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Cognitive Style, Learning Preference and Performance: Theory and Empirics

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Abstract--- *We attempt to explore the association between cognition, learning and performance with theoretical and empirical justification. The study was done on a sample of students pursuing their professional course on Chartered Accountancy in India. Using Allinson and Hayes Cognitive Index as a standard tool, we came out with explicit and implicit recommendation to improvise the pedagogy of professional courses of this kind.*

Keywords--- *Learning Style, Cognitive Style, Academic Performance, Intuition Analysis, Allinson and Hayes Cognitive Index, Quasi Intuitive Learners, The Institute of Chartered Accountants of India.*

I. COGNITION AND LEARNING

Cognition is the process of acquiring and understanding knowledge through our thoughts, experiences, and senses. Learning involves acquiring knowledge through experience, study, or being taught. Learning is a complex process performed by humans to develop and grow. For centuries philosophers and psychologists have worked and will continue to work on understanding the concept of learning. Learning is a cognitive process which is partly social and useful. The concept of learning styles evolved from the fact that each person has a unique learning preference. These styles are not fixed or rigid but are flexible and have different stages of perceiving, processing information and experiencing the same. For centuries, philosophers, academicians, educationalist have been categorizing people by their preferences, particularly their learning preferences. This takes us to several centuries past, Hippocrates (400 BC) and Galen (140 AD), when the Greek philosophers classified people into four personality types which they called 'humors'. They believed that each of the 4 humors was outcome of an excess of one of the 4 bodily fluids. The excess amount of fluids determined a person's character and traits. The 4 humors included choleric (yellow bile), melancholic (black bile), sanguine (blood) and phlegmatic (phlegm). Individuals have different choices and approaches to how they process information. Some like to work with facts and experimental data, while others want to work with theories, empirical data. Some other students would be more comfortable with symbolic or mathematical models. Other students would like to learn through pictures, symbols, diagrams, flow charts, and schematic representations. Some learn through verbal explanations, while others through seeing and observation. Few prefer to learn by doing tasks themselves. Rose Marie Schick[1] in her book states that learning styles are characteristic cognitive, affective and psychological behaviours that serve as relatively stable indicators of how learners perceive, interact and respond to a learning environment. Gordon[2] describes cognitive styles as an individual's typical or habitual mode of problem-solving, thinking and remembering information.

The learning style concept has gained much importance for colleges and universities and are looking for innovative strategies to attract and retain students. David and Malcolm[3] in their research indicate that understanding

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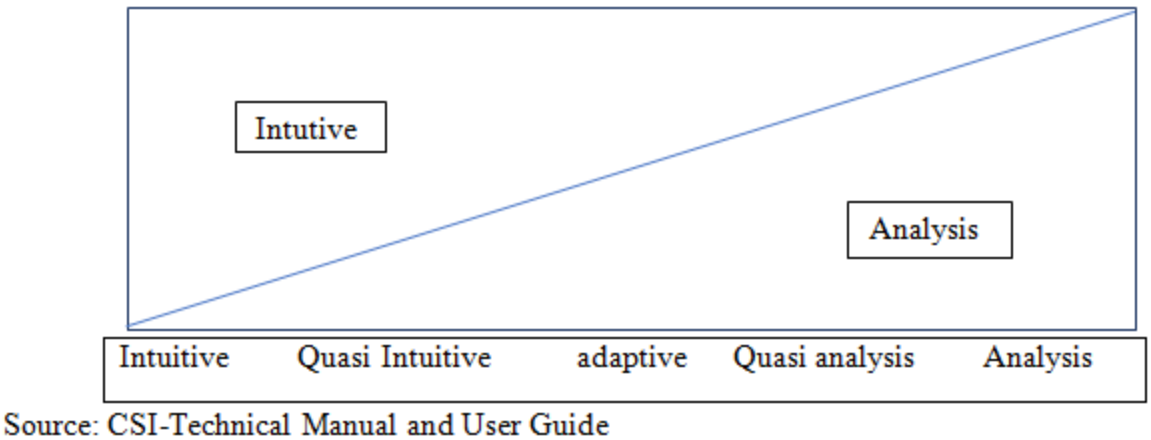
the learning style of students is a prerogative for a successful pedagogical program and has been frequently used from 15 years of age onward in their education. Education is a process by which people acquire knowledge, skills, and attitude. Cohen[4] and Oxford[5] have observed that learning styles can develop and change over a period as the learner accumulates knowledge on their experiences and educational progress. The learning also improves if teachers customise their pedagogy according to learning requirement and style of the student. Lezak[6] categorizes behaviour into three functional areas namely Cognition, which refers to the information handling aspect of practice; Emotionality, which deals with feeling and motivation and Executive function, that deals with the expression of behaviour. Of these three aspects of behaviour, cognition is the way a person acquires, stores and uses the knowledge. Many studies have shown the influence of learning style on student achievement and attitude like, Grasha[7] et. al and Keefe[8] have researched that learning style provides fundamental and generic dimensions of individual learning and is a consistent way in which a student responds to and uses stimuli in the context of learning. Learning style is seen as cognitive, affective and physiological traits that serve as relatively stable indicators of how learners perceive, interact with and respond to the learning environment. Seminal work of Hasan[9] and Robert[10] show that there is no relationship between learning style and academic improvement. Amidst of conflicting research outcomes, we can infer that there prevails an uncertainty in establishing a firm unidirectional association between learning styles and academic performance.

