

Volume 4, Issue 8(3), August 2015
International Journal of Multidisciplinary
Educational Research

Published by

Sucharitha Publications
8-21-4, Saraswathi Nivas, Chinna Waltair
Visakhapatnam – 530 017
Andhra Pradesh – India
Email: victorphilosophy@gmail.com
Website: www.ijmer.in

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Typeset and Printed in India
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IJMER, Journal of Multidisciplinary Educational Research, concentrates on critical and creative research in multidisciplinary traditions. This journal seeks to promote original research and cultivate a fruitful dialogue between old and new thought.

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Sucharitha: A Journal of Philosophy and
Religion
Andhra University, Visakhapatnam
Pin - 530 003 , Andhra Pradesh – India



ISSN : 2277 – 7881
Impact Factor :2.972(2015)
Index Copernicus Value: 5.16



Editorial.....

You will be happy to know that we have entered the fourth year of publication of IJMER, since its inception in April 2012. Focusing on many interdisciplinary subjects, the published papers are spreading the knowledge with fervent hope of upholding the holistic approach. With all my heart, I reiterate to echo my sincere feelings and express my profound thanks to each and every valued contributor. This journal continues to nurture and enhance the capabilities of one and all associated with it.

We as a team with relentless efforts are committed to inspire the readers and achieve further progress. Aim is to sustain the tempo and improve. We acknowledge with pleasure that our readers are enjoying the publications of Sucharita Publishers. We solicit to receive ideas and comments for future improvements in its content and quality. Editor – in-Chief explicitly conveys his gratitude to all the Editorial Board members. Your support is our motivation. Best wishes to everyone.

Dr.K.Victor Babu
Editor-in-Chief

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DEDICATED TO A.P.J ABDUL KALAM

A.P.J. Abdul Kalam (15 October 1931-27 JULY 2015) was the 11 th President of India from 2002-2007. Graduating from Madras Institute of Technology, Kalam joined Aeronautical Development establishment of DRDO as a Scientist. In 1969 he moved to Indian Space Research Organization. He was the Project Director of India's first satellite launch vehicle (SLV-111) which successfully deployed the Rohini Satellite in near- earth orbit in July 1980. Kalam served as the Chief Scientific Advisor to the Prime Minister and the Secretary of the DRDO from July 1992-Dec 1999. Pokhran tests were conducted during this period. Abdul Kalam is known as people's President and was noted for his integrity and simple lifestyle. He was a recipient of many honors and awards; the most prominent was Bharat Ratna in 1997. Many books were authored by him, to name just a few are, India 2020, Wings of fire, Ignited minds and Inspiring thoughts.

Abdul Kalam was a towering personality who touched the heart of every Indian and to many on the global scene.. He relentlessly worked for the country and categorically stated that India should become a prosperous Nation by 2020.Kalam's focus on the growth of younger minds, scientific contribution, value system, simplicity, love towards humanity, interest towards educating the youth, involving associates in the tasks, sharing responsibility, encouragement ; all these and many more qualities only convey one significant feature and that is everyone should take inspiration from this legendary figure who is remembered as a researcher, writer, administrator involving totally in the activities of this great Nation for a period of many decades.

This issue of our Journal is dedicated to Abdul Kalam who said "Excellence is a continuous process and not an accident".

Warm Regards to each and everyone associated with this Journal.

N. Sanyanarayana (Dhanam)

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AN AFFAIR WITH LIFE: MAUD GONNE, OLD AGE AND CREATIVITY IN THE POETRY OF W.B.YEATS

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Introduction:

(a) Dynamicism and Change with Time:

If we look at the poetic career of Yeats we would see that a process of alchemization is always at work in Yeats. He makes, breaks and grinds into time to catch up with the latest. That is why he escaped from the flimsy romanticism to concreteness, terseness and an immediacy quite unfamiliar in his time. An old person, he is broken within and down, but never out of consideration. He is always willing to clinch a victory from the jaw of defeat. His fighting spirit is evident when in "The Circus Animals' Desertion" he says:

"I shall lie down where all the ladders start,

In the foul rag and bone shop of the heart."

(b) Obsessed with Maud Gonne:

The single largest factor that is responsible in the evolution of Yeats as a great poet is Maud Gonne—the queen of his dream-land and the summum bonum of his existence. Love for Ireland and Irish Literary Movement too occupied his heart, but few would contradict that it was Maud Gonne, the revolutionary woman, who stirred the change in Yeats. Though their love did not materialize into marriage, Maud Gonne proved to be the single largest devotion of his life. The beauty of Maud Gonne fascinated him to such an extent that vague romantic idealization gave way to the physical beauty. He longed for woman's



flesh. The soap bubble colours vanished and in came the concrete forms and brilliant colours of objectified beauty.

(c) Refusal, Dissapointment and the Struggle:

Yeats's dream castle broke down like a pack of cards when Maud Gonne married 'the bandy-legged' John MacBride, a major in the Irish Revolutionary Army. Yeats felt rejected. He said:

"It's certain that fine women eat a crazy salad with their meat whereby the Horn of Plenty is undone." ()

Though Yeats could not be certain whether a woman makes or mars the creativity of a poet, we are sure that the growing literary effulgence of Yeats is the result of the strained relationship with Maud Tonne. In his volumes like "In the Seven Woods" and "The Wind among the Reeds" Yeats declares that love has undone him. The cynical, satirical underpinning of the poet is very clear when he says:

"Better go down upon your marrow-bones

And scrub a kitchen pavements, or break bones." (Yeats. "Adam's Curse")

From now on W.B. Yeats seem to concentrate on himself; the torch is turned within.

With the Easter Rising 'a terrible beauty was born'. It replendished his pale soul. It gave him a fresh opportunity to dream a life with Maud Gonne. But again all his hopes were dashed to the ground as both Maud Tonne and her beautiful daughter Iseult rejected his love proposals leaving Yeats in further mental topsy-turvydom.

Zest for Life Returns:

The initial mental disequilibrium resulting from broken heart paved the way for a stronger Yeats. The maternal care of Lady Gregory revived him. After sexual liaisons with Diana Vernon and Florence Flair, it was Hyde Lees who provided him the necessary care and



affection. The marriage was a successful one and Yeats wanted to be young again. The spirit willing and the flesh faltering, Yeats realized:

"This is no country for old men.
The young in one another's arms
Caught in that sensual music all neglect
Monuments of unageing intellect."
(Yeats. "Sailing to Byzantium")

To discard the sense of physical inadequacy and to revive his physical strength, Yeats even underwent Voronoff operation. But that yielded unsatisfactory result. Besides, the age-old traditional values were falling away. This produced in him a kind of self-pity. Out of this self-pity was produced some great verse in which he defied old age and expressed his firm belief in life. His "Sailing to Byzantium" is a case in point.

(e) Coming to Terms with Grief and the Resolution:

The dichotomy between body and soul, between soul in time and soul in eternity persisted with him. But the winter rages of a tormented soul is replaced by a mellowed maturity and a sense of the tragic and the immanent. The conflict between the flesh and the spirit is over. He aspires for "the artifice of eternity." He seems to arrive at a resolution of his conflicts by grinding at despair and overcoming it. Though the resolution is a false one, he seems to have understood the meaning of life. Now he seeks solace in learned Italian things, the proud stones of Greece, the porter's imaginings and the memories of love and wisdom. Yet, he would not altogether reject the body because he knows that it is the 'dolphin' that would take him ashore through the tormented sea of life.

Yeats now does not despise old age. He loves it and grows with it. If Yeats yearned for the untainted soul in "Sailing to Byzantium", in the "Tower" he expresses his determination to merge both body and soul:



"Now shall I make my soul,
Compelling it to study in a learned school
Till the wreck of body,
Slow decay of blood."
(Yeats."The Tower")

He is ready to embrace:

"All that man is
All mere complexities
The fury and more of human veins."
(Yeats."Byzantium")

Himself remaining on the verge of death,he sounds his resolution:

"I must lie down where all the ladders start
In the foul rag and bone shop of the heart."
(Yeats."The Circus Animals' Desertion")

It is true that Yeats sought solace in Buddhist and Hindu religion and philosophy. But that is not a tame surrender..That is a means of unravelling the enigma about life; an attempt at finding out a spiritual torch to enlighten his turbulent soul.

