ISSN: 0974-5823 Vol. 7 No. 4 April, 2022

International Journal of Mechanical Engineering

"To study the relationship between Intellectual Capacity and Behavioral Skills of the engineering students of circuit branches"

Prof. Anil D. Tijare

Dean, Training and Placement

Nagpur Institute of Technology

Research Scholar, G H Raisoni University, Amravati

Prof. Dr. Aarti Deshpande

Director

G H Raisoni Institute, Management and Research,

Abstract:

In this research, total 586 students responded from Computer Science and Engineering (n=240), Electronics/ Electronics and Telecommunication/ Electronics and Communication (n=250) and Information Technology (n=96). Sample is taken from the 21 engineering colleges from Nagpur city. Simple randomized sampling technique is used and correlational study between Intellectual Capacity and Behavioral Skills of the engineering students of circuit branches have been discussed.

SPM was employed as a measure of Intellectual Capacity, and standard 60-question and 60-item questionnaires were created to assess Behavioral Skills. Only those talents are considered that are relevant to an engineering student's employability, because engineering student employability is a hot topic among parents, academicians, and HR professionals these days. Higher employability will be demonstrated by a stronger relationship.

For the students of CSE, the correlation between Behavioral Skills and Intellectual Capacity is found to be positive and significant (r = 0.165). CSE students have mild association of their Behavioral Skills with Intellectual Capacity, hence further improvement in Behavioral Skills is not difficult but it is not easy also. Since the relationship is mild and not strong. Electronics students are completely failed to use their intellectual Capacity for the formation of various Behavioral Skills. Hence it can be interpreted that the students' needs more efforts and special training for enhancing Behavioral Skills. In case of Information Technology, the data suggests worst outcome. They are worst among all the branches of engineering analyzed in this study.

Keywords:

Employability, Engineering students, Assertiveness Skills, Conflict Resolution, Self-Confidence, Decision Making, Empathy, Listening Skills, Handling Stress, Persuasion Skills, Problem Solving and Relationship Building, Clear Thinking, Observation Ability, Reasoning Abilities, Critical Reasoning and Abstract Reasoning, Intellectual Capacity, Behavioral Skills, Computer Science and Engineering, Information Technology, Electronics, Electronics and Communication, Electronics and Telecommunication, Nagpur.

Introduction:

Engineering students in India have a low employability rate of fewer than 25%, industries are having a difficult time finding qualified personnel. On-campus or off-campus drives are used to position engineering students. A campus drive is an important or critical part of the hiring process. According to Jackson, S. E.'s study, a job interview is the most crucial deciding element in hiring an applicant. Employers are looking for young talent with a lot of promise and innovative skills, people who can shift the company's direction. Candidates that can deal with their clients, grasp the requirements, and accomplish the entire assignment are also expected by the organization. Even if they are placed in industries, the firms' expectations are very high in comparison to the students' readiness, which has resulted in anxiety and tension. As a result, many students fail to improve their grades and are unable to advance in their careers.

Intelligence, according to Mittal K.'s research, can be defined as the ability to successfully learn and grasp new situations. It is a person's mental ability to learn from occurrences, adapt to new situations, comprehend and handle intellectual concepts, and so on. It also use facts to exert control over one's surroundings.

IQ tests are used to assess intellectual capacity. It is a person's ability to understand, remember, and recall objects or circumstances. Progressive mattresses are well-known techniques for assessing mental ability, or to put it another way, intellectual activity. Intellectual capacity refers to a person's ability to think clearly and observe patterns or objects in such a way that accurate solutions are reached. Intellectual capacity refers to a brain's ability to perform in academics, athletics, business, scientific invention, and other areas. It is a tangible indicator of a person's mental capacity, as determined by IQ (intelligent quotient)

In this research, a researcher has collected the raw scores initially; assessments and finally study on the correlation of various parameters of Intellectual Capacity and Behavioral Skills of the engineering students of circuit branches from various engineering colleges of Nagpur have been done.

Training is an important input for engineering students. The training has to be very systematic based on psychological principles and appropriate grouping among the students. Irrespective of their semester, the grouping has to be formed on the basis of psychological assessment particularly intelligence, personality, interest and attitude. The grouping needs database research from new researchers. Some of the techniques have been given in conclusions of this study

The scope of the study is limited to theoretical analysis of the factors (IC and BS) and its impact on employability, assuming employability is adversely affected by lower level of IC and particularly lower level of BS. Practical evaluation of employment received, job performance and retention of engineers are beyond the scope of this study. The scope of discussion is limited in purview of reviews collected by the researcher along with findings derived from obtained data.
The aim of this research is to critically analyze IC and BS of the engineering students of Nagpur region. The data collection is limited to engineering colleges in Nagpur. There are many relevant abilities and skills which are necessarily evaluated to understand engineering students and their employability. However, for the purpose of this research critical analysis is restricted to most important factors as IC and BS.
Objective of this research study is limited to assessment, critical analysis, relationship, improvement methods and inventing training techniques in relation to BS and IC; to make the engineering students employable. Hypotheses are few, exploring correlation of IC and BS, impact of IC on BS and impact on employability of engineering students.

The factors of Behavioral Skills like Assertiveness Skills, Conflict Resolution, Self-Confidence, Decision Making, Empathy, Listening Skills, Stress Handling, Persuasion Skills, Problem Solving, and Relationship Building were all addressed in this study. Similarly, Clear Thinking, Observation Ability, Reasoning Abilities, Critical Reasoning, and Abstract Reasoning are all factors in Intellectual Capacity.

Each student is assessed with 120 questions.

The researcher is interested in learning more about the relationship between intellectual capacity and behavioral skills in engineering students from Computer Science and Engineering, Electronics/ Electronics and Telecommunication/ Electronics and Communication. As a result, the researcher took measures of Intellectual Capacity and observed the link with ten distinct significant Behavioral Skills factors, as well as vice versa.

