Critical Thinking and Academic Achievement among Secondary and Senior Secondary School Students

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Abstract

The study examined the effect of critical thinking on academic achievement among secondary and senior secondary school students of Mysuru. It also attempted to find out the variations in the critical thinking abilities of secondary and senior secondary level students. The study was conducted on a sample of 625 students of Mysuru City in India using stratified random sampling technique. Murthy's (2014) Mysuru Critical Thinking Scale was administered. Results indicated that the students' academic achievement was affected by their critical thinking. The students with higher levels of critical thinking did better on academic achievement as compared to their low counterparts. Further, there was no difference between the secondary and senior secondary students on their critical thinking abilities. Results shows that critical thinking is an important factor and a correlate of academic achievement.

Introduction

Education is a process of empowering learners to reach their best and it works towards their self actualisation. In this process, developing different faculties of learners become very important. The purpose of education is not to declare them as pass or fail or label them as someone who is at a certain level of achievement, but to shape every learner towards realising one's potentials. This demands that the teacher acts as a facilitator and education should not focus only on the product, but it must also pay

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attention towards the process of learning of all learners. With this inclusive perspective, every single learner needs to be understood and provided opportunities commensurate with her/his abilities. It implies that every single learner should be understood by the teacher. Also, the learners need to be suitably supported and facilitated to make intrinsic meaning of the content and internalise the content meaningfully and grow from one step to the other. Learners should become thinkers. For this to happen, learners need to be enabled to think and question.

Today, the education system is governed and controlled heavily by the examining bodies and is not learning-centred. Students are busy preparing for examinations but not for life. Consequently, once the exam is over, the content studied is conveniently forgotten as the purpose of facing examination is over. Teachers in schools also seem to be anxious to cover syllabus. The whole system appears to be working to please a system called 'examination', but the larger part of the system is not keen on learning, which should be the *hero* in education. It is time, the school education system responds to the requirement of making education a joy of learning for all learners.

It is a fact that in developed societies, academic achievement is one of the significant indicators to predict students' progress in the field of education. For several decades, researchers, scholars, educationists and psychologists, have attempted to understand major factors that are affecting the academic achievement of students. Several researchers (e.g., Biggs and Tinsley, 1970; Lehmann, 1960; Soares, Guisande, Almeida, and Paramo, 2009) have examined different factors that influence the academic achievement of the students. Research findings from several studies have identified factors such as personality traits, cognitive, family, socio-economic status, school environment and training programs that affect the performance of students.

Education must work towards developing higher order thinking skills (HOTS) commensurate with their levels. One important component of HOTS is critical thinking. Critical thinking is intellectual, active, skillful and disciplined process in which the thinker should conceptualise, analyse, synthesise and evaluate gathered information that are collected or generated based on observation, experience, reflection and reasoning as a guideline to direct belief and action in daily life issues. This type of thinking is

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based on universal intellectual values such as clarity, accuracy, precision, consistency, relevance, sound evidence, good reasons, depth, breadth, and fairness (Defining Critical Thinking, 2013).

"Like reading and writing, critical thinking is important due to its applicability in so many areas of life and learning" (American Philosophical Association, 1990, as cited in Stupnisk, Renaud, Daniels, Haynes, and Perry, 2008, p. 524). The term critical thinking dates back to the Greek philosopher Socrates, as a special dialogue with the aim of using reasoning to examine opinions, because for him reflection on the quality of the belief and thinking was in the centre of thoughts (Ennis, 1987; Paul, 1993, as cited in Geng, 2014, p. 124). Based on 64 definitions of critical thinking, Geng (2014) concluded that the nature of critical thinking is composed of (i) taking judgment, (ii) argument, (iii) questioning, (iv) information processing, (v) problem solving, (vi) meta-cognition (vii) skills, and (viii) dispositions (p.127). Richard Paul debated about interrelationship between thinking and learning and argued to gain knowledge one must think and proper achievement is a result of its comprehension and its justification through critical thought (Andreou, Papastavrou, and Merkouris, 2014, p. 363).