Steven[11], Samuel[12] and Michela[13] researched that there are over hundred learning styles. They came out with seventy-one measures of learning techniques that represent a wide variety of theoretical models and Cognitive Style of Learning (CSI). CSI provides information on the relationship between cognitive styles, learning styles, cognitive strategy, coping, and cognitive ability. Cognitive styles of learning are commonly described as appropriate modes of thinking, remembering and problem-solving as they are stable and constant individual characteristics that partly control and organize more fluid cognitive strategies. The CSI is a cognition theory and views the above as a single dimension which ranges from intuitive to analytical in a continuum.



Source: CSI-Technical Manual and User Guide

Source: CSI-Technical Manual and User Guide, last accessed 02 February 2019

Figure 1: A continuum of cognitive style

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Gerard and Eugene[14] in their paper discussed about CSI developed by Allinson and Hayes in 1996. The development took place due to dissatisfaction with other learning instruments. The instrument used by Allinson and Hayes is one of the psychometric measures that meets validity criteria and can be used for replication. Though it was primarily used for professionals, it was also successfully extended to educational environments and non-managerial employees. They have synthesized an overview of twenty-two dimensions of cognitive style and consider intuition analysis as the most fundamental. The intuition analysis dimension assessed by the CSI has five notional styles which are representative of the full range. At the extreme, we have the pure case of "intuition' and 'analysis' respectively. In the middle, we have the 'adaptive' style which implies a balanced blend of the two cognitive modes. On either side of this are the 'Quasi Intuitive' and 'Quasi Analytic' each of which denotes a tendency towards but not a full adoption of one of the extreme cognitive modes. Within the Allinson and Hayes cognitive style index there are extreme types of learners based on one dimension called Cognition. Analytic learners are individuals who achieve scores from 38-76 while intuitive learners range from zero to 38. Individuals who score 38 are neutral, and they use both intuitive and analytic modes of learning. This scoring method is a continuum and not a bipolar method. In the next section we shall discuss more about Cognitive Style of Learning (CSI), its index and relevance on learning style and performance. Below table provides a quick reference to understand the scores and cognitive style.

Table 1: CSI score ranges for the five cognitive styles

Style	Score range
Intuitive	0 – 28
Quasi-Intuitive	29 – 38
Adaptive	39 – 45
Quasi-Analytic	46 – 52
Analytic	53 – 76

Source: CSI-Technical Manual and User Guide

II. THE STUDY ENVIRONMENT

The Cognitive Style of Learning Index was top rated in a widely published review of learning and cognitive style conducted by Timothy[15] for a learning and skills development agency, a UK government sponsored body. In the survey they identified around 71 theoretical models developed over a period of 50 years, of which, thirteen were widely recognised and all these models used CSI index to have the best psychometric credentials. Therefore, it can be trusted to give statistically meaningful and consistent results and has been globally recognized as a research tool. According to Magnus[16] and Rafael [17] CSI index has been translated into several languages and cross-cultural studies

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have also been conducted by many researchers like Agor[18]. Its reliability and validity have been exhaustively evaluated by authors and therefore, this instrument has been adopted for our study. Although designed to be used for adult unit of study, the instrument has been conducted successfully to high school pupils as young as 15 years of age.