Conclusion:

W.B.Yeats is not as much an optimistic poet of old age as Robert Browning is .Still,in his later poems Yeats displays vigorousness and buoyancy not quite often find among the poets in English literature. Though he is too much preoccupied with the conflict between body and soul,now realizes that life and death has no existence without Man- the measure of all things in the universe.In the "Tower" he exclaims:

"Death and life were not
Till man made up the whole.



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A COMPARATIVE STUDY ON PSYCHO-SOCIAL PROBLEMS OF INSTITUTIONALIZED AND NON -INSTITUTIONALIZED ELDERS AND SOCIAL WORK INTERVENTION

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Introduction:

Aging is nature's gift with its natural grace and beauty, and god's blessings. Generally chronological age is not a marker of aging but a stage of human life span. Classification of aging varies from study to study. Few specialized applications classify persons 65-74 years of age as "elderly", those between 75-84 years as "aged" and those above 85 years as very old. However in the present study the people with more than 60 years are considered as aged or elders or senior citizen.

Aging is a progressive, universally prevalent physiological process that produces measurable changes in the structure and detrimental alteration of the functions of tissues and organs. These bodily changes can make life more difficult as it creates lot of dependency among them. This condition directly or indirectly influences the psychological comfortless of each individual. Along with such influence the social condition of the elders also matters a lot. At this juncture, living atmosphere of the elders whether in family or in institutions contributes a lot to their psychological condition. These conditions results in causing frightening or depression feeling in elderly. All these mixed problems of physical and psychological problems create insecurity feeling among these elderly people. The present study made an attempt to understand such situation and conditions of elderly.



Many studies have conducted relating to the area of problems of elders. One of such studies states that in traditional period the elder persons are given respect in Indian society. But in modern period, weakening of psychological bonds between young persons and old person is mainly due to various advancements in society. Therefore it is suggested that elders should be rehabilitated before situation worsens, Yojana (1983). Cowgil, noticed that care-giving role of the family is affected mainly because of younger generation aspiration and intergenerational value changes. In such a situation, social and economic security for the elderly is shifted from family to government. K Dandekar (1996) says that institutional support for the elderly in India is of western concept. Indian culture not agree that old persons living in old age homes. Hale and Cochram have mentioned that physical health is considered to be the very important cause for psychological adjustment. Physical illness or loss of health is associated with higher level of depression, anxiety, and result in various types of psychological distresses.

Having this literature background a study was conducted to understand the psycho-social conditions of elders in families as well as in institutions. It considered above 60 years of elders as respondents and looked into some of the feelings and conditions of elderly and compare them between those living in families and institutions.

Objectives of the study: The study aims is achieving the below said objectives.

1. To find out the psycho-social problems of elders living at old age homes and families.
2. To find out the causes for psychological distress among the elders.
3. To gauge the effects of psycho-social problems of elders.
4. To find out effective remedial measures to improve the mental health status of aged through social work intervention.



To achieve the objective, the study adopts an explorative research design and interview schedules as tool for collecting the data. All together 100 respondents were interviewed among 50 are from various institutions of Mysore and another 50 respondents are those living in families. The descriptive statistics has been adopted to analyze the data.

The findings of the study are as follows:

Table No. 01 showing the age of the respondents:

Sl. No.	AGE	Family		Institution	
		F	P	Frequency	%
1	+60-65yrs	23	46.00	20	40.00
2	+65-70 yrs	16	32.00	18	36.00
3	70-75 yrs	11	22.00	12	24.00
	TOTAL	50	100	50	100

(F=Frequency, P=Percentage)

As mentioned earlier, the present study has considered the aged above 60 years old as the respondents. The data shows that from families, there are 23 respondents (46.00) who are below 65 years, 16 respondents (32.00) who are between 65-70 years of age and 11 respondents (22.00) from 71-75 years of age. As well from the institutions, there are 20 respondents (40.00) who are below 65 years, 18 respondents (36.00) who are between 65-70 years of age and 12 respondents (24.00) from 71-75 years of age were the respondents. The data reveals that for the study chronologically senior respondents are more from the institutions than those living in homes.



Table No. 02 Showing the family system of the respondents:

Sl. No.	Family System	Family		Institution	
		F	P	F	P
1	Joint	10	20.00	5	10.00
2	Extended	32	64.00	29	58.00
3	Nuclear	8	16.00	16	32.00
	TOTAL	50	100	50	100

(F = Frequency, P=Percentage)

Family plays a vital role in forming and managing a personality without considering the age as a criterion. The nature of family, the system adopted in the family are some factors which influence the quality of life. Having this background, the respondents were observed and found that among the elders living in the families, 10 respondents (20.00) from joint family system, 32 respondents (64.00) are from extended families and 8 respondents (16.00) from nuclear family system. From the institutions, there are 5 respondents (10 .00) joint family system, 29 respondents (58.00) from extended family system and 16 respondents (32.00) from nuclear family system. The data reveals that majority of the respondents both from family and institution has led their life in an extended family. Further the data reveals that senior respondents are more from the institutions than those living in homes.

Table No. 03 showing the feelings of respondents regarding economic issues:

Sl. No.	Economic Insecurity	Family		Institution	
		F	P	F	P
1	Yes	30	60.00	21	42.00
2	No	20	40.00	29	58.00
	TOTAL	50	100	50	100

(F=Frequency, P=Percentage)



Economic security matters important in the old age due to changes in social roles and obligations mainly retirement from the work. Reduced income in the old age period leads to economic insecurity both elders living in families and institutions. Observing the feelings regarding the economic issues, 30 respondents in families (60.00) have agreed for economic security and 20 respondents (40.00) disagree for it, where 21 respondents (42.00) agree and 29 respondents (58.00) disagree with economic insecurity that lives in old age homes. It is clear that majority of the elders living in both families and institutions have agreed that they are facing economic insecurity. The reasons mentioned are the lifestyle adopted earlier, decreased income, lack of knowledge about proper saving methods, increased cost of living etc. All these issues highlight the total insecurity because of various reasons which are in and above the control of them.

Table No. 04 showing the preferred company of respondents:

Sl. No.	Company preferred	Family		Institution	
		F	P	F	P
1	Family members	10	20.00	-	-
2	Friends	15	30.00	23	46.00
3	Relatives	5	10.00	-	-
4	Neighbors	16	32.00	-	-
5	Inmates	-	-	13	26.00
6	To be alone	4	8.00	14	28.00
	TOTAL	50	100	50	100

(F=Frequency, P=Percentage)

Old age is mainly characterized with social isolation; companionship is considered important for the elders. Especially the spouse plays a vital role in the old age. Keeping the same in mind, the study looked to their preferred company, the results reveal that 10 respondents (20.00) preferred family members company, 15 respondents (30.00) preferred



friends company, 5 respondents (10.00) preferred relatives company, 16 respondents (32.00) preferred neighbors company and 4 respondents (8.00) preferred to be alone. Moving towards institution 23 respondents (46.00) preferred friends company, 13 respondents (26.00) preferred inmates and 14 respondents (28.00) preferred to be alone. The data reveals that elders living in families has opportunity to preferring the company of family members, relatives, other members of family. But, elders living in old age homes have no company of family members and relatives. Then have more friends and inmates of same age group. Though they prefer the family member's company, because of the situation, they may be denying it. In any case friends are the ones who are missed by these members. The concept of community organization and counseling works better in this situation to make them

Table No. 05 showing the interest of respondents in different activities:

Sl. No.	Interests in different activities	Family		Institution	
		F	P	F	P
1	Recreational	14	28.00	16	32.00
2	Religious	17	34.00	10	20.00
3	Relaxation	12	24.00	18	36.00
4	Outdoor visits	7	14.00	6	12.00
	TOTAL	50	100	50	100

(F=Frequency, P=Percentage)

Interest varies according to the age, but definitely exists in each individual till the end. The study looked upon and reveals that in families 14 respondents (28.00) shows interest in recreational activities, 17 respondents (34.00) shows interest in performing religious activities, 12 respondents (24.00) shows interest in relaxation, 7 respondents (14.00) shows interest in going outdoor visits. For elders living in old age homes 16 respondents (32.00) shows interest in recreational activities, 10 respondents (20.00) shows interest in religious activities,



18 respondents (36.00) shows interest in relaxation and 6 respondents (12.00) shows interest in going out. The above data reveals that elders living in institution shows greater interest in recreational and relaxation activities where as those living in the family shows interest more in performing religious activities as well as recreational activities. In common the recreational activities are more focused by both respondents. This is due to the responsibilities free life stage where they would complete majority of their responsibilities and leading stress free life.