Boghossian (2006) explained and analysed Socratic pedagogy based on critical thinking and broke down critical thinking according to APA's Delphi Report. APA Delphi Report defined critical thinking as the judgment that is purposeful and self-regulatory. 'This judgment then results in interpretation, analysis, evaluation, and inference of evidence, concepts, methods, criteria, and contexts'. In this definition experts conceptualised six central core elements of critical thinking skills:

(i) *Interpretation*: comprehend and express meaning or significance
(ii) *Analysis*: identify the intended and actual inferential relationships
(iii) *Evaluation*: assess logical strength
(iv) *Inference*: draw reasonable conclusions
(v) *Explanation*: state the results and justify one's reasoning
(vi) *Self-regulation*: monitor one's cognitive activities (p. 47).

According to the national panel of experts, who participated for two years in a Delphi Project (1990), "We understand critical thinking to be purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological,

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criteriological, or contextual considerations upon which that judgment is based. CT is essential as a tool of inquiry. As such, CT is a liberating force in education and a powerful resource in one's personal and civic life. While not synonymous with good thinking, CT is a pervasive and self-rectifying human phenomenon. The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit. Thus, educating good critical thinkers means working toward this ideal. It combines developing CT skills with nurturing those dispositions which consistently yield useful insights and which are the basis of a rational and democratic society. The national Delphi project identified affective dispositions as well as skills abilities associated with the ideal critical thinker" (as cited in Facione, 1991, p. 4–5).

McGuire (1995, as cited in Boghossian, 2006, p. 43), to avoid faulty reasoning/thinking, emphasised on improving critical thinking and moral reasoning. Boghossian (2006) concluded that elements of Socratic pedagogy can be integrated structurally with curricula and the learning objectives of existing correctional educational programmes, and that correctional educators incorporate Socratic techniques to their daily lessons to foster critical thinking skills (p. 60).

In recent years more attention has been given to the role of personality factors. The question rises is, which one is more effective? In 1962, Lehmann designed a study to investigate relationship between critical thinking and some personality factors with scholastic performance in social science courses and found that critical thinking for both the males and females is better predictor of performance in social science courses.

Research indicated that critical thinking is composed of two main factors: critical thinking skills and disposition. Previous research on critical thinking has concentrated on critical thinking skills and excluded critical thinking disposition factors (Browne, Haas, and Keeley, 1978; Ennis, 1962, as cited in Taube, 1997, p. 129). Later research compounded dispositional factors into a two-factor model

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to clarify which factor influences critical thinking performance. Assumption was that two-faced model is more plausible. Findings indicated that there is a strong correlation between ability and disposition and it is plausible that one is a cause of the other (Taube, 1997, p. 157). In conclusion, fostering critical thinking requires considering both ability and disposition. It is essential for educators, psychologists, and administrators to focus on two factors of critical thinking when attempting to promote an individual's critical thinking in educational systems where the major aim of education is to enhance academic performance (Taube, 1997).

Tiruneh, Verburgh, and Elen (2014) highlighted that effective interventions promote students' critical thinking ability. According to Abrami et al. (2008), critical thinking as a fundamental aim of education has important link with the conception and organisation of educational activities. Atkinson (1997) emphasised that critical thinking is one of the most widely discussed concepts in today's education, educational reform and social practice (p. 71). Richard Paul believed that to gain knowledge one must have the ability to think critically. He asserted to achieve comprehensive and proper result; person should justify his/her thought logically (As cited in Andreou, Papastavrou, and Merkouris, 2014, p. 363). Holmes, Wieman, Carl, and Bonn (2015) claimed that critical thinking should be important goal of education and demonstrated that students with ability for acquisition of data and relating it to scientific methods showed much more sophisticated reasoning.

Wang, Pascarella, Laird, and Ribera (2015) conducted a study to determine substantial part of higher-order learning such as critical thinking and found that the impact of clear and organised instruction on growth in critical thinking skills significantly mediated students to have deep approaches to learning. Yang and Chang (2013) conducted a study to investigate the effect Digital game-based learning on students' critical thinking and academic achievement among seventh-grade students taking 67 students as their sample. The results of the study indicated that digital game programme improved critical thinking and academic achievement. Sarigoz (2012) found that critical thinking skills helped students to act logically and make decision accurately. Gharib, Rabieian, Salsali, Hadjizadeh, Kashani, and Khalkhali (2009) conducted another study about critical thinking skills and disposition among freshman and senior students of Health Care Management on a

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sample of 60 students and found that the total scores of critical thinking were related to the students' positive tendency to apply critical thinking skills. It also indicated that there was no significant difference between the freshmen and senior students' score patterns. Ernst and Monroe (2004) examined high school students' critical thinking skills and disposition toward critical thinking on a sample of 404 students of 9th and 12th grades in Florida. Results indicated positive effect on critical thinking skills when controlling for GPA (Grade Point Average).