Review of Literature:

1. There is a significant direct proportional relationship between the student's abstract reasoning and problem-solving abilities. When participants are designated for higher studies, there are significant disparities in their abstract reasoning abilities. The same conclusion holds true for the participants' analytical, practical, creative, and general problem-solving abilities. [Adreil Roman, HamimahGuinungco, July 2020]
2. Critical reading is the process of building a link between the reading content and one's own personal values, attitudes, and standards. Although university students have a good attitude toward critical thinking, their level of critical thinking and capacity to represent critical thinking in critical reading skills do not match their attitude toward critical thinking. [March 2020, Muhammad Din]
3. Self-confidence is described as a student's belief or trust in his or her ability to do a task successfully. Students' self-confidence has an impact on their learning in terms of engagement, goal-setting, generating interest in classes, and reducing fear. It allows them to become more at ease with their teachers, instructors, and classmates, allowing them to offer their thoughts on teaching in class. [JavedSahibzada & Omidullah Akbari, January 2020]
4. In the case of proactive decision making, effective choice making is achievable throughout the process of producing multiple options. If one makes proactive judgments, one's abilities improve and one's contentment with one's decisions and with life as a whole improves. The study's findings suggest that it is worthwhile to assist individuals in improving their decision-making skills on a proactive basis. [February 2020, Johannes Ulrich Siebert, Reinhard E. Kunz, and Philipp Rolf]
5. The problem-solving approach emphasises that the best way to teach important mathematics concepts and procedures is to use problem-solving projects or activities that involve students in thinking about the important mathematical concepts and skills they must master. When the problem solving technique is used in classroom education, there is a significant improvement in knowledge and performance in mathematics, as well as a positive attitude toward the subject, proving the effectiveness of the strategy in teaching mathematics. [Eduard Medley, 2019] [Eduard Medley, 2019]

6. Emotional intelligence is defined by self-awareness, self-management, social awareness, and relationship management: These qualities are increasingly appearing on employer requirement lists when looking for suitable engineering staff, in addition to technical competencies. [August 2018]
7. The study focused on the relationship between interpersonal skills and group learning among Tehran high school students, with an emphasis on the mediating role of emotional intelligence. According to this study, group learning has a direct effect on emotional intelligence and interpersonal skills via emotional intelligence. [April-June 2018] [Saeid Moradi1, Batoul Faghiharam1, and Kobra Ghasempour1]
8. Pupils' abstract thinking skills can be improved by subjecting them to Cognitive Apprenticeship Instruction (CAI) Treatment. The study was carried out utilising an experimental research design with a pre- and post-test research design. On a national and school level, children in the experimental group had clearly superior abstract-thinking abilities to those in the control group. [BG Kartasasmita, BGP Yusepa, YahaKusumah, January 2018] [BG Kartasasmita, BGP Yusepa, YahaKusumah, January 2018]
9. Decision making is one of the most important abilities that has a direct and indirect impact on people's life. Giving pupils training decision-making in groups increased their positive coping style scores and self-esteem, while decreasing their negative coping style ratings. It is usually advantageous for young people to understand how to make positive decisions in order to gain more advantages in life. [March 2016, Oguzhan Colakkadioglu & Billur Celik]
10. For each construct, Hypothetical-Deductive Reasoning, Proportional Thinking, Conservation of Mass and Volume, Control of Variables, Probabilistic Thinking, and Correlation Thinking, the gender of the student has no significant impact on the students' scientific reasoning abilities. Hypothetical-Deductive Reasoning, Control of Variables, and Proportional Thinking had the lowest mean scores for both genders. [February 2014, Chakrapan Piraksa, Niwat Srisawasdi, and Rekha Koul]
11. Nearly 65% of fourth-year students had reached the level of formal operational thought. In the first year, around 60% of pupils had a concrete thinking level, whereas only 40% had a formal thinking level. The results suggest that there is a link between abstract thinking exam scores and university attainment levels (GPA). However, only 3.6 percent had late formal operational thought competence, which is a minor finding. Thirty percent of fourth-year pupils have concrete thinking levels. The abstract thinking level of the students' current thinking level and the anticipation of one of the students were different, and a gap was also detected. [December 2014, Ata Darwish]
12. Causal analyses of the determinants of job performance show that the major effect of General Mental Ability (GMA) is on the acquisition of job knowledge: People who are higher in GMA acquire more job knowledge and acquire it faster. [Schmidt and Hunter 2004]
13. Personnel selection research provides much evidence that intelligence (g) is an important predictor of performance in training and on the job, especially in higher level work. This article provides evidence that ‘g’ has pervasive utility in work settings because it is essentially the ability to deal with cognitive complexity, in particular, with complex information processing. The more complex a work task, the greater the advantages that higher ‘g’ confers in performing it well. [Gottfredson, L. S. 1997]

Rationale

This research is predicated on some assumptions. To begin with, Intellectual Capacity grows continually from infancy to adolescence. Later in life, growth slows down, and at a certain point, it becomes static. As a result, it is assumed that the greater the Intellectual Capacity, the better the learning, and thus the higher the level of Behavioral Skills growth. The researcher is interested in learning how strongly Intellectual Capacity and Behavioral Skills are linked. The stronger the link, the greater the development of Behavioral Skills will be.

SPM was employed as a measure of Intellectual Capacity, and standard 60-question and 60-item questionnaires were created to assess Behavioral Skills. Only those talents are considered that are relevant to an engineering student's employability, because engineering student employability is a hot topic among parents, academicians, and HR professionals these days. Higher employability will be demonstrated by a stronger relationship.

Understanding the employability and levels of engineering students on many Behavioral Skills variables is critical. Thus, engineering students of circuit branches from various engineering colleges of Nagpur are being assessed for weaker elements of Behavioral Skills and their association with Intellectual Capacity and vice versa.

Method

The method is the methodical use of a statistical tool to acquired data, which begins with the formulation of a specific problem, objectives, sample selection, and the use of the right data gathering tool.

Problem

Engineering universities face a difficult task in skill development and offering employable manpower to a variety of sectors. The issue is related to engineering students' underdeveloped BS from diverse colleges and disciplines. This issue affects students, instructors, and educational institutions.

Objectives

1. To assess the factors of Intellectual Capacity and Behavioral Skills of engineering students of circuit branches.
2. To collect the raw scores of Intellectual Capacity and Behavioral Skills of the students of circuit branches from various engineering colleges of Nagpur.
3. To study the correlation of various parameters of Intellectual Capacity and Behavioral Skills of the engineering students of circuit branches from various engineering colleges of Nagpur.

Hypotheses

The researcher has hypothesized this issue as below-

1 – There is a strong correlation between Intellectual Capacity and Behavioral Skills among engineering students of Computer Science and Engineering.

2 - There is a strong correlation between Intellectual Capacity and Behavioral Skills among engineering students of Information Technology.

3 - There is a strong correlation between Intellectual Capacity and Behavioral Skills among engineering students of Electronics / Electronics and Telecommunication/ Electronics and Communication.

Sample

Sample is taken from the 21 engineering colleges from Nagpur city. Simple randomized sampling technique is used.

