

# How is the Influence of Critical Thinking on Education Revolution Era 4.0? : A Pilot Study

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**Abstract:** The education revolution 4.0 demanded educators to be creative and innovative. These skills were aimed to improve the quality of students' graduated from their institutions. One of the main skills needed to be developed was students' critical thinking skills. To know the relation between critical thinking skills and students' score (GPA), this study was conducted using quantitative approach with correlational study on regression. The samples were 340 students from six faculty of a public University in Bandung, West Java, Indonesia. The results showed that critical thinking skills had a low correlation with GPA, which was only 1.7%. Furthermore, the highest level of critical thinking skills was shown by students from social sciences and language background as both of them focused on developing analysis skills and examined in-depth reading regularly in classroom learning. GPA is proven to influence critical thinking skills, so that it can be followed up with guidance that preservative to provide developing critical thinking skills so that the GPA of students also contributes to quality outcomes.

**Keywords:** education revolution 4.0, critical thinking, adolescents, guidance, counseling

## INTRODUCTION

The education revolution 4.0 had positive and negative impacts that needed to be reviewed in the process of implementing preventive and preservative efforts that was appropriate in university level. Although the 4.0 educational revolutions were carried out for some years in universities, some important aspects still needed to be anticipated including the internet usage capacity, internet impacts in learning, information obtained from the internet used, and educators' competency in overcoming students, etc.

The most important thing that needed to be prepared in confronting educational revolution was the quality of the educator that could produce good quality students. An ability to address some information obtained from various online sources also needed to be taken seriously. This was also related to critical thinking skills towards the use of media (Marfu'i, 2018). Critical thinking and problem solving skills were skills that became a supporting component in using technology in the global era (Chaeruman, in Suarsana, 2013).

In the implementation of education in a higher level, students and educators needed to analyze and evaluate the education revolution 4.0 carefully. Related to critical thinking skills, in the era of global competition, some skills were needed in several fields, including decision making and problem solving skills. Those needed to be considered again to be improved first before preparing learning plan that was appropriate to be applied in the era of education revolution 4.0.

This is the question, why do critical thinking skills contribute to the educational revolution in the 4.0 era. Basically, the author often finds several empirical facts about the lack of critical thinking skills in students. These facts include; 1) frequent demonstrations occur on campus because of provocation of hoax issues or information; 2) related to GPA, the writer found some cheating in class due to uncritical students in reading the exam questions that were presented so

that they only trusted what was written by friends in the answer sheet; and 3) spreading false news about conflicting educational issues, etc. The source of the current degradation of teenage characters is often not checking information received and using what is heard without being analyzed first. This is in accordance with the statement stated that some information must contain errors, the thing to do is to check back to the main source where the information was obtained (Starkey, 2004). This is also related to the academic quality of the students themselves, which is reflected by the GPA. From this paragraph it can be concluded that critical thinking skills are one of the core in the 4.0 education revolution.

Critical thinking was an activity using serious thinking ability to get various intellectual standards such as clarity, relevance, skilled, coherence and others (Fisher, 2009, p. 10). The era of globalization required individuals to be more critical in carrying out several activities in several fields. Critical thinking skills were needed in addressing and analyzing some information or news. Adolescents were expected to be able to distinguish correct and incorrect information using supporting data (Kirmizi, 2015). The role of high-level thinking skills (HOTS) was assumed to be very important in the education revolution 4.0.

Based on a number of statements in the form of facts and research results above, the objective of this research was to find out how critical thinking could influence the education revolution 4.0. In addition, this study would also identify why critical thinking became important in the 4.0 educational revolutions. This is also supported by several research results which prove that critical thinking skills can be sharpened through curriculum design and classroom learning (Fern, Poblete, & Galindo-dom, 2019). These results indirectly reveal that educators are the main hope in the development of critical thinking skills of students who are rated in the low category (Marfu'i, 2018).