Facione (2000) argued that skill in critical thinking is positively correlated with the internal motivation to think and that specific critical thinking skills are related with specific critical thinking dispositions. Therefore, these assumptions suggest that a skill-focused curriculum would lead persons to be both willing and able to think. It also asserted that "effective teaching must include strategies for building intellectual character rather than relying exclusively on strengthening cognitive skills". Yeh and Wu (1992) investigated relationship between critical thinking and academic achievement among elementary, junior and senior high school students on a sample of 1022 students from selected grade levels and found positive and significant correlation between critical thinking and academic achievement.

The above review suggests that there is a need to develop critical thinking abilities and dispositions among school going students. Educational system needs to take proactive initiatives in this direction. It is also necessary that the school systems assess the present levels of critical thinking among learners and works towards developing them further. In the present study, researchers have attempted to answer the following two research questions.

Research Questions

1. Do students of secondary and senior secondary schools differ on critical thinking?
2. Does critical thinking affect the academic achievement of secondary and senior secondary schools students?

Objectives

In order to answer the above two research questions, the following two objectives are developed:

1. To study whether students of secondary and senior secondary schools differ significantly on critical thinking.

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2. To study whether critical thinking affects academic achievement among students of secondary and senior secondary schools.

Hypotheses

1. There is no significant difference between the students of secondary and senior secondary school students on their critical thinking level.
2. Critical thinking does not affect academic achievement among secondary and senior secondary school students.

Method

The descriptive survey method was used in the study. The population of the study comprised secondary and senior secondary school students of Mysuru City, who were studying in english medium, in Government and Private High Schools and Pre University Colleges during academic year of 2015–2016. A total of 625 students from the above mentioned schools participated in the study. Further, the students enrolled in Classes 9th, 10th, 11th and 12th were selected for this study that were approximately of 14 to 18 years of age. The sampling frame developed is given in Table 1.

Table 1
Sampling Frame

Mysuru City (9th, 10th 11th and 12th Standards) 625 Students			
Secondary 375		**Senior Secondary 250**	
Government Schools 50	Private Schools 325	Government Schools 100	Private Schools 150

In the study, Mysuru Critical Thinking Scale (MCTS) constructed by C.G. Venkatesha Murthy (2014) was used. The percentage of marks obtained by the students in the previous annual term examination was taken as academic achievement.

Results and Discussion

In order to test the first hypothesis chi square test was used to compare the performance of the students of secondary and senior secondary stages who are on different levels of critical thinking. In order to test the second hypothesis, one way ANOVA was used

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to compare the academic achievement scores of students who are on different levels of critical thinking. The results of the study are discussed hypothesis wise as follows.

In order to test the first hypothesis, the secondary school students and senior school students who are on different levels of critical thinking were identified and tabulated (Table 2).

Table 2
Number of Secondary and Senior Secondary School Students on Different Levels of Critical Thinking

Critical Thinking Levels	Secondary School Students	Senior Secondary School Students	Total
Poor	191 (50.93 %)	132 (52.80%)	323 (51.68%)
Average	61 (16.27%)	49 (19.60%)	110 (17.60%)
High	123 (32.80%)	69 (27.60%)	192 (30.72%)
Total	375 (100%)	250 (100%)	625 (100%)

Table 2 indicates that out of the 625 students, a majority of the sample was poor on critical thinking to the tune of 52 per cent, around 18 per cent are average critical thinkers and around 31 per cent are high critical thinkers. Since, the total number of students of secondary and senior secondary were different, in order to compare them, each of the three levels of learners were converted into percentages. A comparison of secondary and senior secondary students on their critical thinking levels indicated that a larger percentage of senior secondary students are poor as well as average critical thinkers, and a larger percentage of secondary school students were high on critical thinking ability. It means apparently, secondary school students are better than senior secondary school students on critical thinking abilities. In order to verify it statistically, it was subjected to chi square, which yielded the following.

Table 3 indicates that there was no significant difference between the students of secondary and senior secondary schools who are on different levels of critical thinking. It means, whatever variations that was seen in the levels of critical thinkers among secondary and senior secondary was only a matter of chance and that apparent difference is not statistically significant. Therefore, they were more or less the same on their critical thinking levels. So, whether one is at secondary stage or senior secondary stage they will not differ on their critical thinking abilities.

