



A Study On Critical Thinking Skill Among Higher Secondary School Students Of Chennai, Tamil Nadu

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ABSTRACT

The paper reflects the findings of a research study done with the focus on 'Critical Thinking Skill' among Higher Secondary school students. Survey method has been employed to collect the data through a questionnaire, adopting **simple random sampling technique**. 100 students of higher secondary school have been considered as sample for study. The objective of the study has been to assess **Critical Thinking Skill** existing among Higher Secondary School students, and to find whether any significant difference exists in **Critical Thinking Skill** of the students with respect to **gender**, different **Subject Groups** and their **Birth order**. The results have been found to indicate that there is a significant difference in **Critical Thinking Skill** among Higher Secondary Students, with respect to **Gender, different Subject-groups and the birth order**.

Key Words: Critical Thinking Skill - Academic Resilience- Self-Interpretation - Open Mindedness - Attentiveness - Intellectual courage -

Introduction

Critical thinking is a skill to analyze the facts with an objective focus and be able to make a judgment - a kind of emotional intelligence. (**Allaya Cooks-Campbell - 2021**). One with critical thinking skill can clearly and logically think when needed. It helps them to solve problems and make decisions very effectively. (**Dr. Gabriella Rosen Kellerman - 2019**)

Thinking beyond face-value and be able to logically relate

Critical thinking can look beyond what you see at a face-value. We can analyze and see looking from a situation and then gain some insight which would go further than what we normally think from outside. Critical thinking also calls for being able to comprehend the logical relation between two or more ideas/concepts. Taken for example, a team working on the pricing strategy of a company would need to be critical about all the concepts that are relevant.

Critical thinking - a prerequisite

Critical thinking is an essential pre-requisite across all disciplines. The skill comes handy to enable analysis, evaluation, and synthesis of information possible with the required effectiveness. In spite of the focus of education on subject based knowledge, the skill of critical thinking generally remains neglected, leaving students with just the information without comprehension and application skills. With the unexpected growth of knowledge in variety of fields, it is crucial for the students to enhance the capacity to analyze the patterns, measure the levels of data credibility, and possibilities to draw meaningful conclusions. Further, research suggests that students possessing well-honed skills in critical thinking, perform much better academically, and they would be better prepared to meet the growing demands.

To adapt and innovate

The global economy today is witnessing growing demand for critical thinking skills. The whole process therefore needs an integration of critical thinking in the educational practices thus making it quite pertinent. Employers look for individuals who critical-thinkers are having the ability to innovate, adapt to different conditions and end up successfully. Further, the competitiveness of nations' economies also depends on cultivating the employed work force to tackle complex challenges to leverage opportunities. Prioritizing critical thinking in education would benefit individuals apart from contributing to economic strength and innovation as a capacity measurable at global scale. **(Bernard Marr - 2022)**

Nurture to empower

Critical thinking addresses the knowledge gaps in education. It improves academic levels of performance; ideally provides solutions to workforce demands, addressing the larger perspectives of enabling solutions to global economic challenges. Nurturing critical thinking skills in individuals lead to empowerment. They become informed, get equipped with the analytical skills. They will be adaptable thinkers, being able to navigate the difficulties commonly existing in the modern world. Integrating of training in critical thinking in education is therefore essential which is a pre-requisite for innovation, finding solutions to problems and for a sustainable economic growth in the constantly changing global arena. **(SEL Implementation -2024)**

Critical thinking is not Creative thinking

Critical thinking is not Creative thinking, which is the ability to come out with new, and innovative ideas. While Critical thinking is carefully and logically analyzing information on hand. Both Critical thinking and Creative thinking are essential to enhance results in a given situation. **(Maggie Wooll - 2021)**

Types of critical thinking skills.

There are different types of critical thinking skills. The skill depends upon the problem and the different angle to be approached. Sharpening of the critical thinking skills enables tackling of any challenge with comfort & ease.