## **METHOD**

This study used descriptive quantitative approach with correlational method in regression analysis. The samples were 340 students from a public University in Bandung, West Java, Indonesia taken randomly by considering the accessibility. The author uses a sample that is easily accessible in six faculties because the population used is very broad with a number of approximately 6300 students in eight faculties. The stages of this research were testing limited samples, conducting reliability test and validity test of instrument items for critical thinking skills, reducing invalid items, collecting data and testing hypothesis. This study was aimed as a pilot study in testing the external validity of the test instrument for teen critical thinking skills (TKBKR) constructed by researchers to know whether it had been relevance to measure individuals' abilities in terms of cognition or not.

## **FINDINGS**

The findings of this study could be explained from various sides. First, the result of this study indicated that there was a relationship between students' critical thinking skills and cumulative grade point index, where the cumulative achievement index value could be a representation of students' intellectual development. Critical thinking skills were influenced by intellectual development (Marfu'i, 2018). Intellectual was a person's mental performance in responding a problem and studying the causal relationship which became a stimulus both from the outside and from within. In this study, the results of the correlation test indicated that there was a relationship between critical thinking skills and the Grade Point Average. This can be seen in the following table.

**Result of The Research**

The findings of this study can be explained from various sides. First, the results of this study indicate that there is a relationship between students' critical thinking skills and cumulative grade point index, where the cumulative achievement index value can represent a representation of intellectual development. Critical thinking skills are influenced by intellectual development (Marfu'i, 2018). Intellectual is a person's mental performance in responding to a problem and studying the causal relationship which becomes a stimulus both from the outside and from within. In this study, the results of the correlation test indicate that there is a relationship between critical thinking skills and the Grade Point Average. This can be seen in the following table.

TABLE I. THE RESULT OF REGRESSION ANALYSIS

<b>Model Summary</b>				
	R		Std. Error	
Model	Square	Adjusted	of the	
1	R Square	R Square	Estimate	
1	,131 <sup>a</sup>	,017	,013	5,843

a. Predictors: (Constant), IPK\_X

In the table above, it could be seen that from R Square value, the GPA had an effect of 0.017 or 0.17% on students' critical thinking skills. The influence of critical thinking skills on GPA was very small, but it still had an effect on the quality of students' output related to the education revolution 4.0. Critical thinking was one of the components of intellectual ability which influenced the cumulative achievement index.

Critical thinking skills were also influenced by the learning climate in the classroom. Based on the results of observations made on students of six faculties at a public University, in Bandung, West Java, there were some differences of classroom atmosphere and learning styles of every class. These assumptions were examined by comparing the results of the mean scores in the tests of critical thinking skills of students from six faculties with the following results.

TABLE II. THE COMPARISON OF MEAN RANK

<b>Ranks</b>			
	Faculty	N	Mean Rank
Critical Thinking Skills	FPMIPA	44	192,74
	FPIPS	64	159,50
	FPBS	74	159,56
	FPOK	33	87,14
	FIP	32	75,28
	FPTK	57	185,61
	Total		304

The table above showed the results of the comparison of the mean rank scores in each faculty. The faculty of education had the lowest mean rank score, where it could be predicted that this faculty had a learning climate that did not apply critical thinking skills to meet the 4.0 educational revolution goals. Then, FPMIPA showed a mean rank of 192, 74 and occupied the

highest position among the other five faculties. It could be concluded that the Faculty of Mathematics and Science had a good learning climate and the learning content was highly analytical.

The results above were still less detailed in identifying students' critical thinking skills. For more details, it was necessary to categorize students' critical thinking skills so the general picture of the level of students' critical thinking was known. The results of the above research were supported by the categorization table in each faculty as follows.