Design

This is a correlational study between Intellectual Capacity and Behavioral Skills of the engineering students of circuit branches from various engineering colleges of Nagpur as paired correlational design.

Variable

1. Intellectual Capacity
2. Behavioral Skills

Tools

1. SPM by HC Raven
2. Self-Prepared questionnaire on behavioral skills.

Inclusion Criteria

Sample includes UG engineering students from Nagpur city.

Exclusion Criteria

All UG Students those are not pursuing engineering have been excluded, also first and second year students of engineering.

Discussion:

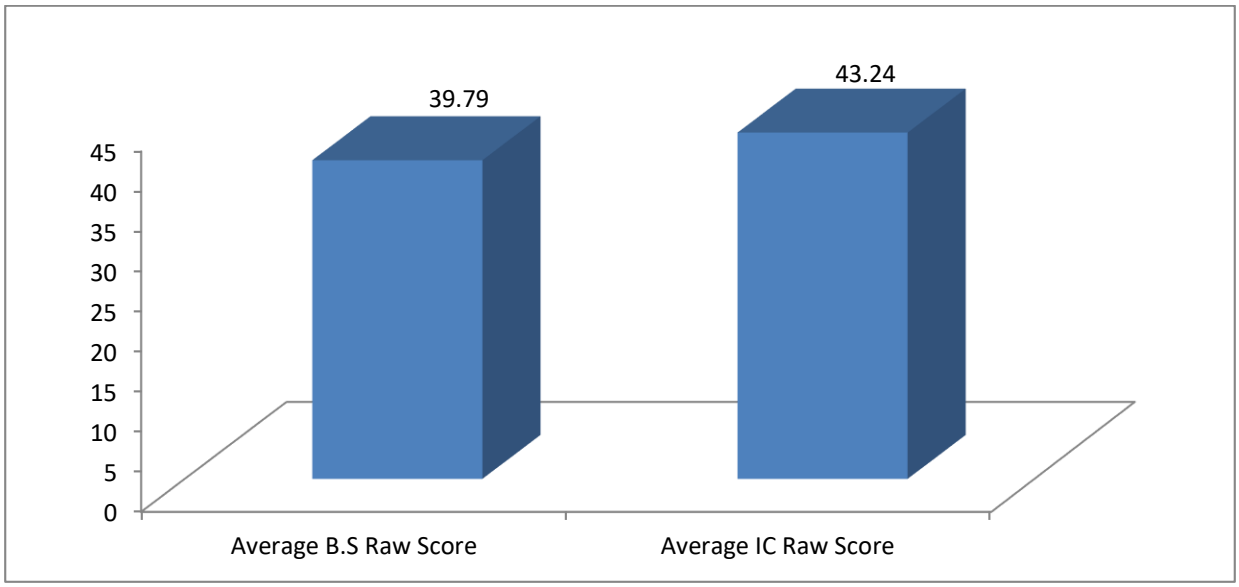
Critical analysis of Computer Science and Engineering

Table 1: Critical analysis of Intellectual Capacity and Behavioral Skills of all the students of CSE (n= 240)

Sr.	Parameters	Correlation	Critical Value	Significance
	Correlation Between Behavioral Skills & Intellectual Capacity	0.1649	0.127	Significant
1	Correlation Between Behavioral Skills & Clarity of thinking	0.1276	0.127	Significant
2	Correlation Between Behavioral Skills & Observation Ability	0.0808	0.127	Non-Significant
3	Correlation Between Behavioral Skills & Reasoning Ability	0.1298	0.127	Significant
4	Correlation Between Behavioral Skills & Critical Reasoning	0.1855	0.127	Significant
5	Correlation Between Behavioral Skills & Abstract Reasoning	0.1447	0.127	Significant
1	Correlation Between Intellectual Capacity and Assertiveness Skills	0.1707	0.127	Significant
2	Correlation Between Intellectual Capacity and Conflict resolution	0.1798	0.127	Significant
3	Correlation Between Intellectual Capacity and Self-confidence	0.1540	0.127	Significant
4	Correlation Between Intellectual Capacity and Decision making	0.0554	0.127	Non-Significant
5	Correlation Between Intellectual Capacity and Empathy	0.1166	0.127	Non-Significant
6	Correlation Between Intellectual Capacity and Listening skills	0.2009	0.127	Significant
7	Correlation Between Intellectual Capacity and Handling stress	-0.1505	0.127	Significant
8	Correlation Between Intellectual Capacity and Persuasion Skills	0.0154	0.127	Non-Significant
9	Correlation Between Intellectual Capacity and Problem solving	0.0820	0.127	Non-Significant
10	Correlation Between Intellectual Capacity and Relationship building	0.0670	0.127	Non-Significant

Number of Respondents (n)	240
Average Age	21
Average B.S Raw Score	39.79
Average IC Raw Score	43.24

Graph 1: Average score of Intellectual Capacity and Behavioral Skills of Computer Science & Engineering (n=240)



The correlation between Behavioral Skills and Intellectual Capacity is found to be positive and significant (r = 0.165). In case of CSE students, relationship is observed between Behavioral Skills and Intellectual Capacity and also with factors of Intellectual Capacity. There is only one factor namely Observation Ability (r=0.081) where the relationship is non-significant. In case of all other factors the relationship is positive and significant. Factors are Clarity of Thinking (r = 0.1276), Reasoning Ability (r= 0.129), Critical Reasoning (r = 0.185) and Abstract Reasoning (r = 0.145). CSE students have mild association of their Behavioral Skills with Intellectual Capacity, hence further improvement in Behavioral Skills is not difficult but it is not easy also. Since the relationship is mild and not strong.

The data has observed relationship between Intellectual Capacity and ten factors of Behavioral Skills. It is observed that significant relationship is obtained for three factors same as Civil engineering students These 03 factors are Conflict Resolution (r = 0.179), Self Confidence (r = 0.154), Listening Skills (r = 0.201). There is one factor called as Handling Stress also has significant but inverse relationship with Intellectual Capacity (r = -0.150). In addition to this CSE students has significant relationship between Intellectual Capacity and Assertiveness Skill (r = 0.171). There are five factors where non-significant relationship is observed. These factors are Decision Making, Empathy, Persuasion Skill, Problem Solving and Relationship Building. Out of these five only two factors are uncommon between Civil and CSE students, that actors are Assertiveness Skill and Decision Making, whereas three factors are common i.e. Persuasion Skill, Problem Skill and Relationship Building.