Table No. 06 showing the feelings of respondents towards relationships:

Sl. No.	Missing feelings	Family		Institution	
		F	P	F	P
1	Spouse	26	52.00	10	20.00
2	Friends	16	32.00	12	24.00
3	Siblings	8	16.00	28	56.00
	TOTAL	50	100	50	100

(F=Frequency, P=Percentage)

Human beings, being social animals, are always bounded with psychological attachments. But these attachments or feelings are not the permanent one. For one or the other reasons the attachments get weekend or sometimes forcefully has be away from such people. Such missing feelings do exist in old age after the adolescent period because of the life style at the period of life span. Relating to this, the study reveals that 26 respondents elders living in family (52.00) miss their spouse, 16 respondents (32.00) miss their friends and 8 respondents (16.00) miss their siblings. Moving towards elders living in the old age homes, 10 respondents (20.00) miss their spouse, 12 respondents (24.00) miss their friends and finally 28 respondents (56.00) miss their siblings. The above data reveals that elders living in the institution



miss their siblings to greater extent than family where as the family members miss their spouses more. The social and religious performance demands the presence of spouse more than any other activities in Indian lifestyle. Since, the elders in families prefer more religious functions the result must have show the supportive willingness. Application of Casework as well as Group Work works in handling such situation.

Table No. 07 showing the experience of the respondents towards their family members:

Sl. No.	Experience with family members	Family		Institution	
		F	P	F	P
1	Negligence	12	24.00	19	38.00
2	Doubting the capacity	12	24.00	7	14.00
3	Dominates	12	24.00	-	-
4	Very Changed	3	6.00	15	30.00
5	Good	11	22.00	9	18.00
	TOTAL	50	100	50	100

(F=Frequency, P=Percentage)

Old age is characterized by sensitive psychological conditions with rich life experience. With the reduced physical capacity, the adjustmental problems with social conditions as well as psychological conditions do prevail seriously with them. In such conditions, the opinion and experience varies with related to family members which influence the factor of adjustment. The same was tried to look into and the study reveals that 12 respondents (20.00) each from family are feeling that they are neglected, family member doubt their capacity and are quite dominating and 3 respondents (6.00) dais that the members have been very changed, 11 respondents (22.00) mentioned that they have a good feelings towards the family members. Out of the elders living in institutions, 19 respondents (38.00) have mentioned the feelings of



negligence by the family members, 7 respondents (14.00) mentioned that the families doubt their capacities, 15 respondents (30.00) says that members shows very changed behavior towards them and 9 respondents (18.00) mentioned that they have a good feelings towards the family members. The significant results reveal that aged living the institutions are having a feeling that the family members are neglecting them and been very changed in their behavior. Where the elders in families are blames more that they have been dominated by the other members and also they doubt their capacity. These feelings are more with family based elders as they live with the family and day to day experiences makes them feel it. But those who are in institution feel the above conditions which indicate their loneliness and social insecurity.

Suggestions:

The following suggestions will helps to solve the Psycho-social problems of the elders to a greater extent:

- Planned retirement benefits solve various socio-economic problems of the elders.
- Health benefits schemes helps in prevention and prevention of various health problems occurs at old age.
- Following the religious ceremony, rituals, practices etc., by the family members and creates an environment of Joint family system timely.
- Giving some time to the elders by the family members to improve their psychological well-being.
- Craft work, Art Therapy and Play Therapy.
- Development of Geriatric Counseling centers.
- Welfare measures to improve mental health of the elders.



- Institutions arrange activities such as group work activities and carrying recreational activities to heal psycho-social problems.
- Involving them in religious activities helps to a greater extent.
- Holding sessions about programmes, policies, services, acts and health benefits programmes relating to gerontology by resource persons to make them to know about the present phenomena.
- Involving in simple vocational activities helps them to improve the psycho-social well-being.

Social Work Intervention:

Social work profession is considered useful in solving the psycho – social problems of aged to great extent. Medical Social workers may appoint to provide institutional services for the welfare of aged. The scope for intervention of Social Workers in such institutions are wide to act as case workers, group workers, community organizers, counselors, experts, and mediators etc. Primary methods of Social Work such as case work, group work and community organization can be very effective.

Conclusion:

The present study investigates the diverse problems confronted by elders persons which are inter-dependents. In study, the respondents are chronologically more senior from the institutions than those living in homes. Majority of them are from extended families. Economic insecurity is clearly witnessed in aged living in both families and institutions. The reasons they mentioned are the lifestyle adopted earlier, decreased income, lack of proper savings, increased cost of living etc. All these issues highlight the total economic insecurity because of various reasons which are in and above the control of them. Further, the elders living in the institutions miss their siblings to greater extent where as the family members miss their spouses more.



The social and religious platforms demand the presence of spouse more than any other activities in Indian lifestyle. It is understood that elders living in institutions are interested in recreational and relaxation activities whereas those living in the family show interest more in performing religious activities as well as recreational activities. In common the recreational activities are more focused by both respondents. This is due to the responsibilities free life stage where they would complete majority of their responsibilities and leading stress free life. In such a life style, they prefer the company of family members, relatives, other members of family. But, elders living in old age homes found preferring friends whom they miss. The elders living in the institutions are having a feeling of negligence from family members and also mentions their observation related to changed behaviour. Where the elders in families are blamed more that they have been dominated by the other members and also they doubt their capacity. These feelings are more with family based elders as they live with the family and day to day experiences makes them feel it. These results the pathetic condition of the elders where they feel socially, economically vulnerable which resulting in moiré adjustmental problems at the end of life span.

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COMBINED DESIGN OF EXPERIMENTS AND FUZZY LOGIC APPLICATION TO PREDICT SURFACE ROUGHNESS AND MATERIAL REMOVAL RATE ON CNC TURNING

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1. Introduction

The turning operation is one of the most basic machining processes in which a single point cutting tool is moved parallel to the axis of rotation. It is a machining process in which a non rotary cutting tool removes the materials from a work piece by moving and work piece rotates. The axes tool movement may be literally a straight line along some set of curves or angles but they are essentially linear. Some essential cutting action when applied to internal surfaces like holes is called boring. The cutting of the faces on the work piece whether with a turning or boring tool is called facing.

There are three primary factors in any basic turning operation are speed, feed rate and depth of cut. The other factors like types of materials and types of tools have a large influence but these three are those in which operator can change by adjusting the control at the machine tools. All the parameter are shown in fig.

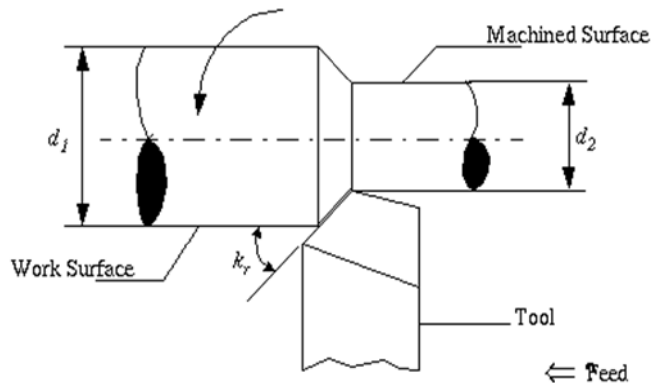


Figure 1. Turning Operation

The turning is one of the metal cutting operation which is widely used manufacturing technique in the industries and there are various studies has done to investigate the complex process in industrial field as well as academic field. The metal cutting process represent the large class of manufacturing operation where turning process is the most commonly used in material removal process. Generally turning process uses single point cutting tools and each group of work piece materials has an optimum set of tools angles.

2. Materials and Methods

For the present study AISI1040 steel has been chosen as work piece material. Cutting speed, feed and depth of cut are input parameters. Surface finish, material removal rate and cutting time are the output responses. It has been found that selected output responses have a great importance and need to be studied for the optimized results. From the literature it has been found that cutting speed, feed and depth of cut has a great impact on output parameters. AISI1040 has a wide industrial applications therefore selected as work piece material.



Table 1. Composition of AISI1040 (EN8)

Material Composition				
C	Si	Mn	S	P
0.35-0.45	0.10-0.35	0.60-0.90	0.6 Max.	0.6 Max.