TABLE III. The Categorization of Students' Critical Thinking Skills of Each Faculty

Category	FPMIPA		FPIPS		FIP		FPBS		FPOK		FPTK	
	Frek	%	frek	%	Frek	%	frek	%	frek	%	Frek	%
Low	17	39%	20	31%	14	44%	20	31%	13	39%	19	33%
Medium	12	27%	22	34%	7	22%	22	34%	10	30%	21	37%
High	15	34%	22	34%	11	34%	22	34%	10	30%	17	30%

In table III, FMIPA and FPOK had low critical thinking skills with a percentage of 39%. On the other hand, FPIPS got a high category with a percentage of 34%. FPTK obtained a medium category with a percentage of 37%. The results of this categorization were sufficient to support the results on table II which explained the mean rank in each faculty. If further analysis was done to plan the next learning program, it was necessary to analyze further the categorization of some aspects of students' critical thinking skills to find out the weak aspects that required some follow-up in the form of some actions applied in the learning process. The categorization results of each aspect could be seen in the table below.

TABLE IV. THE CRITICAL THINKING CATEGORIZATION OF EACH FACULTY

Category	ASPECTS					
	Interpretation	Analysis	Evaluation	Inferention	Explanation	Self Regulation
Low	62%	34%	36%	49%	35%	45%
Medium	0%	0%	28%	16%	23%	17%
High	38%	66%	36%	35%	42%	38%

Based on the table above, it could be concluded that the students' analytical and explanatory abilities were in the high category, while the ability of interpretation, evaluation, inference, and self-regulation were in the low category. The categorization of those four aspects of critical thinking required to be followed up more. Some problems that caused students' low ability of interpretation, evaluation, inference, and self-regulation needed to be identified.

The process of learning in the classroom needed to be redesigned dealing with how to deliver the materials to students, how the class climate created and how the learning system in the classroom. The rules of learning in the classroom for certain materials needed to be arranged well. Considering the result above, the ability of interpretation needed to be prioritized since it had the lowest score. If the ability of interpretation had a low score, students would not be careful in receiving information from others. Furthermore, in conveying or explaining some information to others, students might have different perceptions. As the digital era developed rapidly in learning now, this fact needed to be anticipated seriously.

The use of digital-based learning media had many weaknesses and strengths. The effectiveness and efficiency of the use of learning media became one of the advantages of the 4.0 educational revolutions. While the weaknesses of the education revolution 4.0 were the main challenges for educators / instructors, where educators was required to master IT and had creativity in delivering learning to be more communicative and to build students' critical thinking skills in a structured classroom climate.

### ***Discussion***

Thinking skills involved some activities such as considering some things, determining certainty, designing, calculating, measuring, evaluating, comparing, classifying, distinguishing, connecting, interpreting, seeing possibilities that existed, making analysis and synthesis reasoning or drawing conclusions from existing premises to consider and decide some things (Gibbs, Gambrell, & Blakemore, 2015; Williams, Allin, & Booher, 2015). This was supported by Solso's opinion (in Khodijah, 2006, p. 117) that critical thinking was a process of mental representation that was formed through information transformation with complex interactions because it required mental attributes such as assessment, abstraction, logic, imagination, and problem solving .

Other examples of cognitive activities that could be classified as HOTS activities were argumentation, comparison, problem solving, resolution by dissent, decision making and identification of hidden assumptions (Zohar & Nemet, in Vidergor, 2017). Whereas according to Ashman Conway (in Wowo Sunaryo, 2011), thinking ability involved at least six types of abilities which included metacognition, critical thinking, creative thinking, cognitive processes (problem solving and decision making), core thinking skills (such as representation and summarizing) and understanding the roles of content knowledge, which could be identified in the application of learning through Bloom's taxonomy framework.

Some factors that influenced students' critical thinking skills were the environment where learning and the interaction between teachers and students influenced students' thinking skills. The climate and dynamics in students' learning motivation would also affect students' critical thinking (Ab Kadir, 2017; Cheng & Wan, 2017; Coşkun, Tosun, & Macaroğlu, 2009 ; Delong, 2015; Dilekli & Tezci, 2016). According to Heong et.al. (2011), there was a positive relationship between the level of high-level thinking skills and gender, learning outcomes, and socio-economic status. Therefore, individuals were expected to learn high-level thinking skills to help them to solve problems in learning and improve their learning outcomes.