The CSI is a 38-item self-report questionnaire. Each item has 'true,' 'uncertain' and 'false' response options, and scores of 2, 1 or 0 are assigned to each response with the direction of scoring depending on the polarity of the item. The nearer the total score to the maximum of 76, the more 'analytical' the respondent, and the nearer to the minimum of zero, the more 'intuitive' the respondent. Marking the total score from CSI shows the learners predominant learning style.The study was administered on 211 students pursuing Chartered Accountancy (CA) across 25 learning centres of The Institute of Chartered Accountants of India (ICAI) in the city of Visakhapatnam, India. ICAI is a statutory body established under the Chartered Accountants Act, 1949, for the regulation of CA in India. It has achieved recognition as a premier accounting body across globe for its contribution in the field of education and maintenance of high accounting, auditing and ethical standards. ICAI is the second largest accounting body in the world with 146 branches in India and 26 chapters abroad. The Chartered Accountancy course is a combination of in-depth theory with industry practice. The course is considered to be one of the toughest, rigorous professional course in the world with a pass percentage ranging between 3 and 8. The division of the CA examinations takes place at three levels viz, Common Proficiency Test (CPT); Integrated Professional Competence Course (IPCC) and CA Final Examination. ICAI has five regional canters in India and this study was administered in the period 2016-2017 at one of the branches of southern region known as Visakhapatnam. As mentioned early, we have used Allison and Hayes standard questionnaire to collect the data from sample of 211 students in the registered centre of ICAI using simple random method for choice of respondents.

Given the above sample frame, the main objectives of the study are as follows:

- To evaluate the student performance in Group 1 and Group 2 Chartered Accountancy examinations over the last fifteen years.
- To analyze the intuitive and analytic dimension of Cognitive Style Index.
- To determine the learning style preference of Chartered Accountancy students in India.
- To assess the differences in learning style preferences between genders.
- To assess the empirical relationship between learning style and performance of students in Group 1 and Group 2 exams.
- Determine the observed association between intuitive-analytic CSI score and performance of students in Group 1 and Group 2 exams.

III. RESULTS

Responses were collected from a sample of 211 students pursuing Chartered Accountancy in Visakhapatnam, India. The student data was collected from 25 CA training institutions across the city of Visakhapatnam. The data consisted 59.3% males and 36.2% female candidates. Almost 43% of the respondents were aged nineteen followed by 16.3% of them in their twenties and the remaining either below 18 or above 20. Almost 50% of the respondents

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have completed their intermediate and 33.5% of the students are pursuing their graduation. One interesting fact that came out during the analysis was half of the respondent's parents did not have a formal education background to instil awareness about this professional course. Whereas 24.4% of the respondents had only fathers taken the formal education and 9.5% only mothers, equally 9.5% of the had both the parents with formal education. Three fourth of the students have intermediate level of English language proficiency and remaining 20% have come with beginner level of proficiency and 5.2% of the respondents are experts in the same. All 23 items confirm to the acceptable standards of internal consistency with Cronbach α greater than seventy percent. Table 2 explains the variability between Groups. The variability between Group 1 and Group 2 results is lowest at 0.158. The coefficient of concentration for Group 1 and Group 2 is highest at 66.7% which shows that the variability between Group 1 and Group 2 results is very less as compared to the variability of the other two Groups. We can infer that the number of students passing Group 1 and Group 2 exams over the past fifteen years is almost the same. This demonstrates that both Group 1 and Group 2 exams are equally tough levels to pass in the CA examinations conducted in India.

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Table 2: Student result variance for Chartered Accountancy exams

Groups	Median	Coefficient of Dispersion	Coefficient of Concentration
			Within 20% of Median inclusive
G1 & G2	1.039	.142	80.0%
G1 & Both	1.039	.142	80.0%
G2 & Both	1.609	.148	73.3%

Source: Authors calculation

The learning preferences

When asked about respondents preferred learning time, half of the sample preferred a 45-minute class, 30% of them preferred one-hour session. It shows that students enjoyed learning and were able to provide their focus only for 45 minutes. Both morning and night shift of self-study was preferred equally by students, but afternoon was the least preferred time for self-study. Almost 60% of students doing professional course like CA preferred to do their learning and studies alone. Very few with 8% opted to study in team. Internet was the most relied sources for studies with more than 70 % opting for the same, whereas library and other sources like newspaper were preferred by 11-15 % of the respondents. Professional students rely on internet for updated information and content support. The table below provides a complete break-up of learning preferences.