Taguchi Methodology

Dr. Genichi Taguchi is winner of Deming prize and a Japanese statistician who introduced quality improvement techniques through best and robust design of process and products. Dr. Taguchi also developed fractional factorial experiment design which has limited number of experimental runs. It is useful to understand Taguchi's loss function and serves as foundation for quality improvement.

In traditional way any product within specification is fit for use. In this case cost from poor quality occurs outside specifications. However, Taguchi suggests that parts which are within specifications are little better than a part marginally outside specification.

A continuous loss function increases as a product deviates from the target value. Loss function describes poorly performing products which is proportional to square of the deviation of performance characteristics from the nominal or target value.

Taguchi added this cost to production cost in order to have total cost. Design of experiment was used to make product and process more robust.

Fuzzy Logic

Fuzzy logic described 'degree of truth' and not usual true or false Boolean logic. Fuzzy logic idea was given by Dr. Lotfi Zadeh of University of California in 1960. Dr. Zadeh was working on computer understanding of natural language problem. A natural language is not easily translated into absolute form of true or false. Fuzzy logic

includes various truth states in problem 0 and 1 & also includes extreme cases. Fuzzy logic works like our brain works. A similar type of procedure followed in expert system computer neural network. In fuzzy logic reasoning really works and binary cases are simply special case of it.

Fuzzy logic has many applications like Control of turboshaft aircraft engine, Startup of steam engine, Optimization of steam engine cycle, Control of power supply in resonant converter, Modeling of process variables in rolling mill, Control of trains by fuzzy controller, Heating ventilation and air conditioning, Industrial automation, Artificial intelligence, Decision making etc.



Figure 2. Experimental set-up



Figure 3. Surface roughness measurement

Factor & Levels

Design of Taguchi orthogonal array is only possible by proper selection of factors and their levels. In this study four factors are used for orthogonal array, every factor has three levels. Available DOE table is L27. Factor and their level are presented in table



Table 2. Factor and Levels

Level	Speed N(RPM)	Feed f (mm/rev)	Depth of Cut d (mm)
1	1000	0.1	1
2	1200	0.15	1.5
3	1400	0.2	2.0

Statistical analysis of this study is done using Minitab software.

Table 3. Orthogonal Array

S.No.	Speed N(RPM)	Feed f (mm/rev)	Depth of Cut d (mm)
1	1000	0.1	1
2	1000	0.1	1
3	1000	0.1	1
4	1000	0.15	1.5
5	1000	0.15	1.5
6	1000	0.15	1.5
7	1000	0.2	2
8	1000	0.2	2
9	1000	0.2	2
10	1200	0.1	1.5
11	1200	0.1	1.5
12	1200	0.1	1.5
13	1200	0.15	2
14	1200	0.15	2
15	1200	0.15	2
16	1200	0.2	1
17	1200	0.2	1
18	1200	0.2	1
19	1400	0.1	2
20	1400	0.1	2
21	1400	0.1	2



22	1400	0.15	1
23	1400	0.15	1
24	1400	0.15	1
25	1400	0.2	1.5
26	1400	0.2	1.5
27	1400	0.2	1.5

Regression Analysis:-

Surface Roughness:-

Table 4. Response Table for Signal to Noise Ratios Smaller is better

Level	Cutting Speed	Feed	Depth of Cut
1	-12.639	-9.000	-11.611
2	-11.265	-11.623	-11.400
3	-9.962	-13.243	-10.855
Delta	2.676	4.243	0.756
Rank	2	1	3

Material Removal Rate:-

Table 5. Response Table for Signal to Noise Ratios Larger is better

Level	Cutting Speed	Feed	Depth of Cut
1	50.55	48.89	49.04
2	52.16	52.41	52.41
3	53.49	54.91	54.75
Delta	2.94	6.02	5.71
Rank	3	1	2



Table 6. Fuzzy rules

Rule	IF Speed N(RPM) is	AND Feed f (mm/rev) is	AND Depth of Cut d (mm) is	THEN Experimental (μm) R_a is	AND MRR is
R1	Low	Low	Low	Low	Very Very Low
R2	Low	Low	Low	Medium	Very Very Low
R3	Low	Low	Low	Medium	Very Very Low
R4	Low	Medium	Medium	High	Low
R5	Low	Medium	Medium	Very High	Low
R6	Low	Medium	Medium	High	Low
R7	Low	High	High	Very High	Very High
R8	Low	High	High	Very High	Very High
R9	Low	High	High	Very High	Very High
R10	Medium	Low	Medium	Very Low	Very Low
R11	Medium	Low	Medium	Very Low	Very Low
R12	Medium	Low	Medium	Very Low	Very Low
R13	Medium	Medium	High	Medium	High
R14	Medium	Medium	High	Medium	High
R15	Medium	Medium	High	Medium	High
R16	Medium	High	Low	High	Low



R17	Mediu m	High	Low	Very High	Low
R18	Mediu m	High	Low	Very High	Low
R19	High	Low	High	Very Low	Medium
R20	High	Low	High	Very Low	Medium
R21	High	Low	High	Low	Medium
R22	High	Medium	Low	Low	Low
R23	High	Medium	Low	Low	Low
R24	High	Medium	Low	Low	Low
R25	High	High	Mediu m	Low	Very High
R26	High	High	Mediu m	High	Very High
R27	High	High	Mediu m	High	Very High

3. Results & Discussion

Design of experiment techniques and regression analysis are used to find out model equations for further use.

Main responses from this study were following, which discussed in next sections of this chapters.

Signal to Noise ratio

ANOVA Analysis

Fuzzy logic analysis

Responses are most important predictions for product quality. To find most important critical factors and their responses of this study first of all S/N ratio analysis was carried out in this study and discussed in following section.

Theoretical background of ANOVA was discussed in previous chapter in detail. Minitab software was used for ANOVA and regression analysis in this study.

Signal to noise ratio is simple method to predict the effect of changing of factors according their levels to find effect on product quality. In this study "smaller is better" and "mean" both was adopted as quality indicator for S/N ratio.

Signal to Noise Ratio Analysis

Figure 4. S/N ratio for Surface Roughness

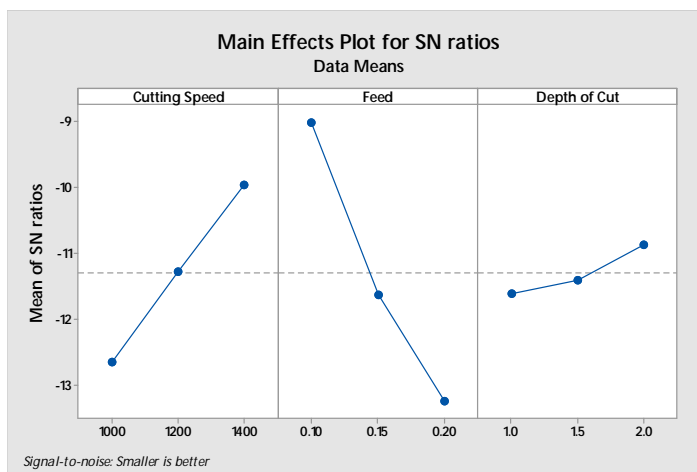
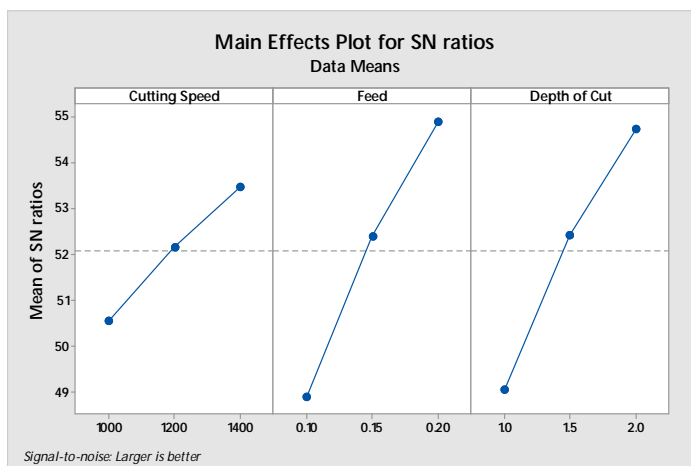


Figure 5. S/N ratio for material removal rate





Analysis of Variance

Table 7. Regression Analysis: Surface Roughness versus Cutting Speed, Feed, Depth of Cut