Recently Bloom's taxonomy had been linked to Multiple Intelligences, which included problem solving skills, creative thinking, critical thinking and technological integration capabilities (Narayanan & Adithan, 2015). This could be exemplified when a student who had performed at an advanced level, he also mastered the material at the level of knowledge and understanding first (University of Wisconsin, Teaching Academy, 2003). A teacher could also ask more questions at the level of analysis and synthesis than simply recalling facts at the level of knowledge to improve students' critical thinking skills.

If a teacher was able to use Bloom's taxonomy framework at the level of analysis, the teacher could enable students to think critically and analytically. It was supported by Cruz (2004) that students could combine the ability to analyze, synthesize, evaluate concepts and apply them in real life situations. The focus of HOTS as stated by Wowo Sunaryo (2012) were in high-level thinking skills such as verbal reasoning skills, argument analysis skills, testing hypotheses skill, using possibilities and uncertainties, decision making and problem solving skill. Of the five

categories, it could be said that high-level thinking skills were one of the characteristics of critical thinking skills. Therefore, to find out that HOTS, it was necessary to stimulate the ability of critical thinking skills.

Unfortunately, in Indonesia, a tool that could be used to measure adolescents' critical thinking skills generically was not yet available. While various solutions to answer the challenge of education revolution 4.0 where critical thinking was needed in any cases were important. This was the reason why the researcher constructed a measurement test for students' critical thinking skills with measuring power as follows.

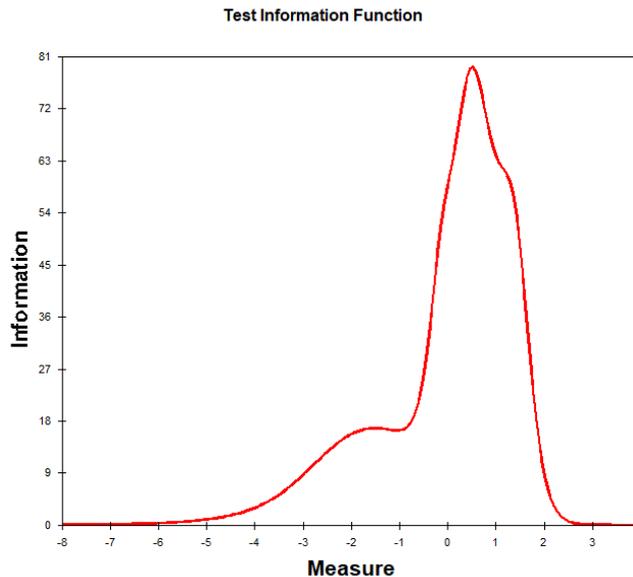


FIGURE I. TEST INFORMATION FUNCTION

In the picture above, it could be seen that the test of critical thinking skills used in this study showed that the test could only measure students' critical thinking skills in the medium and high categories. So, this test needed to be rearranged to balance its distribution by adding some categories that had a low difficulty level. This influenced the results of this study where more aspects of critical thinking skills were lower than the number of aspects which had a high category because the questions were dominated by difficult categories (Marfu'i, 2018). One of some considerations in measuring adolescents' critical thinking skills was the test should had a high consistency. The test used in this study was more precisely applied with the aim of the selection test. The additional figure to describe critical thinking skills of students as follows.