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Table 3
Chi-Square Test Results of Comparison of Secondary and Senior Secondary Level Students on Three Levels of Critical Thinking

	Value	df	Asymp. Sig. (2–sided)
Pearson Chi-Square	2.368	2	0.306
N of Valid Cases	625		

In order to test the second hypothesis, the academic achievement scores of all the students who are on different levels of critical thinking were identified and tabulated (Table 4).

Table 4
Distribution of the Sample on Different Levels of Critical Thinking

	Poor	Average	High	Total
Frequency	323	110	192	625
Percentage	51.7	17.6	30.7	100

Table 4 indicates that out of the entire sample of 625 students, 323 (51.7 per cent) students were poor on critical thinking, followed by 110 (17.6 per cent) as average and 192 students (30.7 per cent) were at high level on critical thinking. It means, in the entire group, almost less than one-third of the group of the sample were high on the critical thinking levels, while remaining were either on average level or poor level on critical thinking. Further, there was a huge percentage to the tune of almost 52 per cent of the sample, who were poor on their critical thinking abilities. This situation should be the cause of concern. The academic achievement scores of different levels of critical thinkers were tabulated. Table 5 contains the results.

Table 5
Descriptive Statistics of Academic Achievement of Three Levels of Critical Thinkers

Critical Thinking Levels	N	Mean	Std. Deviation	Std. Error	Min	Max
Poor	323	72.08	13.200	0.734	35	96
Average	110	75.31	14.153	1.349	40	97
High	192	81.38	12.035	0.869	38	98
Total	625	75.51	13.636	0.545	35	98

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Table 5 indicates that the mean academic achievement scores of the sample increased as they moved from poor to high levels of critical thinking. Those students who were high critical thinkers were also high on academic achievement (M=81.37) and those who were poor in critical thinking were also low on their academic achievement (M=72.08). Further, it can be seen that the secondary and senior secondary students who were on different levels of critical thinking varied on their mean and SD. In order to study whether the above three groups of critical thinkers differ significantly on their academic achievement, the obtained scores were subjected to one way ANOVA (Table 6).

Table 6
One-way ANOVA of Academic Achievement of Three Groups of Critical Thinkers

Groups	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10417.533	2	5208.766	30.679	0.000
Within Groups	105604.284	622	169.782		
Total	116021.817	624			

Table 6 indicates significant effect of critical thinking on academic achievement. Hence, the null hypothesis is rejected. It means the three groups of critical thinkers differed significantly on their academic achievement. Since, the obtained *F* ratio was significant, there is a need to see which of the three groups differ significantly. The results of the post hoc comparisons are presented in Table 7.

Table 7
Multiple Comparisons of Three Levels of Critical Thinkers for Their Academic Achievement using Tukey's HSD

(I) Critical Thinking Level	(J) Critical Thinking Level	Mean Difference (I-J)	Std. Error	Sig.
Poor	Average	–3.228	1.438	0.065
	High	–9.299	1.187	0.000
Average	Poor	3.228	1.438	0.065
	High	–6.071	1.558	0.000
High	Poor	9.299	1.187	0.000
	Average	6.071	1.558	0.000

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Table 7 shows significant differences between poor and high (Sig=0.00) and also between the average and high critical thinking groups on their academic achievement. While, there was no significant difference between poor and average groups on academic achievement. It means, the post hoc comparison clearly indicates that students who are high level of critical thinking differ significantly from the poor critical thinking group in favour of the former group as the mean score indicates. Further, the other two groups, average and high critical thinking groups are also found to differ significantly on their academic achievement in favour of the high critical thinking group as mean scores of the latter is higher that the former group. It means the higher levels of critical thinking affects their higher levels of academic achievement. Therefore, critical thinking is found to positively affect academic achievement among secondary and senior secondary school students.

The poor and the average critical thinking groups however have not differed significantly as their mean scores and mean difference on academic achievement are not too wide. It means, conceptually, in the present study, the poor and the average level critical thinkers are more or less same on their academic achievement. It means, in the present study the poor and the average critical thinking groups are not two different groups when it comes to their academic achievement.

The above finding appears to have a large consensus among researchers implying that critical thinking is an important variable to be focused as a part of education process which can positively influence academic achievement among learners. Therefore, it is an important variable to be focused as a part of education process.

