson and then the responses are analysed.
3. Exploratory – Case study-taking a situation and reporting on it.
4. Application of a model of critical thinking from the literature to how people are doing a task and displaying the results in terms of this model.

In the Republic of Croatia, there was a project entitled 'Reading and Writing for Critical Thinking' (Vizek-Vidović et al., 2005). In collaboration with the International Reading Association, the University of Iowa and Croatian teachers they attempted to encourage critical thinking skills in the classroom. The aim of this project was to try to raise awareness of critical thinking processes among teachers who would in turn more successfully transfer these skills onto their students. In particular, asking the right types of questions in order to promote higher order critical thinking is mentioned as are various teaching strategies and methods to increase teachers actively seeking critical thinking processes from students.

Regarding research that compares education internationally, there was some carried out on examinations and comparison of the critical factors of total quality management across countries (Sila & Ebrahimpour, 2003). Here a survey was used comparing critical factors of quality management. In research on comparing educational systems and labour market outcomes (Allmendinger, 1989) a typology for classifying educational systems was used and empirical evidence was collected according to the typology.

HOW IS CONSEQUENTIAL VALIDITY RELATED TO CRITICAL THINKING?

Our research topic deals with high school leaving examination questions and therefore deals with assessment. One aspect of assessment is consequential validity or using assessment to drive instruction (Mehrens, 1997). Ur stated that one of the reasons for testing is to "...motivate students to learn or review specific material" (1999, p. 9). Therefore, it would be logical to say that if an external examination such as the high school matriculation examination contained a high focus on tasks that demanded demonstration of critical thinking skills, this would force or at least encourage both students and professors to develop and practice critical thinking skills. A scale or taxonomy of level of critical thinking demanded was logically necessary to evaluate how examination questions were created and assessed. This led to the question of should tests emphasise critical thinking? Yeh stated: "…state mandated tests should focus on critical thinking, defined as careful argumentation. This could address the primary criticism of such tests – that they drive an instructional focus on rote factual learning. Conceptualising critical thinking in terms of argumentation provides a simple, useful way to focus instruction and assessment according to the type of critical thinking to be valued in the workforce" (2001, p. 16). So, a logical basis existed for tests to emphasise critical thinking. Also supported was the presumption that tests that encouraged the memorisation and retelling of content facts should not be encouraged as they were not conducive to critical thinking.

Indeed, it was claimed that students' acquisition of knowledge is more effective if forced to handle that knowledge at the higher levels of critical thinking, even though most teachers were still testing at the lower levels (Garavalia et al., 1999). This made the connection between subject matter and application of critical thinking inextricable. This would support the argument that external examinations such as high school matriculation papers needed to make their focus on critical thinking. Paul and Binker (1993) in their quintessentially entitled book, *Critical Thinking: What Every Person Needs to Survive in a Rapidly Changing World*, explain that critical thinking is applicable across subject disciplines and domains. Suhor (1984) believed that thinking skills should ideally be interwoven into subjects and that while some subject specific skills do exist, critical thinking processes can and should be a part of each subject's assessment, just as it has been purported that developing lessons which emphasise critical thinking should be a part of teaching (Noddings, 2006).

Further related to consequential validity, it was logical to conclude that university entry tests such as high school leaving examination papers should focus on what is educationally and socially important. Matriculation examinations influence entry into university, Atkinson and Geiser (2009) who based on their research on college entry examinations, have even gone to the point where they believed school grades were a better indication of student suitability for college entry over entrance examinations. They believed examinations should reflect what was in the curriculum and not be in the form of a separate intelligence test. Having a substantial focus on critical thinking in high school leaving examination questions would be an ideal combination of linking subject content to the cognitive processes desirable for study at university and indeed for student preparation for the workforce and society. What is taught in school, demanded in high school leaving examinations should be linked to what is required of students for university entry.