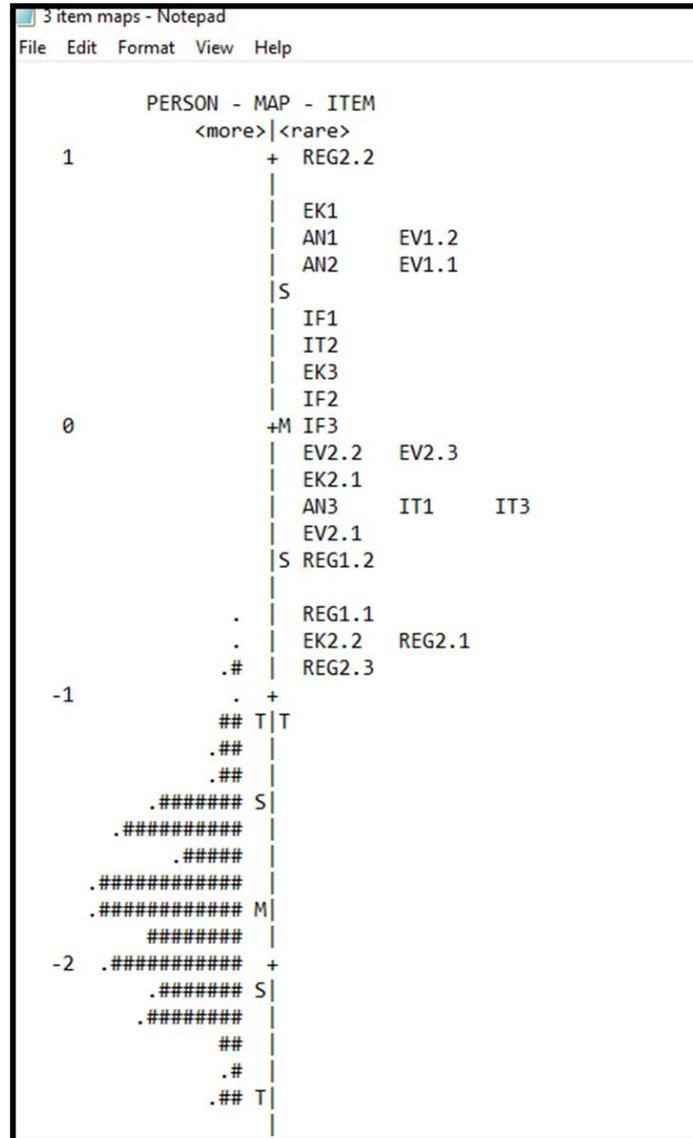


Figure 2. Item Map (Source: Marfu'i, 2018)

Critical thinking skills of students based on the description of the item map above can be interpreted in the low category, or it can be said of students who reach the target level of difficulty of the questions in the low category.

### CONCLUSION

Critical thinking skills support the educational revolution 4.0 where these skills are one of the core of the goals of educational development. Critical thinking skills are predicted to be influenced by curriculum design in schools and learning from educators themselves in their development. This study showed that there was a link between critical thinking skills towards students' learning outcomes. Learning outcomes in the form of Grade Point Average (GPA) was a representation of students' cognitive ability. The result of this study showed that critical thinking skills had a relationship with a GPA with the percentage of 1.7%. Students who had critical thinking skills in the high category were dominated by students from scientific and social science backgrounds since they had strong reading literacy and the learning method used in their class was still dominated by traditional methods or not fully utilizing the digitization

system. The critical thinking skills have an important component, namely analytical skills and evaluation abilities that need to be developed through providing conservative and cognitive-based group guidance given the condition of the results of the assessment of critical thinking skills of students in the low category.