Source	DF	Adj SS	Adj MS	F-Value	F-Value
Regression	3	19.0852	6.3617	355.02	0.000
Cutting Speed	1	5.2994	5.2994	295.73	0.000
Feed	1	13.6712	13.6712	762.93	0.000
Depth of Cut	1	0.1146	0.1146	6.40	0.019
Error	23	0.4121	0.0179		
Total	26	19.4974			

Table 8. Model summary Surface Finish

S	R-sq	R-sq(adj)	R-sq(pred)
0.133863	97.89%	97.61%	97.05%

Table 9. Regression Analysis: MRR versus Cutting Speed, Feed, Depth of Cut

Source	DF	Adj SS	Adj MS	F-Value	F-Value
Regression	3	656462	218821	174.35	0.000
Cutting Speed	1	47987	47987	38.23	0.000
Feed	1	328622	328622	261.83	0.000
Depth of Cut	1	279853	279853	222.98	0.000
Error	23	28867	1255		
Total	26	685328			

Table 10. Model summary MRR

S	R-sq	R-sq(adj)	R-sq(pred)
35.4270	95.79%	95.24%	94.01%

Fuzzy Logic Analysis

Figure 6. Results display of fuzzy logic

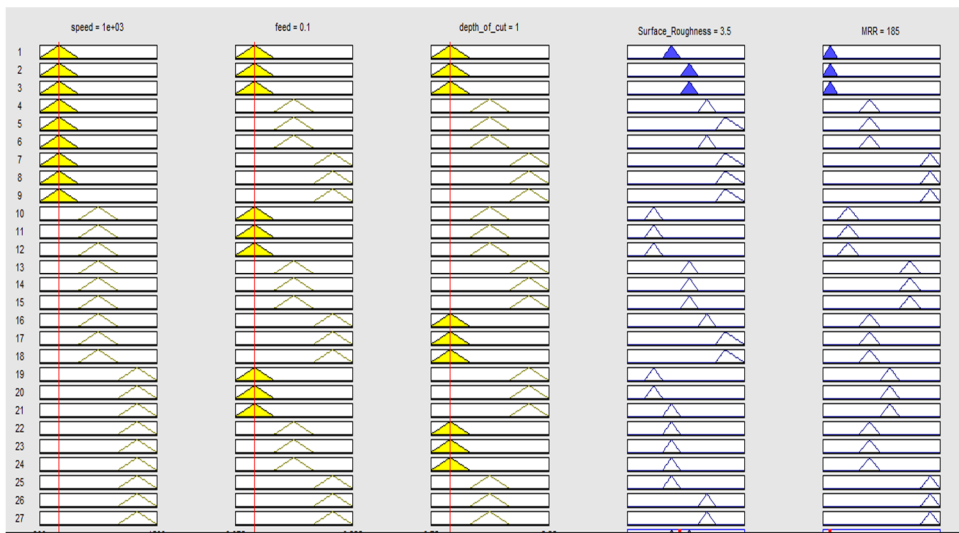


Table 11. Results comparison on experiments, model equation & fuzzy logic for MRR and Surface roughness

No. of Experiment	MRR mm ³ /s			Surface Roughness (μm)		
	Experimental	Model Equation	Fuzzy Logic	Experimental	Model Equation	Fuzzy Logic
1	162.32	122.53	185	3.376	3.520	3.5
2	164.93	122.53	185	3.545	3.520	3.5
3	167.55	122.53	185	3.646	3.520	3.5
4	359.32	382.33	370	4.246	4.312	4.62



5	371.10	382.33	370	4.501	4.312	4.62
6	365.21	382.33	370	4.416	4.312	4.62
7	628.32	642.14	655	4.873	5.103	4.85
8	638.79	642.14	655	5.116	5.103	4.85
9	638.79	642.14	655	5.263	5.103	4.85
10	287.46	298.85	270	2.745	2.897	2.75
11	292.17	298.85	270	2.909	2.897	2.75
12	296.88	298.85	270	2.854	2.897	2.75
13	565.49	558.66	560	3.574	3.689	3.75
14	574.91	558.66	560	3.752	3.689	3.75
15	584.34	558.66	560	3.859	3.689	3.75
16	389.56	444.39	370	4.475	4.720	4.62
17	402.12	444.39	370	4.744	4.720	4.62
18	402.12	444.39	370	4.654	4.720	4.62
19	439.82	475.17	465	2.145	2.275	3
20	447.15	475.17	465	2.253	2.275	3
21	454.48	475.17	465	2.317	2.275	3
22	340.86	360.91	370	3.273	3.306	3.25
23	346.36	360.91	370	3.470	3.306	3.25
24	351.86	360.91	370	3.404	3.306	3.25
25	670.73	620.72	655	3.946	4.098	3.75
26	681.73	620.72	655	4.144	4.098	3.75
27	692.72	620.72	655	4.262	4.098	3.75

Prediction of Modeling Equations

Regression Equation

Surface Roughness = 4.649 - 0.002713 Cutting Speed + 17.430 Feed - 0.1596 Depth of Cut

Regression Equation:-

MRR = -655.2 + 0.2582 Cutting Speed + 2702 Feed + 249.4 Depth of Cut

4. Conclusions

In this analysis experimental as well as design of experiment approach has been used in order to find out the effects of machining parameters on surface finish and material removal rate of AISI1040.

It has been found that in case of surface roughness, feed rate is the most influencing factor followed by cutting speed and depth of cut respectively.

In case of MRR feed rate is the most influencing factor followed by depth of cut and cutting speed respectively.

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CLIMATE CHANGE AND ITS CONSEQUENCES

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The only permanent thing in this world is “change” Change can be natural or anthropogenic. When the change is natural it is slow and provides opportunity and time to organisms to adopt themselves. However, the problem arises when change is anthropogenic. Man-made, it is fast and Hazardous. As the organisms do not get ample time in composition of global atmosphere observed over period of time. Climate change occurs because of natural as well as anthropogenic factors.

The natural reasons behind climate change are Vulcanism, astronomical cycle, variation in solar energy, continental drift etc. But such changes are across centuries or millennia. But in the past few decades human actions has changed atmospheric composition thereby causing climatic change.

The major reason behind the climate change is the anthropogenic emission of GHGs like CO_2 , Nitrogen oxide and its derivatives, methane, hydrofloro Carbons etc.. These gases beyond a limit absorbs the radiations (outgoing terrestrial radiation). This increases the temperature of earth and cause climate change.

Most of the scientists agree that earth's temperature has risen 0.5 degree Celsius since 1900 and will continue to increase at an increasing rate. The year 1990 was the hottest year in the last century. Together with 1991, the years of 1983, 1987, 1988 and 1989 have been measured warmest six years in the last hundred years. The findings of scientific research done in this field reveal that the temperature of the earth is likely to rise from 1.4°C to 5.8°C within a period of 100 years.



The concentration of CO_2 has increased from 280ppm (parts per million) to 400ppm record as recorded at the Mauna Law observatory in Hawaii due to indiscrlmate burning of forest fuels like petroleum. Coal , Loss of forest and blomass etc. but major threat to global atmosphere is from methane and nitrous oxide. Methane has 34 times heat trapping capacity then CO_2 . Methane is produced through digestive activities of live-stock., rice-cultivation via flood irrigation, heaps of farmyard manure, coal-minery, sewage, etc. nitrous oxide is produced from micro-biological activities and nitrogen fertilizers especially when used in excess of requirement. Agriculture directly contributes 10-12 percent of all GHGs that are attributed to human activities. Indirectly these gases are produced via change in land used e.g burning forest land or wetland under cultivation.

Change in land used pattern has contributed in climate change like agricultural and forest land is diverted for construction of roads, canals, dams, powerstation etc. they have caused substantial reduction in forest cover. Everyday over 5500 acres of rain forest are destroyed. Trees play a significant role in the global carbon cycle. They are the largest land based mechanism for removing CO_2 from the air. Deforestation is checking these +ve processes. It is the second principle cause of atmospheric CO_2 . Deforestation is responsible for 25% of all carbon emissions entering the atmosphere, by the burning and cutting of 34 million acres of trees each year. As a consequence of massive loss of forests, global CO_2 level rise approximately 0.4% each year. Moreover, rapid industrialization and urbanization has also contributed in altering the composition of atmosphere. As excessive use of energy, heating and cooling devices and machinery have created heating islands. Climate change has socio-economic and ecological implication. Higher temperature near earth surface has changed rainfall patterns, melting of glaciers, increased intensity and frequency of extreme weather. It has created an imbalance in life cycle of organisms. This



imbalance which we have created between our life and earth is already showing the signs of disaster in the form of flood, cyclones, landslides, tsunami, drought etc. if the imbalance continues to rise, one day this will pose a question mark on the existence of this planet.