Furthermore, it was logical to assume that the elements of a test that are deemed to be more important should be awarded higher marks. So too, should the higher-level skills of critical thinking be awarded more points so that students and teachers perceive them as being worthwhile and consequently work on developing and displaying these skills. This then became one of the claims we were testing. That is, another question was whether the elements of a test that are awarded higher marks are also those that demand higher level critical thinking skills, which, if so, would prove that critical thinking is important in tests.

METHODOLOGY

To analyse the questions in the 2010 examination papers of biology in both Australian and Croatian school leaving exams, a critical thinking taxonomy was created based on existing literature (see Bloom et al., 1956; Anderson & Krathwohl, 2001). The following taxonomy was created (see Table 1.).

Table 1.

Revised taxonomy of critical thinking for analysing school leaving examination questions

6. **Creating**	- producing new arguments
	- producing new ideas
	- make something new
	- invent

	Can the student create new product or point of view?
5. **Assessing**	
	- evaluating information - providing valued judgements about information with justified reasons - judge the value of something - making judgements based on criteria and standards through checking and critiquing Can the student justify a stand or decision?
4. **Analysing**	
	- determining causes and consequences - breaking down the parts Can the student distinguish between the different parts?
3. **Applying**	
	- carrying out or using a procedure through executing, or implementing. - make use of something in another situation Can the student use the information in a new way?
2. **Understanding**	
	- demonstrating understanding of information by explaining - know the why or how something works Can the student explain ideas or concepts?
1. **Remembering**	
	- providing pre-learned information and facts - bring back a piece of information into your mind or keep a piece of information in your mind - recognising and nominating a pre-learned concept in the form of visual stimulus

	- remembering: retrieving, recognizing, and recalling relevant knowledge from long-term memory
	Can the student recall or remember the information?

It is important to note that all levels presented in the taxonomy in fact correspond to a certain degree to which critical thinking is applied whilst the student engages in a particular cognitive activity. This means that critical thinking can occur at all levels, albeit to a lower degree while, for instance, remembering (Level 1), and to a greater degree at subsequent higher levels.

The biology papers of the high school matriculation papers of the Republic of Croatia and Australia were analysed according to this taxonomy. Each question in the examination paper was categorised according to this Taxonomy of Critical Thinking. Additionally, accurate interpretation was necessary and also related to an ethical approach to this research. This was done to establish which level of critical thinking was most encouraged in the examination papers of biology. Further related to precision of interpretation was the issue of how to place each examination question in the correct category according to the specific Critical Thinking Taxonomy. Firstly, our approach was to analyse each question in terms of what it was demanding. For example,

High School Leaving Biology Examination in the Republic of Croatia

1.	What molecule does the diagram show?	From a proffered choice of four items, choose the one that answers the question.
2.	Which of the following substances would you use to show protein in milk?	From a proffered choice of four items choose the one that answers the question.
3.	Katarina and Luka are ordinary coloured husband and wife who are not colour blind. Katarina's father is colour blind and albino. Luka's parents are healthy homozygotes…	Write down the possible genotypes of Luka and Katarina's children.

High School Leaving Biology Examination in Australia

1.	Prions are composed of…?	From a proffered choice of four items, choose the one that answers the question.
2.	MRNA is….?	From a proffered choice of four items, choose the one that answers the question.
3.	A woman accidentally touched a hot object. She withdrew her hand quickly in a reflex action. A model of the event is best represented by…	From a proffered choice of four items choose the one that answers the question.

Then, from the analysis of what the question was demanding the procedure would have been to apply this to the Critical Thinking Taxonomy. That is:

Question 1.	1. Remembering
Question 2.	1. Remembering
Question 3.	3. Applying

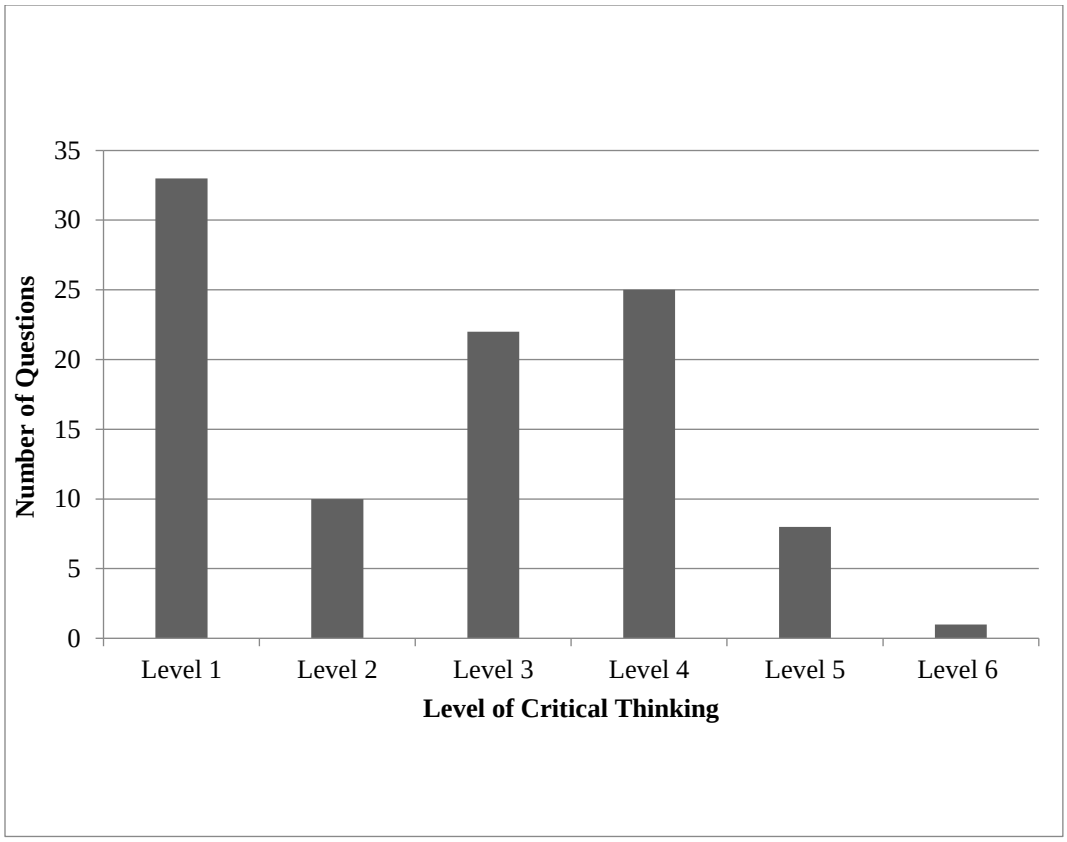
The following section purports in both numerical and graphical form the prevalence and range of different types of questions in both countries' matriculation exams as classified according to the afore developed taxonomy. A comparison of results between Croatian and Australian matriculation exam questions is also drawn and discussed in further detail based on the given statistical data.

RESULTS AND DISCUSSION

The highest concentration of questions in the Australian matriculation exam according to the Critical Thinking Taxonomy was at Level 1 at 33.03%, followed by Level 4 questions at 25%, then level 3 at 22.32% level 2 at 10.71%, level 5 at 8.03%, level 2 at 10.71% and finally level 6 at .89%. Questions at Level 4 Analysing were the greatest in number at 25% with the amount at Level 3 Applying followed closely at 22.32%. Questions were mainly multiple choice; 50 questions as opposed to 17 questions that required long answers or explanations of explanations of a few sentences in length as well where students had to explain and justify their answers (see Graph 1.). It should be noted that the number of questions increased during analysis as many questions contained multiple parts, each of which was analysed.

Graph 1.

Australian high school leaving biology examination question analysis according to Critical Thinking Taxonomy



Just as there were the greatest amount of questions at level one so too was the highest concentration of marks awarded to questions to Level 1 questions at 29.33%, followed by level 4 at 25.3%, then Level 3 at 20%, Level 5 at 12.66%, Level 2 at 12.00% and Level 6 at 0.66%. There were 50 multiple choice questions and 17 long answer questions. Visual input through the use of graphs, picture and diagrams were frequent throughout the examination (see Table 2.).