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## REFERENCES

- Ab Kadir, M. A. (2017). What Teacher Knowledge Matters in Effectively Developing Critical Thinkers in the 21 st Century Curriculum? *Thinking Skills and Creativity*, 23, 79–90. <https://doi.org/10.1016/j.tsc.2016.10.011>
- Cheng, M. H. M., & Wan, Z. H. (2017). Exploring the effects of classroom learning environment on critical thinking skills and disposition: A study of Hong Kong 12th graders in Liberal Studies. *Thinking Skills and Creativity*, 24, 152–163. <https://doi.org/10.1016/j.tsc.2017.03.001>
- Coşkun, Y. D., Tosun, Ü., & Macaroğlu, E. (2009). Classroom teachers styles of using and development materials of inclusive education. *Procedia - Social and Behavioral Sciences*, 1(1), 2758–2762. <https://doi.org/10.1016/j.sbspro.2009.01.489>
- Cruz, E. Encyclopedia of Educational Technology: *Bloom's Revised Taxonomy*, (2004). [Online]. Diakses Pada Tanggal 5 Maret 2018 Pada <http://Coe.Sdsu.Edu/Eet/Articles/Bloomrev/>
- Delong, M. (2015). Encouraging Critical Thinking in the Classroom : An Example from Aesthetics.
- Dilekli, Y., & Tezci, E. (2016). CLASSROOM PRACTICES FOR TEACHING THINKING. *Thinking Skills and Creativity*. <https://doi.org/10.1016/j.tsc.2016.06.001>
- Fern, D., Poblete, M., & Galindo-dom, H. (2019). Methodologies for teaching-learning critical thinking in higher education: The teacher's view. *Thinking Skills and Creativity*. <https://doi.org/10.1016/j.tsc.2019.100584>
- Fisher, Alec. (2009). *Berpikir Kritis (Sebuah Pengantar)*. Alih Bahasa: Benyamin Hadinata. Jakarta : Erlangga.
- Gibbs, L., Gambrill, E., & Blakemore, J. (2015). About Practice, (April 1995), 193–204.
- Heong, Y.M., *Et Al.* (2011). The Level of Marzano Higher Order Thinking Skills among Technical Education Students. *International Journal of Social Science And Humanity*. Vol. 1, No.2. Pp121-125.
- IM Suarsana, G. M. (2013). Pengembangan E-Modul Berorientasi Pemecahan Masalah. *Jurnal Pendidikan Indonesia*, 2(2), 264–275.
- Khodijah, Nyayu. (2006). *Psikologi Belajar*. Palembang: IAIN Raden Fatah Press.
- Kirmizi, Fatma Susar, Dkk. (2015). Determine the Relationship Between the Disposition of Critical Thinking and the Perception about Problem Solving Skills. *Procedia- Social and Behavioral Sciences Journal*. No.191. Pp. 657-661.
- Kuswana, Wowo Sunaryo. (2012). *Taksonomi Kognitif*. Bandung : Remaja Rosdakarya.
- Kuswana, Wowo Sunaryo. (2011). *Taksonomi Berpikir*. Bandung : Remaja Rosdakarya.

- Marfu'i, Lucky Nindi Riandika. (2018). Pengembangan Tes Keterampilan Berpikir Kritis pada Mahasiswa Universitas Pendidikan Indonesia. *Tesis*. Bandung : Universitas Pendidikan Indonesia.
- Marfu'i, Lucky Nindi Riandika, I., & Nurhuda. (2018). The Analysis of Critical Thinking Skills Test of Adolescent (TKBKR) in Biology Education Students: A Rasch Model Analysis. *Indonesian Journal of Educational Assessment*, 2(1), 31–38.
- Marfu'i, L. N. R. (2017). Adolescent Development In The 21 St Century : Developing Critical Thinking Skills Through Expressive Drawing Techniques. *International E-Journal of Advances in Social Sciences (IJASOS)*, III(9), 773–780.
- Marfu'i, L. N. R., Nurihsan, A. J., Nurhuda, & Vismaia Sabariah Damaianti. (2018). Self-Regulation in Critical Thinking Skills of Buddhist Teenagers for Solving Problems in Indonesia. *BRAIN – Broad Research in Artificial Intelligence and Neuroscience*, 9(1), 101–113. Retrieved from <https://www.edusoft.ro/brain/index.php/brain/article/view/753/860>
- Narayanan, S., & Adithan, M. (2015). Analysis of Question Papers in Engineering Courses with Respect to HOTs (Higher Order Thinking Skills). *American Journal of Engineering Education*, 6(1), 1–10.
- Starkey, L. (2004). *Critical Thinking Skills Success in 20 Minutes a Day* (First Edit). New York: Learning Express.
- Vidgor, H. E. (2017). Effectiveness of the multidimensional curriculum model in developing higher-order thinking skills in elementary and secondary students. *Curriculum Journal*, 5176(May), 1–21. <https://doi.org/10.1080/09585176.2017.1318771>
- Williams, R. L., Allin, J. L., & Booher, C. S. (2015). Psychological Critical Thinking As a Course Predictor and Outcome Variable. *Sage Publisher*, 30, No. 3, 220–223.
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