This imbalance of hydrological cycle will cause melting of glaciers. As per the latest survey rate of melting of glacier has seen sharp increase in recent times, Even those glaciers are affected which have been considered permanent.

The sea levels as a result of melting glaciers have risen from 0.35 mm to 0.4mm. Scientists have warned in their reports that most of the glaciers will disappeared within a period of 15 to 25 years. The Himalayan glaciers have shrunk about 30% after 1970. it will create problems of drinking water and food grains.

Research has shown that every 1°C increase in temperature would cause a 5 to 15 percent in temperature would cause 9.5 to 15% yield reduction in US and Africa and in wheat in India., If atmospheric temperature were to increase to 5°C, food production in most countries would be expected to decrease and food-grain prices expected to double. Heat stress reduces milk yield, weight gain and reproduction activities. Production of meat and milk is projected to decline with increase of above 3°C.

The rise in sea level is a major cause of concern. A large number of cities located in coastal areas will submerge in the sea. Besides many island countries will ultimately lose their existence and will be washed away from the surface of earth. Due to it, millions of people will not only burden the state excheques but will also lead to social struggle among people on whose land they will be rehabilitated and displaced.

It will also lead to inundation of coastal agricultural land, which is highly fertile. Due to inundation by brackish water it will become



infertile. Consequently the coastal food and potable water security will be effected.

It will lead to outbreak of air-borne and water-borne diseases. Consequently malnutrition and starvation will pose serious challenge before humanity.

Climate change will adversely affect the biomas and biodiversity. Tropical and sub-tropical forests will shift to higher latitudes due to increase in temperature in these areas. It will cause great threat to the flora and faura of the earth. A large number of species of them may become extinct.

The growing population has also affected the CC. there is a close relation between global warming and population growth. Today the large population on earth is using the technologies which are destructive fro the earth. A large portion of carbon emission is attributed to the burning of gasoline in internal combustion engines of vehicles. Vehicles with poor mileage contribute the most to global warming. Besides, this population growth has also affected the forest land. This growing population needs more land to live in and for that purpose forests are being cut for their rehabilitation.

In Indian context, the impact of global warming is a matter of grave concern. As it well known India is mainly an agricultural country and agriculture here is a gamble of monsoon. i.e. largely depending on rainfall. Though it will affect the whole country the worst likely impact would be on central and northern India States like Punjab, Haryana and Up(Western) would have to pay heavy price for the demand for water will increase both for agriculture and other purposes. The scientific studies by PAV shows that combined availability of water from canals and rainfall and seeage is 3.13 million million hectare meter meter per year whereas water demand is 4.33 million hectare meter per year. This deficiency is met by over-exploitation of water



resources. A satellite study conducted by NASA during 2002-08 estimated that under ground water in Rajasthan, Punjab and Haryana was being depleted @ $17.7 \pm 4.5 \text{ Km}^3$ per year. During the six years study period, the total net reduction in water was 109 km^3 which is twice the capacity of India's largest water reservoir on land.

The growing concerns over global temperature have led to nations, states, corporations and individual to draw out a plan of action to avert the situation. As a result the world's primary international agreement on combating global warming reach in Kyoto in 1997 which came to be known as Kyoto protocol. However, 18 years have passed, the situation does not appear to be very changed. It seems that the member countries are not very serious about its devastating effects. Both developed and developing countries are not ready to bear their responsibility. As developed countries wanted the emission targets to be building on developing countries like India, China etc., Which is being opposed by developing nations by stating that for developed countries emissions are increasing due to luxury, whereas they have to eliminate poverty, illiteracy etc, so they should not be bending on them. For this action plan to tackle cc beyond 2012 was checked out at Bali (Indonesia) known as "Bali Actions Plan". It was agreed that every nation will check out its own domestic strategies to take climate change. India has checked out its own national plan. India has announced that it will endeavor to reduce 20-25% by 2020. Under National Action Plan on climate Change (NAPCC) 8 national missions have been initiated like National Solar Mission, National Mission to enhance energy efficiency etc. Besides all these efforts can be made by individuals also like planting more trees and reducing timber cut world wide, following environmental policy of "Reduce, Reuse, Recycle i.e. promoting reuse of anything. Thirdly, by using fuel efficient Vehicles, besides eco-friendly technologies which cause great emission of global warming gases.



Need of the hour is to balance b/w environment, ecology and development. This can be maintained only when our development is sustainable by utilizing our resources and emphasizing on 3 principles of sustainability Viz. conservation, economy and social equity. Public awareness campaign can be of great help in this regard because unless each and every individual is aware only govt's effect cannot bring desired difference.

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AN APPRAISAL ON LGBT RIGHTS AND HUMAN RIGHTS WITH SPECIAL REFERENCE TO INDIA

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"The State shall not deny to any person equality before the law or the equal protection of the laws with in the territory of India. Prohibition of discrimination on the grounds of religion, race, caste, sex or place of birth"- Article -14 and 15 of the Constitution of India. Like-wise "No person shall be deprived of his late or personal liberty except according to the procedure established by law" – Article 21 of the Constitution of India.

Introduction:

Though the world has accepted the Fundamental and Universal Declaration of Human Rights, but the rights of the LGBT have not gained recognition in several countries and India is one among them and still hesitating to provide legal recognition to the Section 377 of IPC Act, 1860 which violates and is impediment in providing the rights and recognition to the marriages of the LGBT Community. To our surprise, in its verdict 2013, even the Supreme Court of India verdicted that Section.377 of the Indian Penal Code, which outlaws sex "*against the order of nature*" is constitutionally valid. Further the conviction carries a fine and maximum 10 years imprisonment. Aggrieved against this verdict, the progressive citizen of India society has vehemently criticized the Supreme Court's Judgment and demanded for the amendments to Sec.377 of the IPC. Navi Pillay, Commissioner of UNO criticized the Supreme Court order in legalizing the ban on LGBT and appealed to the Indian Parliament to initiate bold steps for the protection of the LGBT Rights. In the New York Human Rights Watch Film Festival held in June 2012, UNO Secy. General, *Ban ki Moon* said



that " *in all regions of the world, LGBT people suffer discrimination at work, at home, at school, in all aspects of daily life... no custom or tradition, no cultural values or religious beliefs can justify depriving a human being of his or her rights*". Further on 26.06.2015, the Supreme Court of USA delivered a land mark judgment in the case law of *Obergefell V.Hodges* that prohibition of same sex marriages in the country as unconstitutional. *Raison de'tre* on 24.04.2015 the Rajya Sabha (RS) of India passed the Rights of Transgender Persons Bill,2014 – a first in 45 years which create a National Commission for transgender was just 15th Private Members Bill to have been passed by the Parliament and the first since 1970. The Government of India has also assured the House that "*it would bring in Lok Sabha (LS) by accepting the spirit and the sentiment of the Bill, which has certain infirmities that needed to be removed*".

LGBT Rights and Human Rights - International Scenario:

A land mark judgment was delivered by the Supreme Court of USA in the light of *Obergefell V.Hodges* case law, which will go down in the annals as a culmination of decades of struggle for the existence by Gay Rights activists for equal treatment prevention of abuse, violence and exploitation. Like-wise in the Case law of *Bowers Vs. Hardwick* held in 1986, wherein their lordship had found nothing is unconstitutional about laws penalizing consensual sex between homosexuals. It took 17 years for *Bowers* to be formerly overruled in the case law of *Lawrence Vs. Texas*, but today the court deserved credit for moving in less than 3 decades from viewing arguments in support of autonomy of Gay individuals as frivolous to recognizing their rights to be treated as equal beings. In the case law of *Obergefell Vs. Hodges*, Justice Kennedy opined that "*in denying people a right to marry individuals of the same sex, the states also violated the right to equal protection of the laws which can help to identify and correct in equalities in the institution of marriage, Vindicating precepts of liberty*



and equality under the constitution". Following the USA's Supreme Court ruling, Gay couples are being make a beeline for USA and other countries to benefit from the verdict. Further one more historical event has been occurred on 23.05.2015, the Republic of Ireland became the first country to legalize the same-sex marriage through a referendum with a reverberating majority of 62.1% 'yes'.