Critical analysis of Electronics Engineering

Critical analysis of Intellectual Capacity and Behavioral Skills of all Electronics engineering students

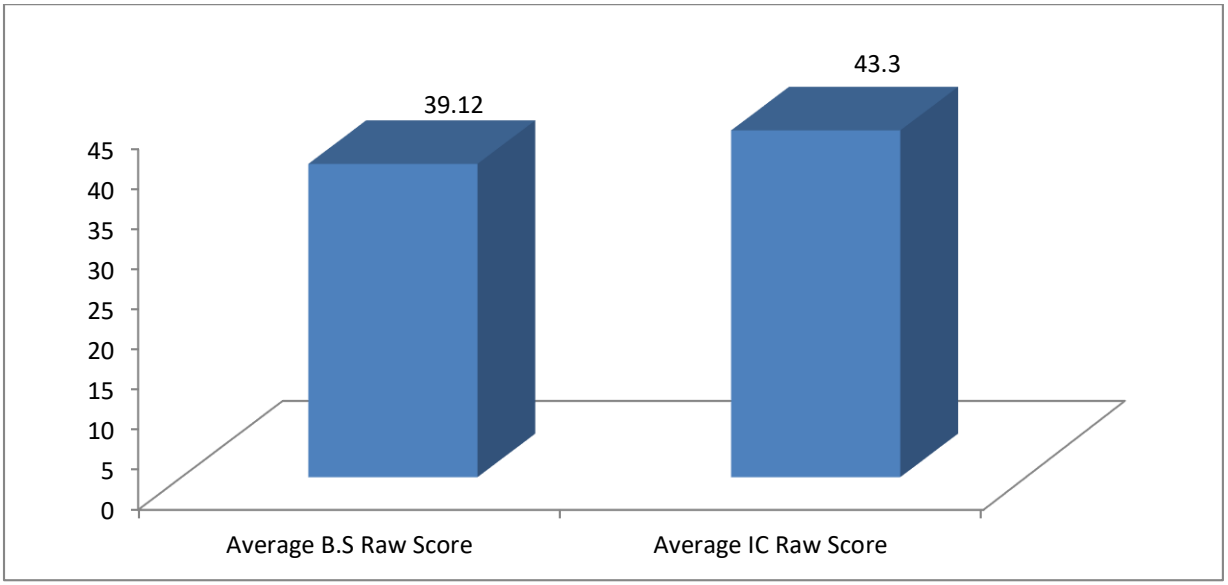
Table 2: Correlation of Intellectual Capacity and Behavioral Skills of all Electronics engineering students (n = 250)

Sr.	Parameters	Correlation	Critical Value	Significance
	Correlation Between Behavioral Skills & Intellectual Capacity	0.0295	0.123	Non-Significant
1	Correlation Between Behavioral Skills & Clarity of thinking	-0.0005	0.123	Non-Significant
2	Correlation Between Behavioral Skills & Observation Ability	0.0444	0.123	Non-Significant
3	Correlation Between Behavioral Skills & Reasoning Ability	0.0571	0.123	Non-Significant
4	Correlation Between Behavioral Skills & Critical Reasoning	-0.0303	0.123	Non-Significant
5	Correlation Between Behavioral Skills & Abstract Reasoning	0.0488	0.123	Non-Significant

1	Correlation Between Intellectual Capacity and Assertiveness Skills	-0.0133	0.123	Non-Significant
2	Correlation Between Intellectual Capacity and Conflict resolution	0.0478	0.123	Non-Significant
3	Correlation Between Intellectual Capacity and Self-confidence	-0.0074	0.123	Non-Significant
4	Correlation Between Intellectual Capacity and Decision making	-0.0351	0.123	Non-Significant
5	Correlation Between Intellectual Capacity and Empathy	0.0350	0.123	Non-Significant
6	Correlation Between Intellectual Capacity and Listening skills	0.1251	0.123	Significant
7	Correlation Between Intellectual Capacity and Handling stress	-0.1659	0.123	Significant
8	Correlation Between Intellectual Capacity and Persuasion Skills	-0.0047	0.123	Non-Significant
9	Correlation Between Intellectual Capacity and Problem solving	0.0055	0.123	Non-Significant
10	Correlation Between Intellectual Capacity and Relationship building	0.1785	0.123	Significant

Number of Respondents (n)	250
Average Age	21
Average B.S Raw Score	39.12
Average IC Raw Score	43.3

Graph 4.23: Average score of Intellectual Capacity and Behavioral Skills of Electronics Engineering students (n=250)



Critical Analysis – ETC/ EX/ ECE Engineering Students

Correlation is obtained between Behavioral Skills and Intellectual Capacity and with all the five factors of Intellectual Capacity. Surprisingly all the relationship is found non-significant for Electronics students. Similarly correlation is obtained between Intellectual Capacity and ten factors of Behavioral Skills. Except three factors namely Listening Skills (r = 0.125), Handling

Stress (r = -0.166) and Relationship Building (r = 0.178), the correlation with all the other seven factors are found to be non-significant.

Non-significant and negligible correlation is found between Behavioral Skills and Intellectual Capacity(r = 0.029). Similarly the no-significant and negligible correlation is also obtained for factors of Intellectual Capacity namely, Clarity of Thinking, Observation Ability, Reasoning Ability, Critical Reasoning, Abstract Reasoning, Assertiveness Skill, Conflict Resolution, Self Confidence, Decision Making, Empathy, Persuasion Skill and Problem Solving. All the relationships are negligible.

The meaning of, this kind of relationship is that, Electronics students completely failed to use their intellectual Capacity for the formation of various Behavioral Skills. Hence it can be interpreted that the students' needs more efforts and special training for enhancing Behavioral Skills. However, it can be assured that the Electronics students will be able to develop their Behavioral Skills within available time during their engineering education.

Only those students will succeed to develop Behavioral Skills, who will work hard and mentally devote themselves to follow learn and absorb training techniques by heart in a given stipulated time frame. Then only these students will stand at par with the Civil, CSE and Electrical students.