1. Analytical Thinking
2. Creative Thinking and Idea Generation
3. Decision-Making
4. Problem-Solving
5. Reflection and Assessing Evidence
6. Open-mindedness
7. Good communication

(Sanju Pradeepa - 2023)

The **Delphi report** which was an outcome of the collective work of **FORTY-SIX** experts covering different disciplines - Science & education. Presented various characteristics of critical thinkers. According to them, the Critical thinkers are:

1. Curious.
2. Knowledgeable
3. Believe in reason
4. Open-minded
5. Flexible
6. Fair-minded in evaluation
7. Honest in dealing with personal biases
8. Wise in making judgments
9. Willing to reconsider
10. Clear about problems
11. Orderly in complex problems
12. Diligently looking for relevant information
13. Makes sense in the selection of criteria
14. Focus on the investigation, and
15. Persistent in finding results that match the subject conditions and circumstances



Six dimensions of critical thinking skills according to the Delphi Report

Interpretation - Interpretation is understanding and voicing out various aspects of any given subject. It is about experiences, conditions, Data / information, idea / phenomena, perceptions / opinions, acts / practices, beliefs, rules / regulations, and procedures. It is providing arguments based on the data connected to the subject for providing clarification. In gist, interpretation means to make sense of the data or information in the context relevant for the purpose.

Analysis - It is a process of picking up and understanding the relevance and relationships between statements, questions raised, ideas shared, narratives in support, and the information or data. It necessitates clarifying on the connections and the patterns existing within the information to draw final inferences. Further, analysis needs the skill to pick relevant information and crystalize the connections and the meanings of them which support the statements and the points of view.

Evaluation - Evaluation means assessment and the credibility and validity to the statements or the points of view. It needs assessing the level of credibility by taking into consideration the perceptions, previous experiences, the ideas, the beliefs, and / or the opinions. Evaluation focuses on to determine to identify the rational and logical coherence in regard to the factual relationships and conclusions presented for consideration.

Looking at the summary, interpretation has its focus on understanding and expression of various aspects of a given subject; analysis means identification of relationships observed within information or data, and evaluation process has a measure of the credibility and the coherence supported by logic of statements or points of view made. Every process among these has a crucial role in the clear understanding and the critical engagement with information to be evaluated.

The Inference - This is the stage which involves identification and determination of the needed elements to derive conclusions and evidences to hypotheses. It needs to consider all the relevant information and the consequences thereof, from different sources, such as information / data, observations & reports, beliefs & principles, proofs & evidences, decisions and judgments, principles / beliefs, opinions, ideas / concepts, narratives / descriptions, and questions / clarifications. When inferring the individuals should employ the ability of theirs to zero-in on to identify the elements needed to structure logical conclusions.

Explanation: narration needs articulation of the results using logic to justify the conclusions with the supporting evidence, clear concepts, acceptable methodologies, the points of consideration and the context that supports the process. It is very important to ensure that a clear and relevant response to the questions coming up or the challenges encountered. Explaining helps to communicate the due process and the basis for arriving at the right conclusions.

Self-regulation: Self-regulation is the ability of individuals to oversee and to optimize the cognitive activities of themselves. Further it is being aware of the elements connected to the thinking process of them, the outcomes derived from their thinking, and consciously applying the skills like analysis and evaluation to

their thoughts and the corresponding actions. The need for Self-regulation need not be over-emphasized specially for engaging to support continuous improvement and the growth in one's critical thinking skills.

Concluding to say, it is important to draw inferences relevant to the information; explanation necessitates justification of the conclusions, and self-regulation means monitoring to optimize the cognitive processes to enhance the ability to think critically. These aspects together have contribution in the effectiveness of critical thinking and also to make decisions. **(Muhammad Minan Chusni et al - 2020)**

The paper which is a reflection of the findings of the pilot study done in Chennai, India, on Critical thinking skill among Higher Secondary school students, has been taken for consideration to discuss on the findings of the statistical study and to arrive at the final conclusions.

Methodology

The study - basically an empirical one - involved a Survey method - administering a Questionnaire (Likert scale) (incorporating the dimensions of Critical Thinking) on a sample size of 100 students of Higher Secondary. The data obtained as feedback was critically analyzed applying Statistical method to arrive at the findings and the Conclusions.

Results & Discussions

The Sample size considered for the study was 100 students of Higher Secondary School in Chennai. Survey method has been employed to collect the data through a questionnaire, adopting simple random sampling technique. The statistical output and the derivations from the findings are as discussed below:

Research Component		Qty/Ref	Remarks
Total	Sample size	100	Higher secondary school students
Gender	Boys	60	
	Girls	40	
Subject Groups	Computer Science	27	
	Biology	22	
	Commerce	24	
	Vocational	27	

Table 01

Research Component		Qty/Ref	Remarks
Birth Order	First	50	Boys & Girls Of Higher secondary school students
	Middle	37	
	Last	13	

Table 02

The total number of students - 100 represent THREE groups - Gender; Different Subjects and the Birth order, as mentioned in the Table 01 & 2 above. The data collected as feedback to the Questionnaire which the students responded have been statistically measured for each dimension chosen against the individual groups and the findings provided are shown in the tables along with the interpretations following each table.