Table 3: Learning preferences

Class time preference		Self-study learning Preference		Learning pattern		Learning resource	
Time in minutes	Respondents in %	Shift	Respondents in %	Mode	Respondents in %	Resource	Respondents in %
35	20.86	Early morning	33.65	In groups	8.057	Library	15.16
45	50.72	Afternoon	7.58	Alone	57.35	Internet	72.98
60	27.97	Night	33.17	Both	34.12	News paper	11.37
Total	99.53	Any time	25.12	Total	99.53	Total	99.53
		Total	99.53				

Source: Authors calculation

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Gender and learning preference

The average mean score for the entire population of students is 38.1. This matches the neutral score of 38 of a given set of people. The females in the study obtained an average rating of 39.8 with the lowest score being 20 and the highest score at 53. The average score for the males in the study was 38.2, with the lowest score of 20 and the highest score of 54. From table 4, it can be inferred that both male and female, the lowest score was 20 for both and the highest score was quite similar (53 for females, 54 for males).

Table 4: Gender and learning preference

Gender	Intuitive	Quasi -Intuitive	Adaptive	Quasi -Analytical	Analytical	Total
Male	11	54	48	16	2	131
Percent	84	41.2	36.6	12.2	1.5	100
Female	3	36	30	10	1	80
Percent	38	45	37.5	12.5	1.2	100
Total	14	90	78	26	3	211
Percent	6.6	42.7	37	12.3	1.4	100

Source: Authors calculation

A comparative analysis of the total CSI score for both males and females show that the average score for females was 39.08 and males was 38.21. The mean of the total CSI score is 38 for both the males and females which confirms that they are Quasi-intuitive learners. There are 131 male students in this study of which 41.2% male students are Quasi-intuitive learners, and 45% students are adaptive learners. In the female category, there are overall 80 female students of whom 45% are quasi-intuitive learners, and 37.5% of them are adaptive learners. Another finding is that in total there are 211, 42.7% of the students are Quasi-intuitive learners and individually 41% of the male students and 45% of the female students are quasi-intuitive learners. 211 students were sampled and evaluated where (f=54) male students and (f=36) female students had the same learning style. Hence the null hypothesis that there that is no difference in the choice of learning style among the male and female students in the study was accepted, $X2(1) =.797$, $P>.05$. We can infer that 90 of 211 students show a single preferred learning style; hence the null hypothesis that is no preferred learning style observed among the chartered accountancy students in India can be rejected, and we can accept the alternative hypothesis that the students exhibit a particular learning style.

When we tried to understand the relationship between Group 1 and 2 students with their learning preferences, we found that the results in table 5, indicate a positive yet weak link with the preferred learning style adopted by the students and the performance in Group 1 exams and no significant relationship between the preferred learning style and performance of students in Group 2 exams. The correlation between Group 1 and Group 2 exams is positive and strong indicating that the learning style adopted by the students is supporting them to achieve a pass in only Group1 exams but not Group 2. The evidence also indicates that if a student passes in Group 1 exams, there is a high chance that he will pass Group 2 exams also.

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Table 5: Relationship between the learning style and results

Pearson Correlation	Preferred Learning Style	Group 1	Group 2
Preferred Learning Style	1	.141*	.069
Group 1	.141*	1	.550**
Group 2	.069	.550**	1