Critical analysis of Information Technology

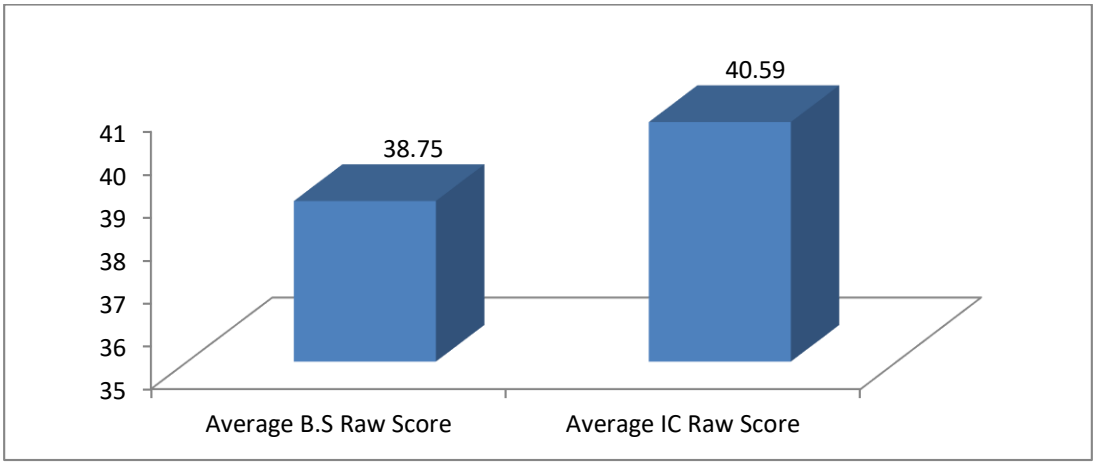
Critical analysis of Intellectual Capacity and Behavioral Skills of all Information Technology students

Table 3: Correlation of Intellectual Capacity and Behavioral Skills of all Information Technology students (n = 96)

Sr.	Parameters	Correlation	Critical Value	Significance
	Correlation Between Behavioral Skills & Intellectual Capacity	0.0760	0.201	Non-Significant
1	Correlation Between Behavioral Skills & Clarity of thinking	0.0760	0.201	Non-Significant
2	Correlation Between Behavioral Skills & Observation Ability	0.1223	0.201	Non-Significant
3	Correlation Between Behavioral Skills & Reasoning Ability	0.0560	0.201	Non-Significant
4	Correlation Between Behavioral Skills & Critical Reasoning	0.1376	0.201	Non-Significant
5	Correlation Between Behavioral Skills & Abstract Reasoning	0.0995	0.201	Non-Significant
1	Correlation Between Intellectual Capacity and Assertiveness Skills	0.1047	0.201	Non-Significant
2	Correlation Between Intellectual Capacity and Conflict resolution	0.1621	0.201	Non-Significant
3	Correlation Between Intellectual Capacity and Self-confidence	-0.0106	0.201	Non-Significant
4	Correlation Between Intellectual Capacity and Decision making	0.0007	0.201	Non-Significant
5	Correlation Between Intellectual Capacity and Empathy	0.0495	0.201	Non-Significant
6	Correlation Between Intellectual Capacity and Listening skills	0.1086	0.201	Non-Significant
7	Correlation Between Intellectual Capacity and Handling stress	-0.0308	0.201	Non-Significant
8	Correlation Between Intellectual Capacity and Persuasion Skills	0.0723	0.201	Non-Significant
9	Correlation Between Intellectual Capacity and Problem solving	0.0220	0.201	Non-Significant
10	Correlation Between Intellectual Capacity and Relationship building	0.1568	0.201	Non-Significant

Number of Respondents (n)	96
Average Age	21
Average B.S Raw Score	38.75
Average IC Raw Score	40.59

Graph: 3: Average score of Intellectual Capacity and Behavioral Skills of Information Technology students (n=96)



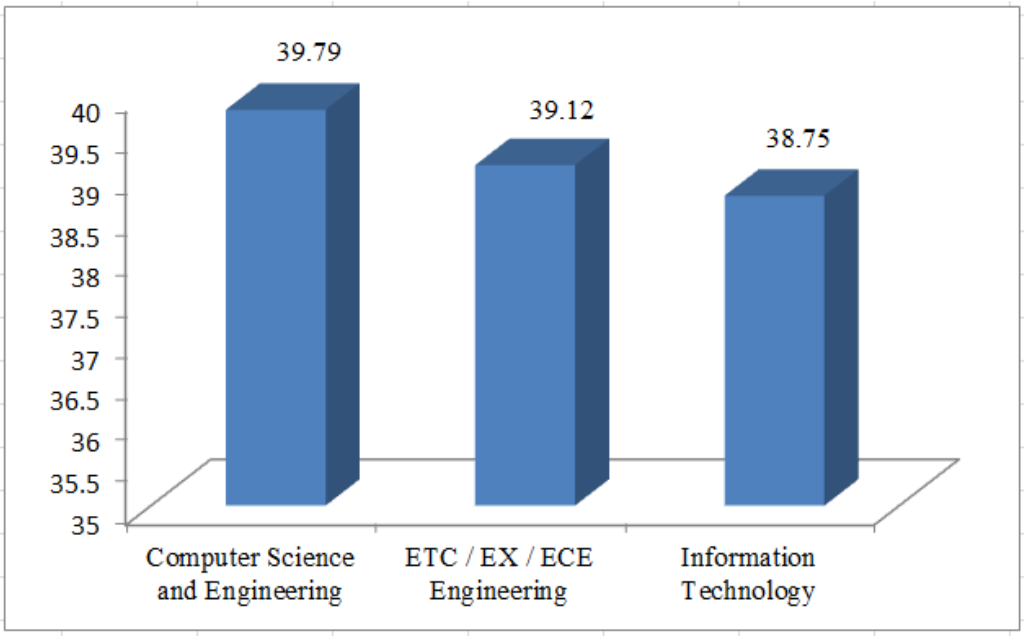
Critical Analysis – Information Technology Students

The data suggests worst outcome in case of IT students. They are worst among all the branches of engineering analyzed in this study. The relationship between Behavioral Skills and Intellectual Capacity is non-significant (r = 0.076). The critical r is 0.201.