Conclusions and Implications

The results of this study demonstrate that critical thinking ability is related to academic achievement among secondary and senior secondary students and the students with high critical thinking will have high academic achievement. It is therefore necessary that educational process fosters critical thinking abilities among learners. There are different studies which have found and shown that critical thinking can be developed among learners in school situations. Emir, (2013) has found that teachers' critical thinking disposition and thinking styles of students are significantly related. Florea and Hurjui (2015) have identified static and dynamic contexts as useful developing critical thinking among elementary school

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students. Marin, L. M., and Halpern, D. F. (2011), in their Pedagogy for developing critical thinking in adolescents, conducted two studies and compared explicit and imbedded instructional modes and found that the students receiving explicit instruction showed much larger gains than those in the imbedded instruction group. These results provide robust evidence that explicit instruction is an effective method for teaching critical thinking skills to high school students. McMahon, G. (2009) examined the relationship between students working in a technology-rich environment and their development of higher order thinking skills. The research suggests that to develop students' higher order thinking skills, schools should integrate technology across all of the learning areas. This will allow students to apply technology to the attainment of higher levels of cognition within specific contexts. Miri, David, and Uri (2007) conducted a longitudinal case-study aimed at examining whether purposely teaching for the promotion of higher order thinking skills enhances students' critical thinking (CT), and found that the experimental group showed a statistically significant improvement on critical thinking skills components and disposition towards critical thinking subscales, such as truth-seeking, open-thinking, self-confidence, and maturity, compared with the control groups. Our findings suggest that if teachers purposely and persistently practice higher order thinking strategies for example, dealing in class with real-world problems, encouraging open-ended class discussions, and fostering inquiry-oriented experiments, there is a good chance for a consequent development of critical thinking capabilities.

Further, it was also found that secondary and senior secondary students are alike on their critical thinking levels. Together, it implies that it is important to make our learners critical thinkers as they can exceed in education. This is an important correlate of academic achievement. Therefore, enough attention is to be given to this variable by teachers as a part of educational process.

References

Abrami, P. C., etal. 2008. Instructional Interventions Affecting Critical Thinking Skills and Dispositions: A Stage 1 Meta-analysis. *Review of Educational Research*. 78(4), pp. 1102–1134. doi:10.3102/0034654308326084

Andreou, C., E. Papastavrou and A. Merkouris. 2014. Learning Styles and Critical Thinking Relationship in Baccalaureate Nursing Education: A Systematic Review. *Nurse Education Today*. 34, pp. 362–371. Retrieved from http://dx.doi.org/10.1016/j.nedt.2013.06.004

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Atkinson, D. 1997. A Critical Approach to Critical Thinking in Teachers of English to Speakers of Other Languages (TESOL). *TESOL Quarterly*. 31(1), pp. 71–94. Retrieved from http://www.jstor.org/stable/3587975

Biggs, D.A. and D.J. Tinsley. 1970. Student-made Academic Predictions. *The Journal of Educational Research*. 63(5), pp. 195–197. Retrieved from http://www.jstor.org/stable/27535961

Boghossian, P. 2006. Socratic Pedagogy, Critical Thinking and Inmate Education. *Journal of Correctional Education*. 57(1), pp. 42–63. Retrieved from http://www.jstor.org/stable/23282687

Defining Critical Thinking. 2013. *The Critical Thinking Community*. Retrieved from http://www.criticalthinking.org/pages/defining-critical-thinking/766

Emir, S. 2013. Contributions of Teachers' Thinking Styles to Critical Thinking Dispositions (Istanbul-Fatih Sample). *Educational Sciences: Theory and Practice*. 13(1), pp. 337– 347. Retrieved from http://ezp.lib.ttu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=85466205

Ernst, J. and M. Monroe. 2004. The Effects of Environment-Based Education on Students' Critical Thinking Skills and Disposition toward Critical Thinking. *Environmental Education Research*. 10(4), pp. 507–522.

Facione, P.A. 1991. Using the California Critical Thinking Skills Test in Research, Evaluation and Assessment (ED337498). *Reports-Evaluation/Feasibility*. California Academic Press.

Facione, P.A. 2000. The Disposition toward Critical Thinking: Its Character, Measurement and Relationship to Critical Thinking Skill. *Informal Logic*. 20(1).