Table 2.

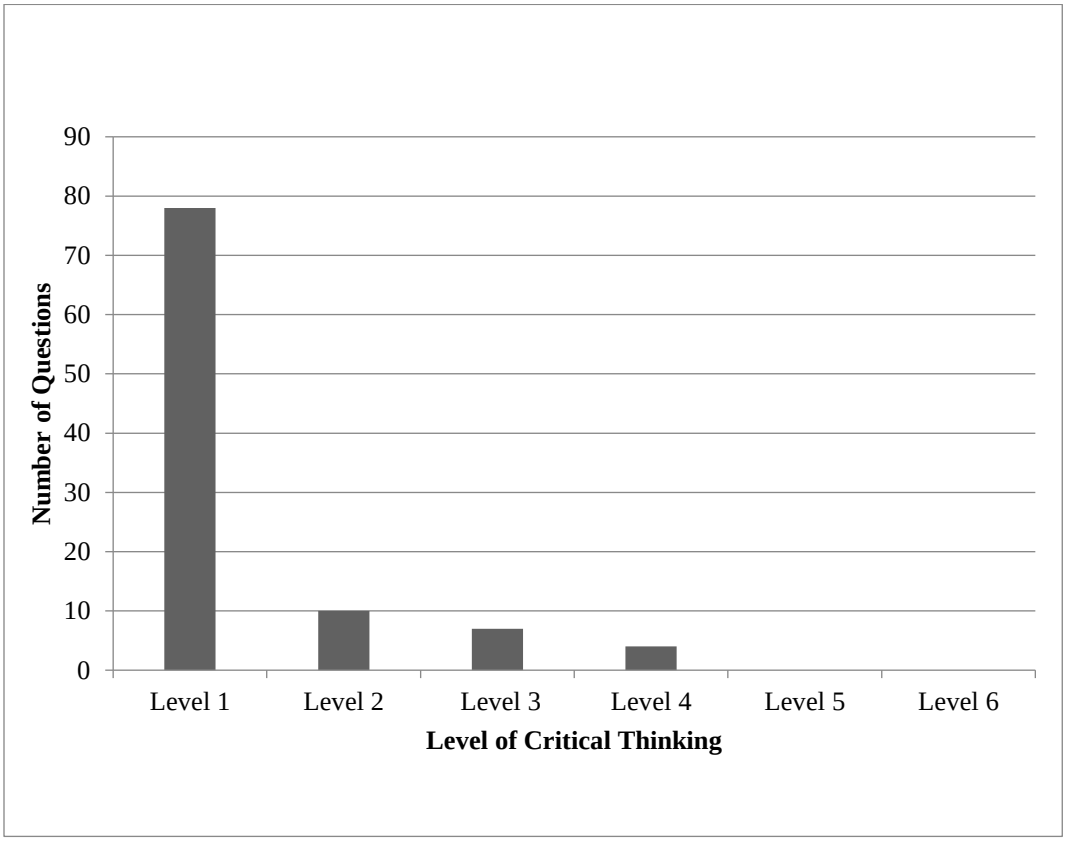
Numerical analysis of marks allocation of Australian biology examination according to Critical Thinking Taxonomy

CT 1	CT 2	CT 3	CT 4	CT 5	CT 6	Total number of points
44	18	30	38	19	1	150
29.33%	12.00%	20.00%	25.3%	12.66%	0.66%	100%

On the other hand, the Croatian biology paper questions had the greatest emphasis on Level 1, that is, 78.12 % of questions entailed remembering facts with questions being mainly multiple choices and some short answer (see Graph 2.). There were 40 multiple choice questions and 56 short answer questions. The short answers were very short, mainly requiring one word and did not require full sentences.

Graph 2.

The Croatian biology matura school leaving examination paper question analysis according to Critical Thinking Taxonomy



Interestingly, the questions were awarded one mark each regardless of the fact that the various questions were demanding differing levels of critical thinking skills according to our Critical Thinking Taxonomy (see Table 3.).