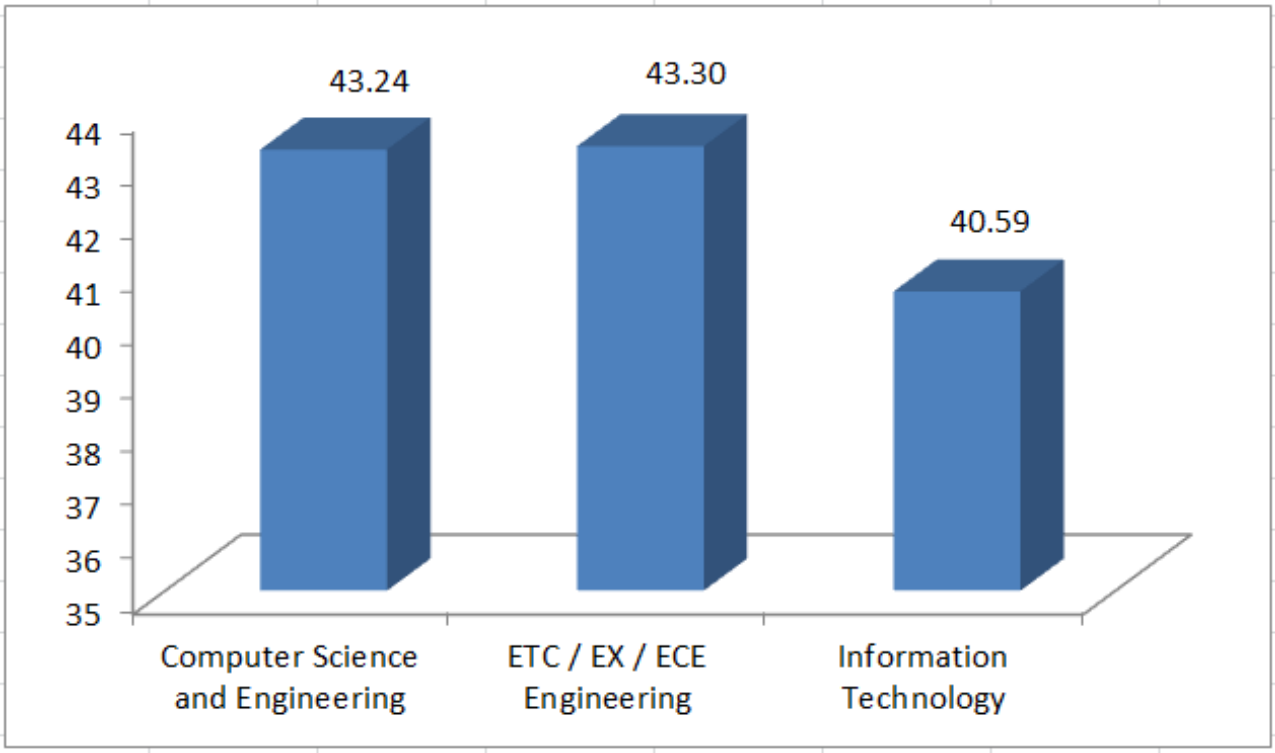
There is non-significant and negligible relation for Reasoning Ability (r = 0.056), Self Confidence (r = -0.010), Decision Making (r = 0.0007), Empathy (r = 0.049) , Handling Stress (r = 0.031) and Problem Solving (r = 0.022). This relationship is the indicator of lack of formation and development of the above mentioned skills in IT students.

A non-significant relationship is found between Behavioral Skills and four factors of Intellectual Capacity, namely Clarity of Thinking (r = 0.076), Observation Ability (r = 0.122), Critical Reasoning (r = 0.137) and Abstract Reasoning (r = 0.099). Similarly non-significant relationships are found between Intellectual Capacity and four factors of Behavioral Skills, namely Assertiveness Skill (r = 0.104), Conflict Resolution (r = 0.162), Listening Skills (r = 0.108) and Relationship Building (r = 0.157).

Graph 4: Summary of critical analysis of Behavioral Skills the respondents from circuit branches (n = 586)



Graph 5: Summary of critical analysis of Intellectual Capacity all the respondents of circuit branches of engineering (n = 586)



These Critical evaluations have five objectives and three Hypotheses. Now it is taken one by one and evaluated on the basis of available data of all the students.

Result-

For the students of CSE, the correlation between Behavioral Skills and Intellectual Capacity is found to be positive and significant (r = 0.165)

CSE students have mild association of their Behavioral Skills with Intellectual Capacity, hence further improvement in Behavioral Skills is not difficult but it is not easy also. Since the relationship is mild and not strong.

Electronics students are completely failed to use their intellectual Capacity for the formation of various Behavioral Skills. Hence it can be interpreted that the students' needs more efforts and special training for enhancing Behavioral Skills.

In case of Information Technology, the data suggests worst outcome. They are worst among all the branches of engineering analyzed in this study. The relationship between Behavioral Skills and Intellectual Capacity is non-significant (r = 0.076). The critical r is 0.201. This relationship is the indicator of lack of formation and development of the above mentioned skills in IT students

Conclusion:

Conclusion 1

Intellectual Capacity (Median = 45) of all students (n=1426) and Intellectual Capacity (Median = 45) of Industry ready students (n = 936). Hence it is concluded that there is no significant difference between the two groups of students.

Conclusion 2

Behavioral Skills (Mean = 39.28) of all students (n=1426) and Behavioral Skills (Mean = 40) of Industry ready students (n = 936). There is a negligible difference between the two groups. Hence it is concluded that Behavioral Skill is an improvable factor that is not improved at all, among engineering students to become ready to enter into the industry.

Conclusion 4

Students from Information Technology branch need improvement in their mental abilities which is very difficult to develop after 16 to 18 yrs. However, these students, by their personal efforts improve on Intellectual Capacity with the help of expert Psychologists.

Conclusion 5

Students from the two branches namely CSE and Electronics engineering have a common median score for their Intellectual Capacity (Median = 46). These students also need improvement in their mental abilities.

Conclusion 6

Behavioral Skill (Mean = 40) of CSE is common and higher among all six branches. Whereas the other two branches have lower Behavioral Skills (Mean = 39). The difference is marginal and non-significant. Hence it is concluded that almost all the students are lacking in the Behavioral Skills. All of them need rigorous training to develop their Behavioral Skills, which is possible also.

Conclusion 7

The correlation between Behavioral Skills and Intellectual Capacity for engineering students is positive, mild but significant for CSE ($r = 0.165$). The correlation is positive is a correct signal for these students but the mild correlation is unexpected. The relationship between Behavioral Skills and Intellectual Capacity has to be positive and strong.

Conclusion 8

The correlation between Behavioral Skills and Intellectual Capacity for engineering students is negligible and non-significant for two branches namely Electronics ($r = 0.029$) and Information Technology ($r = 0.076$) . The negligible correlation is not a correct signal. Students belonging to these two branches have to improve their Intellectual Capacity and simultaneously associate it with Behavioral Skills. It is concluded that students belonging to these two branches needs improvement of Intellectual Capacity along with the development of Behavioral Skills. Both the tasks have to be done simultaneously.

Conclusion 9

The challenging task for the T&P dept. is designing methods of improvement of Intellectual Capacity and methods of development of Behavioral Skills. The challenge can be taken strategically by paring of students and selection of topic according to assessment and formation of groups as per group's needs, for improvement of Intellectual Capacity and development in Behavioral Skills.