LGBT Right s and Human Rights – Indian Scenario:

The Tamil Nadu state in India was the first state to introduce a Transgender Welfare Policy. According to the Transgender Welfare Policy, transgender people can access free Sex Reassignment Surgery (SRS) in the Government Hospital, free housing program; various citizenship documents; admission in government colleges with full scholarship for higher studies; alternative sources of livelihood through formation of Self-Help Groups and initiating income-generation programmes. Tamil Nadu was also the first state to form a Transgender Welfare Board with representatives from the transgender community. In India one group of transgender people are called Hijras. They were legally granted voting rights as a third sex in 1994. Due to alleged legal ambiguity of the procedure, Indian transgender individuals do not have access to safe medical facilities for SRS. However, On 15 April 2014, Supreme Court of India declared transgender people as a socially and economically backward class entitled to reservations in Education and Job, and also directed union and state governments to frame welfare schemes for them. On 24 April 2015, the Rajya Sabha passed *The Rights of Transgender Persons Bill, 2014* guaranteeing rights and entitlements, reservations in education and jobs (2% reservation in government jobs), legal aid, pensions, unemployment allowances and skill development for transgender people. It also contains provisions to prohibit discrimination in employment, prevent abuse, violence and exploitation of transgender people. The Bill also provides for the establishment of welfare boards at



the Centre and State level, and for Transgender Rights Courts. The Bill was introduced by DMK MP, Tiruchi Siva and marked the first time the House had passed a Private Member's Bill in 45 years. The Bill was passed unanimously by the House. However, the Bill contains several anomalies and lack of clarity on how various ministries will co-ordinate to implement its provisions. Social Justice and Empowerment Minister, Thaawar Chand Gehlot stated on 11 June 2015 that "*the Government would introduce a comprehensive Bill for transgender rights in the Monsoon session of Parliament*". The Bill will be based on the study on transgender issues conducted by a committee appointed on 27 January 2014. According to Gehlot, "*the Government intends to provide transgender people with all rights and entitlements currently enjoyed by Scheduled Castes and Scheduled Tribes*".

Remarkable events of LGBT Rights Occurred in the recent Past: LGBT in the Political Scenario:

The All India Hijra Kalyan Sabha fought for over a decade to get voting rights, which they finally got in 1994. In 1996 Kali stood for elections in Patna under the then Judicial Reform Party and gave the Janata Dal and the BJP a bit of a fight. Munni ran for the elections as well from South Bombay that year. Thus, more than 13 years, Hijras are participating in the politics in India. Thereafter, Kamla Jaan run and win the position of the mayor of Katni in MP. Like-wise Shabnam Mausi, who was elected to the Legislative Assembly in 2002. In the huge political machinery, Heera won a seat at the city council of Jabalpur. Meera won a similar position in Sehora, and so did Gulshan in Bina. In December 2000, Asha Devi became the Mayor of Gorakhpur, and Kallu Kinnar was elected to the city council in Varanasi. This brings us to the current elections, which has Mangesh Bharat Khandye running for the Thane Lok Sabha seat. Shabnam Mausi is the first transgender Indian *hijra* to be elected to public office. She was an elected member of the Madhya Pradesh State Legislative Assembly



from 1998 to 2003. In 2000 Shabnam Mausi became India's first eunuch MP. (Hijras were granted voting rights in 1994 in India.) In 2003, Hijras in Madhya Pradesh have announced establishing their own political party called "Jeeti Jitayi Politics" (JJP). The party has also released an eight-page election manifesto which it claims outlines why it is different from mainstream political parties. Hira Bai became the first TG MLA of India from Jabalpur vidhanshaba seat. On 4 January 2015, an independent candidate Madhu Bai Kinnar was elected as the Mayor of Raigarh, Chhattisgarh, becoming India's first openly transgender Mayor. Manabi Bandopadhyay became the India's first transgender college principal, on 9 June 2015, when she assumed the role of Principal of the Krishnagar Women's College in Nadia district, West Bengal.

Consequences of Certain Protests made by the LGBT against TNPSC and UPSC:

Transgender Swapna and gender activist Gopi Shankar from Srishti Madurai staged the protest in Madurai collectorate on 7th October 2013 demanding reservation and to permit alternate genders to appear for the examinations conducted by TNPSC, UPSC, SSC and Bank Exams. Swapna, incidentally, had successfully moved the Madras High Court in 2013 seeking permission to write the TNPSC Group II exam as a '*woman*' candidate. Swapna is the first trans person to clear TNPSC Group IV exams.

Role of LGBT in literature and studies:

"*Vaadamalli*" by novelist Su. Samuthiram is the first Tamil novel about Aravaani community in Tamil Nadu published in the year 1994. Later Transgender activist A. Revathi is the first Hijra to write about Transgender issues and Gender politics in Tamil, her works have been translated in more than 8 languages and acting as a primary resources on Gender Studies in Asia. Her book is part of research project for more



than 100 universities. She is the author of *Unarvum Uruvamum* is the first of its kind in English from a member of the hijra community. She also acted and directed several stage plays on Gender and Sexuality issues in Tamil and Kannada. "*The Truth about Me: A Hijra Life Story*" by Transgender A. Revathi is part of the syllabus for Final Year students of The American College in Madurai. The American College is the first college in India to introduce Third Gender literature and studies with research oriented seminar and the Tamil terms for Gender queer people was coined in this college by gender activist Gopi Shankar. Later Naan Saravanan Alla" (2007) and Vidya's "I am Vidya" (2008) became first transwoman autobiography.

Certain LGBT Rights Activists and their remarkable achievements:

Swapna Madurai - 1st Transwoman to clear Tamil Nadu Public Service Commission Exam & 1st Transgender I.A.S aspirant; A.Revathi - Actor, Artist, Writer, Theater Activist; Anjali Gopalan- Human Rights Activist; Leena Manimekalai- Poet, Writer, Film maker; Rituparno Ghosh- Popular Film maker, Winner of 11 Indian National Film Awards; Celina Jaitley-Miss India 2001; Nolan Lewis-Mr India Gay 2013; Shabnam Mausi-1st Trans to contest in the Indian election; Sushant Divgikar-Mr India Gay 2014; Ismail Merchant- Film producer and director; Freddie Mercury- Popular Pop singer; Onir- Award winning Film Director; Manabi Bandyopadhyay- India's first openly transgender college Principal & 1st Transgender PhD holder; Kalki Subramaniam- Founder of Sahodari Foundation; Nakshatra Bagwe- Actor, Film maker and First ever openly Indian LGBT person to be signed up as a brand ambassador. (for Moovz); Sridhar Rangayan- Founder and Festival Director of Kasish Mumbai International Queer Film Festival, Film Maker; Manil Suri- Indian-American mathematician and writer; Rose Venkatesan-1st Trans TV host in India.



Suggestions:

Quite a good number of analytical studies and researches also divulged that there is a dire need for a National Commission for Transgender persons with statutory powers on the lines of other such National Commissions. While the Governments of Tamil Nadu and West Bengal formed Welfare Boards for Transgenders, why not the rest of the states? Transgenders face total discrimination even by their own families. Therefore the Bill should be guaranteed reservations in education and jobs, financial aid and social inclusion besides skill development for prevention of abuse, violence, exploitation and discrimination. Both the Central and State Governments shall be formed Transgender Rights Courts. At least 2% reservations shall be provided in Government Jobs and prohibits discrimination in employment. After the Nalsa Ruling, the centre sent out notices to the states to implement 5 steps such as a Central grant of Rs.1,000/- per month to the parents of transgender children; a class 7th to 10th Scholarship for higher studies; skills training schemes; and finally a monthly pensions scheme with the centre-state contribution set at 75:25. Alas! Most of the states are not implemented even one. Therefore the Government of India shall reckon the Principles of Natural Justice and all are equal before law, place the Bill passed by the RS before the LS with resounding majority as had done at Ireland for the wellbeing of the third Gender community since they are also born like us as human beings who entitled to get all the fundamental rights. Born with infirmities are neither their sin nor error but for certain harmonic defective problems for which they are no way concerned. It is therefore sincerely and positively extrapolates with a beacon of hope that the Hon'ble LS will certainly consider all these facts and circumstances while voting and the Bill might be passed with a thumping majority which will be stood as a landmark event in the annals of the



enactments with the milk of human kindness which will be pioneered the rest of the world for the wellbeing of the LGBT community.