Table 3.

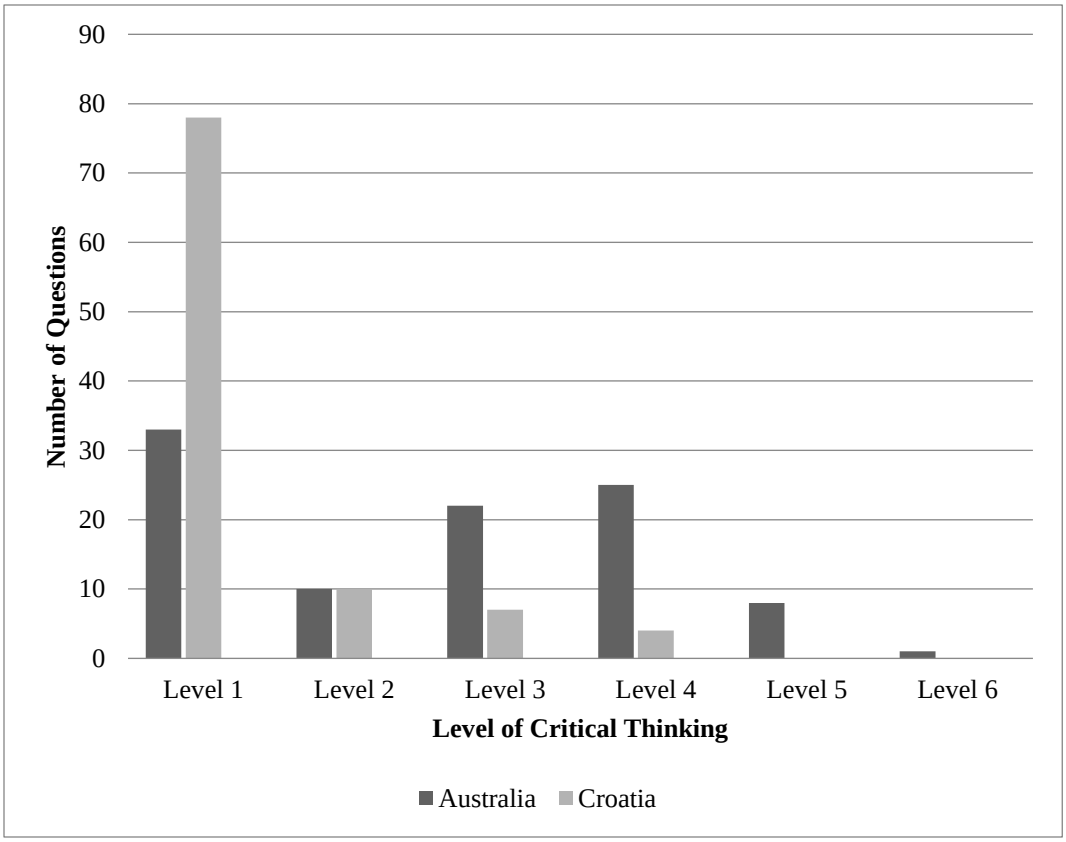
Numerical analysis of marks allocation of Croatian biology examination according to Critical Thinking Taxonomy

CT 1	CT 2	CT 3	CT 4	CT 5	CT 6	Total number of points
75	8	8	5	0	0	96
78.12%	8.33%	8.33%	5.2%	0	0	100%

When comparing the two countries' examination paper questions, the Australian biology examination had more questions than the Croatian biology examination, but not by a great deal, that is 96 questions for the Croatian examination and 112 for the Australian paper. There seemed to be a lot detail in terms of facts and information required in biology examinations hence the huge amount of questions and heavy emphasis on Level 1 questions. However, the Australian paper still has a heavier emphasis on the higher order critical thinking questions. The Australian paper also had the greatest proportion of its questions at Level 1 Remembering, that is, 33.03%, but not as high as the Republic of Croatia examination questions which had 78.12 % of questions at Level 1 Remembering (see Graph 3.).