Conclusion 10

Our study on the basis of data of correlation concluded that Assertive discussion, Persuasive discussion, Empathetic discussion, Problem centric discussion, building relationship exercise and acquiring Decision Making are some important and critical exercises for all the students. However, it has to be planned and executed group-wise according to the needs of the group. These exercises are useful for the students of CSE.

Conclusion 11

Another two branches of students namely Electronics and Information Technology needs different methods than students of the other four branches. Hard work is involved for the T&P dept. These students have needs assessment of Intellectual Capacity, Behavioral Skills, testing Emotional Intelligence and personality factors. Training methods have to be designed on the basis of data obtained on testing and evaluation.

Conclusion 12

It is concluded that the majority of students are not employable. Hence the situation demands to application of suitable methods or techniques to make them employable. All the data is critically analyzed and concluded that student needs to develop planning, implementation, monitoring, evaluation, controlling, self-perception improvement, organizational ability, managerial skills, maturity of personality, human relationship and understanding Human engineering. This can make them employable. In house training and on the job training are two important methods to develop the above skills. In short, these skills mean the development of managerial ability, leadership ability and entrepreneurship

Conclusion 13

Intellectual Capacity and Behavioral Skills of engineering students ($n = 1426$) are significantly correlated $r(df1424 = 0.121, p<0.05)$. However exceptionally, Electronics and Information Technology students have shown non-significant relationship.

Conclusion 34

On the basis of data it is observed that there is a non-significant relationship between Intellectual Capacity and Assertiveness skills among students of all the engineering branches except CSE ($r = 0.171$). It means students' having a sizable level of Intellectual Capacity does not necessarily possess Assertiveness. The relationship for Electronics ($r = -0.01$) and Information Technology ($r = 0.104$), almost all these relationships stands negligible. Hence improvement in Assertiveness is the need of the time.

Conclusion 35

Intellectual Capacity and Behavioral Skills are significantly correlated for the students of CSE and non-significant for the engineering students of Electronics and Information Technology. A similar relationship is obtained between Intellectual Capacity and Conflict Resolution. Hence improvement in Conflict Resolution is the need of time for the students of Electronics and Information Technology.

Conclusion 36

The relationships are obtained between Intellectual Capacity and Self Confidence of the engineering students of CSE, IT and Electronics branches. It is observed that the correlations are significant for CSE and non-significant for Electronics and

Information Technology. Hence improvement in Self Confidence is the need of the time for Electronics and Information Technology.

Conclusion 37

The Decision Making seems to be very poor among all the engineering students since the correlation between Intellectual Capacity and Decision Making is found non-significant for CSE, Electronics and Information Technology. Hence improvement in Decision Making is vital for students from five engineering branches.

Conclusion 38

The relationship between Intellectual Capacity and Empathy is found non-significant for all the students of CSE, Electronics and Information Technology branches. Hence improvement in Empathy is critical for students of the other four engineering branches.

Conclusion 39

The relationship between Intellectual Capacity and Listening Skills is found to be significant for two branches namely CSE and Electronics and it is non-significant for the students of Information Technology. Hence students of Information Technology need special attention to improve their Listening Skills.

Conclusion 40

Negatively Significant relationship between Intellectual Capacity and Handling Stress has been observed in the engineering students of CSE and Electronics except Negligible correlation among students of Information Technology. It means the students having higher Intellectual Capacity can cope up better in managing Stress during studies and attending the campus drives. In this data, only 33% of students (n =471) are having Intellectual Capacity above average (>P75). It means, 67% of students are not capable to handle the stress. These students need training on Stress handling.

Conclusion 41

Persuasion Skill is very important for every engineering student. However, the data has observed a non-significant relationship between Intellectual Capacity and Persuasion skills among students of all the three branches of Engineering. Negligible correlation is observed among the engineering students of CSE ($r = 0.01$) and Electronics ($r = -0.004$). Imparting training to improve Persuasion Skills is the need of time.

Conclusion 42

Problem Solving Skill is also critically important for every engineering student throughout his/her career. However, the data has observed a non-significant correlation between Intellectual Capacity and Problem Solving skills among students of all the three branches of Engineering. Negligible correlation is obtained for Electronics ($r = 0.005$) and Information Technology ($r = 0.02$). This is an indicator of having no relationship between these two variables. However, since Problem Solving is important, improvement in this is essential and can bring better changes in the effectiveness of engineering students. Hence it is a must to organize training programmes to improve Problem Solving skills.

Conclusion 43

Correlation between Intellectual Capacity and Relationship building is found non-significant in CSE and Information Technology students and significant correlation is observed in Electronics ($r = 0.178$) engineering students, the relationship is mild. Hence it is a must to organize training programmes to improve Relationship building skills.

Conclusion 44

It is also observed that all the engineering students' moderately need the training to improve Conflict Resolution and Self Confidence.

Conclusion 45

It is observed that all the engineering students severely need the training to improve Assertiveness, Decision Making, Empathy, Listening Skills and Relationship building skill.

Conclusion 46

There are three Behavior Skills most severely to be developed in the students of all the engineering branches i.e. Handling Stress, Persuasion Skill and Problem Solving. In fact, these are professional skills that are important throughout the life of an engineer. Hence it is most necessary to impart training to develop these skills.

Conclusion 47

The median value of Intellectual Capacity is 45, which is average, slightly above mid-point in a sample (n = 1426) of engineering students and stands at 55th percentile (P55). The median value of Behavioral Skills is 39.63 which is below average and stands at the 38th percentile (P38). It means when compared all students on a standard scale of percentile, it is observed that students are lacking in Behavioral Skills as compared to their average level of Intellectual Capacity. Hence their abilities can be questioned to pursue engineering study but improvement in Behavioral Skills is essential to become a successful engineer.

Conclusion 49

Out of students of six branches, students of CSE (r = 0.165) has shown significant relationship between Behavioral Skills and Intellectual Capacity. However, students of other two branches namely Electronics (r = 0.029) and Information Technology (r = 0.076) have shown negligible relationship. It indicates that some students pursue engineering with marginal developed Behavioral Skills whereas others do not have any correlation, which must exist to succeed in their professional career.

Limitations and Delimitations

The aim of this research is to critically analyze IC and BS of the engineering students of Nagpur region. The data collection is limited to engineering colleges in Nagpur. There are many relevant abilities and skills which are necessarily evaluated to understand engineering students and their employability. However, for the purpose of this research critical analysis is restricted to most important factors as IC and BS.