Source: Authors calculation

IV. DISCUSSION& RECOMMENDATION

The demographic variables that have shown no significant relationship with the Cognitive style are gender, qualification, religion, level of study, education level of the student's parents, class duration, time of the study. The demographic variables of age and study pattern are significant with CSI Index. The analytic dimension of the CSI Index was also found to be significant, but none of the demographic variables were found to be statistically significant with the intuitive dimension of the CSI Index. The research findings of our work are in line with Lemire[19] that one's learning style changes with age and experience. This finding was further substantiated by the work of Schieck[20], who found dramatic learning style differences between younger and older students. This only further strengthens the research findings that though the students are quasi-intuitive learners their inclination towards the analytic dimension is much stronger.There is no difference in the performance based on gender in both Group 1 and Group 2 examinations. We also found a a weak positive correlation between learning style adopted by the students and Group 1 exams and no relation as far as group 2 examinations are concerned.The Group 1 and 2 exams have a coefficient of concentration at 66.75% depicting similar level of difficulty. Thus, the present study infers that a student who secures a pass in Group1 examination has a high probability of acquiring a pass in Group 2 examination. According to the CSI score, the male and female students in this study have a mean score of 38, with a minor variation between them. The females scored an analytic score of 24.24 with a higher standard deviation in comparison to the males with a score of 23.4. According to Allinson[21] males are rational thinkers and females are intuitive by nature. Agor[22] states that in a survey conducted before the development of CSI produced varying results, some of which confirmed the stereotype of female intuition but other studies by Kirton [23]showed that men are more intuitive than women in CSI score though, the analytic and intuitive dimensions of the study show variations, the overall CSI score of both the male and female students indicate great similarity with 38.25 and 38.08 respectively. This finding, however, does not provide support to the results of earlier studies by Murphy et al[24] which found that female participants scored significantly higher on the total Cognitive Style Index than male participants.

According to the mean score of students with intuitive and analytic dimensions of CSI score, the analytic learners had a higher score than the intuitive learners. All students who passed the various individual subjects have a higher analytic score than intuitive score. This means that being analytical is more beneficial than intuitive. There is much evidence to show that irrespective of the subject taught, analytical thinkers scored higher than intuitive thinkers. This has been proved by Backhaus[25]and by Ma[26] for undergraduate students in Hong Kong and Moore[26] have proved the same. Armstrong[27] in his study showed that grades for various academic modules and overall grades for degree students differed for analytical and intuitive thinkers. The former did a better job than the latter. In

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our study both Group 1 and Group 2 and all individual subjects considered separately, the performance of a student who passed, depicted the analytical thinkers have a higher mean than the intuitive mean.

V. CONCLUSION

CSI has been extensively used after its publication in 1996, and it is the most widely adopted measure of all in academic studies. Research in CSI has gained momentum in recent years. One can claim that learners have different preferences in the way they absorb and process information. The study of cognitive styles has different implications for management practice, student improvement. This research is indicating that learning styles adopted by the students have a positive influence on their academic performance in their Chattered Accountancy examinations. It is evident that all the students who secured a pass in the examinations as a whole and individual subjects had a higher analytic mean score in comparison to the intuitive mean score. Another interesting find was that the learning style was not influenced by gender but by age and pattern of learning. By encouraging students to recognize their learning style they will become more receptive to consider different approaches. Awareness of one's cognitive style helps them in the self-development process. This will prove useful in the areas of career guidance and counselling. Determining the learning style profile of students serves as additional support for effective instructional design. As a ground for further research, the study can be replicated with a more significant number of participants for generalization. Other modules and academic disciplines can be further researched.

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Dr. Mythili is an Assistant Professor at the College of Banking and Financial Studies, Oman, with teaching and research experience over diverse areas of Strategic Management, Organizational Behaviour and International Business. She has obtained a doctorate degree in strategic management with a focus on the relationship between strategic management and leadership. She is also a certified Strategic Planning Professional. She has over 18 years of experience in academics and corporate world. She is also engaging in strategic consultancy for Knowledge Oman. She has worked in USA, India, and the Middle East. She has headed the research wing in her academic career. She has published a book on strategic management, research papers in peer-reviewed journals and has presented in both national and international conferences. (email: mythili@cbfs.edu.om).

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Table A:1 Cognitive style dimensions from which CSI items were derived

Intuitive	**Analytic**	**CSI Items**
Active	Passive	23, 12, 31
Ambiguity	Clarity	9
Cautious	Risk taking	6,17,21,33,35
Cognitive simplicity	Cognitive complexity	4
Divergent	Convergent	29
Field depend	Field independent	38
Holist	Serialist	3
Impulsive	Reflective	11,13,16,22,27,34
Intuitive	Sensing	20,26,37
Intuitive	Rational	1,25
Innovator	Adaptor	5, 36
Intuitive	Sympathetic	10,18,32
Less attention to detail	Rigour	19,28
Low tolerance of incongruity	High tolerance of incongruity	24,30
Lumper	Splitter	5
Personal	Impersonal	14
Scanning	Focussing	2,7
Wholist	Analytic	8

Source: CSI-Technical Manual and User Guide

A. Notes

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