Demographic variables	Group	Frequency	Percent
Gender	Male	60	60
	Female	40	40
Group	Computer Science	27	27
	Biology	22	22
	Commerce	24	24
	Vocational	27	27
Birth Order	First	50	50
	Middle	37	37
	Last	13	13

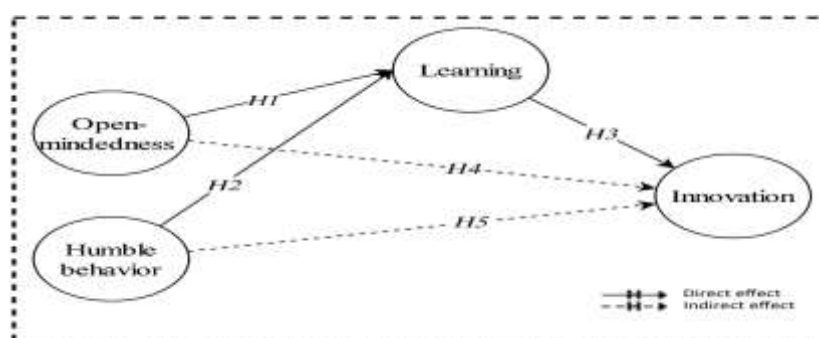
Table 03

Critical Thinking and its dimensions	N	Mean	Std. Deviation
Self-Interpretation	100	27.36	8.308
Open Mindedness	100	44.57	13.916
Attentiveness	100	34.03	8.419
Intellectual Courage	100	24.53	8.142
Overall Critical Thinking	100	130.49	34.729

Table 04

The above table depicts that based on the **mean value**, the **Open Mindedness** - one of the dimensions identified for the Critical thinking skill has been found to be higher among the students followed by the other dimensions - **Attentiveness**, **Self-Interpretation** and **Intellectual Courage** of Critical Thinking, respectively. Thus the study finding reveals that the dimension ‘**Open mindedness**’ of the Critical Thinking scores higher than the other dimensions, though every dimension has got a value and position in the skill to critically think.

In the study conducted to collect data through a questionnaire-employed-survey among 400 employees of international organizations in Iraq, resulted in the findings revealing the fact that the effect of Open Mindedness and humble behavior is on achieving innovation & Learning. The study findings showed that Open Mindedness has direct impact on innovation through its mediating role connected to learning. **(Hadi AL-Abrow - et al - 2021)**



Study model

Critical Thinking and its dimensions	Gender	N	Mean	Std. Deviation	t Value	p value
Self-Interpretation	Male	60	25.72	8.838	2.575	0.015**
	Female	40	29.83	6.831		
Open Mindedness	Male	60	41.6	15.238	2.695	0.008**
	Female	40	49.03	10.312		
Attentiveness	Male	60	31.85	9.146	3.329	0.001**
	Female	40	37.3	5.923		
Intellectual Courage	Male	60	22.48	8.785	3.221	0.002**
	Female	40	27.6	5.952		
Overall Critical Thinking	Male	60	121.65	37.99	3.266	0.002**
	Female	40	143.75	24.034		

Table 05

The above table 05 depicts that the **overall Critical Thinking and its dimensions** such as **Self-Interpretation**, **Open Mindedness**, **Attentiveness**, and **Intellectual Courage** the calculated **t values** are **greater than the table value** and it's **statically significant at 0.01 level**. Hence the framed hypothesis that “there is no significant difference in Critical Thinking among high school students with respect to Gender” is disproved. **Based on the mean value female students are found to have better Critical Thinking than male students.**

Critical Thinking and its dimensions	Group	N	Mean	Std. Deviation	F value	p value
Self-Interpretation	Computer Science	27	32	4.206	8.517	0.000**
	Biology	22	28.86	7.815		
	Commerce	24	21.63	8.899		
	Vocational	27	26.59	8.395		
	Total	100	27.36	8.308		
Open Mindedness	Computer Science	27	50.89	9.645	5.08	0.003**
	Biology	22	46.86	13.809		