Florea, N.M., and E. Hurjui. 2015. Science Direct Critical Thinking in Elementary School Children. *Procedia – Social and Behavioural Sciences*. 180, 565–572. http://doi.org/10.1016/j.sbspro.2015.02.161

Geng, F. 2014. A Content Analysis of the Definition of Critical Thinking. *Asian Social Science*. 10(19), pp.124–128. Retrieved from http://dx.doi.org/10.5539/ass.v10n19p124

Gharib, M., M. Rabieian, Salsali, E. Hadjizadeh, A.S. Kashani and H. Khalkhali. 2009. Critical Thinking Skills and Critical Thinking Dispositions in Freshmen and Senior Students of Health Care Management. *Iranian Journal of Medical Education*. 9(2). pp.1–11.

Holmes, N.G., Carl E. Wieman and D.A. Bonn. 2015. Teaching Critical Thinking. *Proceedings of the National Academy of Sciences of the United States of America*. 112(36), pp. 11199–11204. Retrieved from http:// ezproxy.uni-mysore.ac.in:2334/Search.do?product

Lehmann, I.J. 1962. The Relationship between Critical Thinking, Attitudes, Values and Performance in Social Science Course. *Yearbook of the National Council on Measurement in Education*. 19, pp. 23–32. Retrieved from http://www.jstor.org/stable/41862674

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Marin, L. M. and D. F. Halpern. 2011. Pedagogy for Developing Critical Thinking in Adolescents: Explicit Instruction Produces Greatest Gains. *Thinking Skills and Creativity*. 6(1), pp. 1–13. http://doi.org/10.1016/j.tsc.2010.08.002

McMahon, G. 2009. Critical Thinking and ICT Integration in a Western Australian Secondary School. *Educational Technology and Society*. 12(4), pp. 269–281.

Miri, B., B.C. David and Z. Uri. 2007. Purposely Teaching for the Promotion of Higher Order Thinking Skills: A Case of Critical Thinking. *Research in Science Education*, *37*(4), 353–369. http://doi.org/10.1007/s11165–006–9029–2

Sarigoz, O. 2012. Assessment of the High School Students' Critical Thinking Skills. *Procedia–Social and Behavioural Sciences*. 46, pp. 5315–5319.

Stupnisky, R.H., R.D. Renaud, L.M. Daniels, T.L. Haynes and R.P. Perry, 2008. The Interrelation of First-Year College Students' Critical Thinking Disposition, Perceived Academic Control and Academic Achievement. *Research in Higher Education.* 49(6), pp. 513–530. Retrieved from http://www.jstor.org/stable/25704580

Soares, A.P., A.M. Guisande, L.S. Almeida and F.M. Paramo. 2009. Academic Achievement in First-Year Portuguese College Students: the Role of Academic Preparation and Learning Strategies. *International Journal of Psychology.* 44(3), pp. 204–212. doi: 10.1080/ 00207590701700545

Taube, K.T. 1997. Critical Thinking Ability and Disposition as Factors of Performance on a Written Critical Thinking Test. *The Journal of General Education.* 46(2), pp. 129–164. Retrieved from http://www.jstor.org/stable/27797335

Tiruneh, D.T., A. Verburgh and J. Elen. 2014. Effectiveness of Critical Thinking Instruction in Higher Education: A Systematic Review of Intervention Studies. *Higher Education Studies.* 4(1), pp. 1–17. Retrieved from http://dx.doi.org/10.5539/hes.v4n1p1

Wang, J.S., E.T. Pascarella, T.F.N. Laird and A.K. Ribera. 2015. How Clear and Organised Classroom Instruction and Deep Approaches to Learning Affect Growth in Critical Thinking and Need for Cognition. *Studies in Higher Education.* 40(10), pp.1786–1807. URL: http://doi.org/10.1080/03075079.2014.914911

Yang, Y.T.C. and C.H. Chang. 2013. Empowering Students through Digital Game Authorship: Enhancing Concentration, Critical Thinking and Academic Achievement. *Computers and Education.* 68, pp. 334–344. URL: http://www.sciencedirect.com /science /article/pii/S0360131513001516

Yeh, Y. C. and J.J. Wu. 1992. The Relationship between Critical Thinking and Academic Achievement among Elementary and Secondary School Students. *Journal of Education and Psychology.* 15(7), pp. 79-100. URL: http://www.fed.cuhk.edu.hk/en/jep/9215/9215079.htm

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