Objective of this research study is limited to assessment, critical analysis, relationship, improvement methods and inventing training techniques in relation to BS and IC; to make the engineering students employable. Hypotheses are few, exploring correlation of IC and BS, impact of IC on BS and impact on employability of engineering students.

Data collection is a tough task. Contacting students was not possible due to pandemic situation. Hence Google form is used to get the responses from the students of various engineering colleges of Nagpur. Possibly the voice and the spirit of research aim may not be reached, in absolute, to students responded to Google form. However, the researcher has observed and collected huge data; therefore the elimination irrelevant responses were possible. One big limitation of this study is that it is not supported by secondary data from periodicals or newspapers. However, sizable research information has been collected through review of various research papers.

Sample size is too large but, it may have not been correctly representing students from engineering colleges; neither nation-wide nor state-wide. The sample collected is restricted to engineering colleges in Nagpur. The sample and its analysis are mostly limited to quantitative study more and a small part of qualitative aspects are also included.

Tests used to collect responses, having one test standardized (SPM) and other is based on popular items (Test Statements) picked up from the various standardized tools measuring factors of BS. Statements are validated by the researcher on the basis of own previous experience of researcher, in handling the Training and Placement department.

A broad range of reviews are included, including researches on factors encompassing IC and BS, to compare and discuss findings of other researchers with our results. However, some of our findings are unique which cannot be compared with any review; it may be because of limited number of reviews or non-availability of research on those factors.

The scope of the study is limited to theoretical analysis of the factors (IC and BS) and its impact on employability, assuming employability is adversely affected by lower level of IC and particularly lower level of BS. Practical evaluation of employment received, job performance and retention of engineers are beyond the scope of this study. The scope of discussion is limited in purview of reviews collected by the researcher along with findings derived from obtained data.

The study is limited to three branches of engineering namely CSE, Electronics and IT because in other branches students are limited or other branches are not available in the engineering colleges of Nagpur region.

Delimitations of research mean factors to be controlled very well in the study. The aim is defined only by selecting two factors namely IC and BS. Objectives and hypotheses are controlled to the extent of, facilitating the researcher to critically evaluate the relationship of IC and BS and its impact on employability of engineering students.

The average age of respondents is 21 years; age wise range is from 20 to 24 years. The gender proportion is also well controlled. Respondents constitute 53% of Male and 47% of female. Geographically all the respondents are from Nagpur district. The scope of this study is delimited to third and final year students because they are more concerned with the training, campus interview and selection for getting an engineering job as compared to first and second year students.

Suggestions

It is suggested that by the end of third year engineering, as students enter into forth year, their Behavioral Skills has to be better than average Behavioral Skills of first, second and third year students. In other words, colleges have to take efforts to improve Behavioral Skills right from first year to third year, since our results are observed, no significant difference among third and final year students for their Behavioral Skills and Intellectual Capacity.

Engineering colleges, particularly at the State level have no choice but to accept students with average intelligence. The majority of the students taking admission in State level engineering colleges are average or below average. It is observed in a negatively skewed distribution of respondents in this study. The correlation between IC and BS is positive but mild. The expected correlation is very high (greater than r = 0.66) for industry-ready students. Hence it is suggested that either engineering colleges shall check such a relationship before accepting the admissions or improve their BS right from the first year.

This suggestion is for the new researcher. In this research, it is observed that among three engineering branches students from Electrical and Information Technology have the lowest IC. In fact, most of the available jobs in the present scenario are in the IT domain. The recruiters in IT industries demand a higher level of reasoning and clear thinking among newly selected Graduate

Trainee Engineers (GET's). New researchers have to take database research on "Which branch need what level of Intelligence". This type of research was beyond the scope of this study.

In practice, it has been observed that engineering aspirants are either forced to select a particular branch of engineering or due to a lack of psychological assessments/ knowledge; there is a misconception in students and their parents during the selection of any particular engineering branch. This decision is vital for students' success and their performance in their professional careers. Some more database researches are required to align IC, BS, training input, Job Description and student's attitude management (parents too).

It is suggested that engineering colleges and their department of Training and Placement must focus on students from Information Technology and Electronics engineering since these students have no relationship between their IC and BS. Formation of relationship is the first stage, the second stage is to grow this relationship, it means as BS improves, IC (Crystalized Intelligence) will also improve, the third stage is the maturation of relationship and final stage will be a continued improvement. Engineering colleges must take these students up to the stage of maturation.

References:

- AzitaJoibari, NiloufarMohammadtaheri, The Study of Relation Between Emotional Intelligence and Students' Academic Achievement of High Schools in Tehran City,vProcedia - Social and Behavioral Sciences, Volume 29, https://doi.org/10.1016/j.sbspro.2011.11.371.
- Cavallo, A.M. (1996), Meaningful learning, reasoning ability, and students' understanding and problem solving of topics in genetics. J. Res. Sci. Teach., 33: 625-656. https://doi.org/10.1002/(SICI)1098-2736(199608)33:6
- Colakkadioglu, O., &Celik, B. (2016). The effect of decision-making skill training programs on self-esteem and decision-making styles. Eurasian Journal of Educational Research, 65, 259-276 http://dx.doi.org/10.14689/ejer.2016.65.15
- Darwish, Ata. (2014). The abstract thinking levels of the science-education students in Gaza universities. Asia-Pacific Forum on Science Learning and Teaching. 15.
- Gottfredson, L. S. (1997). Why g matters: The complexity of everyday life. *Intelligence, 24*(1), 79–132. https://doi.org/10.1016/S0160-2896(97)90014-3
- Guinungco, Hamimah& Roman, Adriel. (2020). Abstract Reasoning and Problem-Solving Skills of First Year College Students. V. 33-39.
- Kıralp, Yeliz&Dincyürek, Sibel&Beidoglu, Müge. (2009). Determining the conflict resolution strategies of university students. Procedia - Social and Behavioral Sciences. 1. 1205-1214. 10.1016/j.sbspro.2009.01.217.
- Edwards, A. J. (1994). Wechsler, David (1896-1981). In R. J. Sternberg (Ed.), *Encyclopedia of intelligence (Vol. 1, pp. 1134-1136)*. New York: Macmillan.
- Schmidt FL, Hunter J. General mental ability in the world of work: occupational attainment and job performance. Journal of personality and social psychology. 2004 Jan;86(1):162.
- Gottfredson LS. Why g matters: The complexity of everyday life. Intelligence. 1997 Jan 1;24(1):79-132.