	Commerce	24	37	15.351		
	Vocational	27	43.11	13.446		
	Total	100	44.57	13.916		
Attentiveness	Computer Science	27	35.89	7.255	6.644	0.000**
	Biology	22	38.68	6.629		
	Commerce	24	29.04	7.899		
	Vocational	27	32.81	8.953		
	Total	100	34.03	8.419		
Intellectual Courage	Computer Science	27	26.63	6.823	5.18	0.002**
	Biology	22	28.05	7.094		
	Commerce	24	19.96	8.348		
	Vocational	27	23.63	8.27		
	Total	100	24.53	8.142		
Overall Critical Thinking	Computer Science	27	145.41	21.223	7.314	0.000**
	Biology	22	142.45	30.268		
	Commerce	24	107.63	37.219		
	Vocational	27	126.15	36.361		
	Total	100	130.49	34.729		

Table 06

The recorded statistical findings in the table - 06 depicts that in the overall **Critical Thinking and its dimensions such as Self-Interpretation, Open Mindedness, Attentiveness, and Intellectual Courage** the **calculated F values are greater than the table value** and it's statistically significant at 0.01 level. Hence the framed hypothesis that **"There is no significant difference in Critical Thinking among high school students with respect to Group"** is disproved. Further, based on the mean value, the **Computer Science** students are found to have better Critical Thinking than other group students.

Computer science & Critical thinking skills - The fact that the Computer scientists are charged with critical thinking skills has been considered as an objective of the referenced paper cited. It has been discussed in it with evidential supports to conclude that through the discipline of computer science, critical thinking skills could be developed and enhanced. It has been thus substantiated that there is a strong connection between scientists in computer discipline and the critical thinking as a skill (**Barry Fagin - 2006**)

Critical Thinking and its dimensions	Birth order	N	Mean	Std. Deviation	F value	p value
Self-Interpretation	First	50	30.32	6.523	16.579	0.000**
	Middle	37	26.86	7.938		
	Last	13	17.38	7.848		
	Total	100	27.36	8.308		
Open Mindedness	First	50	50	10.69	16.499	0.000**
	Middle	37	42.81	13.249		
	Last	13	28.69	14.097		
	Total	100	44.57	13.916		
Attentiveness	First	50	36.24	8.045	14.641	0.000**
	Middle	37	34.65	6.738		
	Last	13	23.77	6.978		
	Total	100	34.03	8.419		
Intellectual Courage	First	50	26.84	7.172	16.071	0.000**
	Middle	37	25	7.261		
	Last	13	14.31	6.524		
	Total	100	24.53	8.142		
Overall Critical Thinking	First	50	143.4	26.929	21.182	0.000**
	Middle	37	129.32	30.573		
	Last	13	84.15	34.061		
	Total	100	130.49	34.729		

Table 07

The recorded findings of the table 07 depicts that in the **Overall Critical Thinking and its dimensions such as Self-Interpretation, Open Mindedness, Attentiveness, and Intellectual Courage** the **calculated F values are greater than the table value** and it's statically significant at 0.01 level. Hence the framed

hypothesis that is "**There is no significant difference in Critical Thinking among high school students with respect to Birth order**" is disproved. Hence based on the **mean value, the First born students** in the birth order, are found to have better Critical Thinking than the other counterparts among the sample of students chosen.

Data about the Children of the NLSY79, "the latter-born children score lower on cognitive assessments than their siblings, and the birth order gap in cognitive assessment increases until the time of school entry and remains statistically significant thereafter". "First-born children scored higher on tests including reading, matching letters, names, reading single words aloud and picture vocabulary tests." (Jee-Yeon K. Lehmann et al - 2016)

Conclusion

The Study done involved 100 students from a Higher Secondary school in Chennai, India, having focus on 1) to assess **Critical Thinking Skill** possessed by them; 2) to find whether any significant difference exists in **Critical Thinking Skill** of the students with respect to **gender**, different **Subject Groups** and their **Birth order**. **The survey done and the data when statistically measured revealed the findings as below:**

1. The dimension **Open mindedness** of the Critical Thinking scores higher than the other dimensions, though every dimension has got a value and position in the skill to critically think.
2. Among the students of Higher Secondary grade, the **Female students** are found to have better Critical Thinking than male students.
3. Among the students of Higher Secondary grade, the **Computer Science** students are found to have better Critical Thinking than other group students.
4. **The First born students** in the birth order, are found to have better Critical Thinking than the other counterparts among the sample of students chosen.

Limitations:

The study which is empirical, has been critically analyzed taking into consideration the data collected through the framed survey questionnaire. Therefore the results and conclusions spelt out as conclusive study are adequate and substantive. A larger sample could perhaps bring out slight variation in the values, however the genre of the study and the results and conclusion in future would remain positive.

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