Graph 3.

Comparison of Australian and Croatian biology examination paper questions



Obviously, there were numerous questions in both the Australian and Croatian biology examination. This showed that for both countries, a subject such as biology has much necessary content, and therefore, copious questions were essential for students to demonstrate subject competence.

There was a greater concentration of questions that demanded higher level critical thinking in the Australian matriculation biology paper as opposed to the Croatian one. The Croatian school leaving examination paper contained a majority of low-level critical thinking questions. They also had a greater number of examination questions which reflected the emphasis on remembering information to test how much pre-information students have memorised.

As previously stated, we were unable to locate any research to date that has already been carried out covering our area of research interest entailing analysing high school leaving examination questions in terms of critical thinking. This naturally further encouraged us to do just that, in the hope of shedding more light on critical thinking and examination questions.

All research already presented (see Scanlan, 2006; Vizek-Vidović et al., 2005) pointed out the benefits of research into thinking skills. In particular, it pointed out the following which influenced our research path and that is:

1. Critical thinking is not only an intertwined subject, that is ‘embedded’ into subjects through questions that promote critical thinking rather than memorisation, but should also be developed as a separate skill.

2. All students are similarly disposed to and capable of critical thinking regardless of their academic achievement. Therefore, students of all nationalities and in all countries are equally disposed to acquiring critical thinking skills.
3. Some of the above-mentioned research showed that some cultures are not conducive to critical thinking. In some cultures, it is not acceptable to question the teacher or what is presented to students. Therefore, critical thinking should be viewed as being important and valuable for it to be accepted naturally.
4. Motivation is essential through teaching strategies and teacher approach. Critical thinking is demanding. One must be motivated to be taught how to think critically. Although all students are capable of being critical thinkers, this has to be encouraged from them. Students must be motivated and taught.
5. Testing should focus on what is educationally and socially important. If critical thinking is intertwined into school leaving examinations, consequential validity, the theory that if something is tested, it will be learned, will purport the application and implementation of critical thinking.

These findings supported our specific course of research the outcomes of which led to the following recommendations. Recommendations emerging from our research are:

Recommendation 1: Croatian examination creation processes should create examination questions that encourage higher levels of critical thinking.

Questions in the Republic of Croatia had a heavy emphasis on Multiple Choice. This type of questioning is more applicable to remembering as it provides a quick way to check whether someone is familiar with a piece of information. It is also easier to mark because it is not necessary to ponder over a written piece of text. That is, the question is right or wrong, 'black or white'. In the Republic of Croatia, students can view their examination papers and lodge complaints. Also, higher level critical thinking skills need criteria for equitable assessment which is more difficult to explain to irate parents! Having complex interpretative criteria for marking requires standardisation and costs more to implement. Costs involved in education invariably depend on how much each country is prepared to invest financially into its educational system.

Interestingly, it was not always the higher-level critical thinking questions that were awarded the highest number of points in examinations. Taxonomies of critical thinking imply that certain abilities require higher intellectual thought, yet this was not always reflected in the marks allocation in these high school leaving examinations. This was especially apparent in the Australian examinations as these examinations had the greater variety of questions encouraging critical thinking and consequently greater assessment discrepancy. This could be an area that needs more research to further ascertain why higher-level critical thinking skills are not awarded the highest number of points in examinations.

Recommendation 2: Marks allocation should be organised to award the questions that demand higher levels of critical thinking higher marks.

Critical Thinking skill 6 Creativity was poorly represented in all examination papers. Creativity had a low emphasis in high school leaving examination. The literature supports creativity as being a high-level skill requiring high level cognitive skill (Huitt, 1998). However, examinations need to be equitable, and creativity is such a specific skill that it would be difficult to assess fairly.

Recommendation 3: Creativity should be encouraged more in high school leaving examination questions.

Creativity is essential for a progressive society (Sternberg, 1988). If there is no creativity, it is difficult to encourage positive change and progress. In the Croatian system, creativity is definitely not encouraged enough with students reluctantly providing and justifying their own opinion, wanting to regurgitate the teacher's opinion and are often rewarded for having the same stance as the teacher.

CONCLUSION AND FURTHER RESEARCH DIRECTIONS

If one accepts from the literature that a range of and a focus on higher level critical thinking skills are necessary, then the research results show that this was more representative in the Australian school leaving examinations and definitely needs to addressed and remedied in the Croatian education system. However, the similarity in critical thinking skills in terms of foreign language high school leaving examinations in the two countries could exclude foreign language testing from needing to undergo changes.

Following on from this, the backwash effect of the degree to which critical thinking is purported in school leaving examination questions in regard to teaching and learning needs to be considered. Logically, teaching needs to be remedied in the Republic of Croatia also to adapt to the greater influence on higher level critical thinking questions. Less emphasis on learning facts from set textbooks and more activities on comparing information, drawing conclusions, evaluating and so are needed. Educational practices in the Republic of Croatia come to mind here such as the assignment of a book to learn for each subject and rote learning as opposed to the Australian method of library research and the practical elimination of learning most concepts off by heart. More information about how long the examination lasts and point allocation are always presented on the front cover of the Australian examinations but this is not the case with Croatian counterparts. Clarity and information about the examination could be improved and given in more detail in the examination itself. This would require further research interviewing people involved in the production and organisation of examinations.

Additionally, the correlation between marks allocation according to the level of critical thinking demanded could be more congruently adjusted for both countries. Awarding the higher marks for questions demanding higher levels of critical thinking is a task for both countries' educational systems.

In terms of university entrance, Australia takes into account student performance in the ASAT intelligence test. However, since the introduction of the high school leaving examination in the Republic of Croatia, most of its universities only require grades from school and performance in the high school leaving matriculation examination. Hence, if higher level critical thinking skills are not demanded in the examinations, there is no official mode for students in the Republic of Croatia to be 'forced' to demonstrate these skills.

Further related to university entrance where in Australia school leaving examinations make a considerable contribution to ranking student abilities which influences their ability to get into certain university courses, having examinations with a heavy reliance on Level 1 Remembering questions could jeopardise the ranking process. That is, many students could get top marks in remembering facts resulting in the bunching of marks at the highest levels. For example, if the majority of students get 100% in a remembering based examination, how will that help determine who should enter the limited quota professions of say medicine and law? Examinations testing the higher levels more difficult levels of critical thinking would more successfully display a range of success among students and be more useful as a ranking tool.

Although most of the Australian school leaving examination papers indicated higher levels of critical thinking according to the proffered taxonomy, this might not necessarily assume that critical thinking is encouraged adequately in the Australian teaching system. However, if the literature on consequential validity or the assumption that demanding process in examinations will lead to those processes being taught and demanded from students in class, Australia is reflecting a greater commitment to critical thinking and questions in the Croatian school leaving examinations need to be drastically revised. A heavier emphasis needs to be placed on testing the whole range of critical thinking skills, especially the higher levels. In turn, the wash-back consequences of focussing questions more on higher levels of critical thinking will be to be borne in teaching and learning.

More research needs to be done in the areas of assessment and student responses in relation to critical thinking to demonstrate student performance in this area. Choosing examination question analysis

in relation to critical thinking was feasible as an item of research, but it should be kept in mind that is not an exhaustive one and will certainly not reveal all aspects regarding critical thinking and education. So, are the higher levels of critical thinking which are obviously demanded by Australian high school leaving examinations and not by the Republic of Croatia's high school leaving examinations a reflection of the Republic of Croatia's poorer economic and educational success status internationally? Perhaps from the discrepancy in critical thinking shown in this research logically yes, if the correlation between corruption, citizenship and work practices from the literature are taken into consideration and applied to the results of this research. However, this would require further research into how student answers in examinations are marked and the extent to which critical thinking processes are applied in other educational and workplace and social practices.

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