Conclusion:

Thus beyond any skepticism we can say that the U.S. Supreme Court's, momentous verdict allowing same-sex marriages across that country sparked celebrations among the LGBT community and expressions of support from others. Implicit in every such celebration or voice of support is the expectation that other societies too would follow suit, if not in recognizing the same-sex marriages, at least in ending open discrimination based on the medieval prejudice. The community's long battle for equal rights has reached its logical conclusion there. The court ruled that the bond of marriage cannot be limited to the opposite-sex couples. Supreme court has made considerable progress in recognizing the liberty of the individuals with alternative sexual orientation and their right to equal treatment before the law. Instead of hiding behind traditional arguments to the effect that legal questions concerning personal relations such as marriage be best decided by elected bodies, the court has said that the '*due process*' and '*equal protection*' clauses in the 14th amendment to the U.S. constitution are as available to the gay community as anyone else when it comes to marrying a person of his or her choice, including of the same gender. It is inevitable that such a ruling occasions an evaluation of where India stands. Indian law on homosexuality continues to be retrograde. The restraint that the Court has shown in not striking down Section 377 in the light of *Suresh Kumar Koushal Vs. Naz Foundation* and the reasoning that it should be left to the legislature to decide whether or not to decriminalize homosexuality, fell short of Indian judicial standards. There are several cogent arguments – including some that figure in the U.S. Supreme Court's majority opinion- in favour of judicial intervention to uphold the individual liberties. Now that the judicial opportunity has been lost, the



legislature cannot shirk its responsibility any longer. It may seem unlikely that parties embroiled in electoral politics will risk antagonizing conservative sections of society. However, progressive parties and liberal parliamentarians should come forward with amendments to delete or at least dilute Section 377 of the IPC. An outdated provision cannot be allowed to violate fundamental rights and offend human dignity by remaining on the statue book. Before epilogue to this topic, it is an apt to quote here the buzz words: *"In all regions of the world, LGBT people suffer discrimination at work, at home, at school, in all aspects of daily life ... no custom or tradition, no cultural values or religious beliefs can justify depriving a human being of his or her rights".* – Ban Ki Moon, Secretary General of UNO.

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DOES PRIMARY SCHOLASTIC GROWTH ESTABLISH HUMAN DEVELOPMENT IN GUJARAT? AN ECONOMIC ANALYSIS

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Introduction

Education has been considered as one of the most important instrument to broaden human development and foster economic growth (Lucas; 1988 and Barro; 2001). Education is the key to national prosperity and welfare. It furnishes the individual with basic knowledge and technical skills essential for work, productivity and economic survival. Education enhances personal growth, economic advancement and social effectiveness which are vital for success in a competitive society. The ultimate goal of education is to produce competent pupils in the society. The elementary education years lay the foundation for total development of child- physical, intellectual, social and emotional. Kofi Annan, Secretary-General of United Nations, emphasized the need of universalizing basic education of a satisfactory quality in children of world in the following words:

“Every child should have the best possible start in life; every child should receive a good quality basic education; and every child should have the opportunity to develop his or his full potential and contribute to society in meaningful ways”

(UNICEF, 2001)

In India, the responsibility of educational development and spread of literacy rests largely with State Governments. The Central Government has also been taking initiatives, under its Constitutional obligations, to supplement the efforts of State Governments by meeting some critical gaps in public provisioning for literacy improvement,



particularly in the educationally backward States. These efforts have taken the shape of an enabling policy framework — for instance, the National Education Policy 1986, and the more recent step of introducing the bill for making primary education compulsory in the Parliament, as well as specific programmes including the Total Literacy Campaign, District Primary Education Programme (DPEP), Mahila Samakhya or the present initiative on Sarva Shiksha Abhiyan embodying some of these past programmes.

Numerous empirical studies conducted by social scientists have established a strong correlation between education and national development. The Jomtien Conference 1990, the report of the Jacques Delors Commission on Education for the Twenty first Century, and the United Nation's Millennium Development Goals (MDGs) all attach utmost importance to education as an effective tool in reducing poverty by building available workforce capable of competing in an increasingly competitive and global economy.

The number of educational institutions imparting primary education in the State was 40723 in 2010-11 as against 39952 in 2009-10. The number of pupils enrolled in these schools was 81.45 lakh in 2010-11 as against 78.18 lakh in the previous year. The Gujarat Council of Elementary Education (GCEE) is the state level implementing agency for Sarva Shiksha Abhiyan Mission (SSAM) in all the 26 districts and 8 Municipal Corporation in State.

Primary education is considered the primary agent of transformation towards human development. Hence Gujarat is trying to achieve significant level in primary education.

Review of literature:

Education is the main indicator for human development. Many researcher and academicians has done research on this crucial issue for



socio-economic development. Here we review many articles for our study.

Elaine Unterhalter (2014) in his research paper on Millennium Development Goals considers the history of how and why the indicators for MDG 2 were selected and puts forward some critical reflections on two alternative indicators for the education goal in a post-2015 framework. Some of the constraints associated with the lack of targets or indicators concerning adult, secondary, or tertiary levels of education have been discussed. Thus, two possible education indicators for discussion, suggests that both an indicator-led form of policy on primary school completion and a policy-led form of indicator on participation, lifelong learning, equity, and empowerment are necessary for more comprehensively addressing education in a post-2015 agenda. But working with the power of numbers alone is not sufficient. In attempting to think about what is possible and what might be impossible on a post-2015 framework, it is necessary to consider the significant achievements of the rights frameworks so comprehensively developed in previous decades. **Antonio Villar (2013)** in his study on The Educational Development Index: A Multidimensional Approach to Educational Achievements through PISA (Programme for International Student Assessment) proposes a multidimensional index that summarizes three relevant aspects of the educational achievements, out of the data provided by the PISA Report, concerning reading abilities of 15-years-old students from 65 countries. The three aspects considered here are: performance, equity and quality. The researcher has analyzed the distribution of the variables that approach these three aspects and the resulting index, relative to the corresponding means of the OECD countries. The aim of the PISA study is to test and compare school children's performance across the world. A multidimensional Index of education involves three critical decisions: The number and nature of the dimensions considered the choice of variables that measure those



dimensions and the selection of the aggregation formula. Educational Development Index has been used to evaluate the educational development of all the countries that participate in the PISA exercise and compared the results with the average PISA scores. **Sahidul Ahmed (2013)** conducted a study about primary education in northeast states of India. He analyzed the status of primary education on the basis of some parameters associated with primary education like literacy rate, access, growth of school, gross enrolment ratio, dropout rate, number of teacher working in primary schools, teacher pupil ratio, single teacher school, academic qualification of teachers, professional qualification of teachers, single classroom primary school, student classroom ratio, drinking water facilities in school, toilet facility in school and learning achievement of the student. The study also indicated the existence of intra-regional disparities in development of primary education. The findings of this study indicates a very low gender literacy gap and high ST and SC literacy rate which signify that NER is providing equal educational opportunities for all section of the society. NES are also having similar kind of problems faced by India as well as the world such as poor performance by the students in learning achievements tests, gender difference, rural-urban difference, etc. **Mallikarjun G. Naik and Dr. V. Sharada (2013)** in their paper Educational Development in Karnataka: Inter-district disparities attempts to identify the inter-district disparities in educational development in Karnataka and to find out various factors behind the growth of disparities. The paper focuses on pattern of educational infrastructure and looks several aspects, including various educational institutions, student's enrolment, literacy rate and remedial measures for improvement in educational infrastructure in the state. The researcher has used Composite Index method to know the educational development of each district of the state. In constructing the composite indices of development the Principal Component Analysis (PCA) has been used. The results of the study classify the level of development of



the districts among highly developed, developed, backward and highly backward using the index and ranks. Hence it is useful for the policy measures and also it will help to reduce the disparities among the districts of the state in respect of educational development. **Sonalde Desai, Cecily Darden Adams and Amaresh Dubey (2008)** in their paper "Segmented Schooling: Inequalities in Primary Education" has utilized a newly collected nationally representative survey data from over 41,550 households to examine social inequality in children's educational outcomes. The focus is on 8 to 11 year old children's reading and mathematical skills. The paper documents substantial differences in reading and arithmetic skills between children from different caste, ethnic and religious backgrounds in India. However, these differences persist even after controlling for current school enrollment, grade completion and parental socio-economic status. This suggests that the differences in educational attainment between people of different social strata are not simply due to difference in enrollment rates. Even when children from disadvantaged groups attend school, they fail to learn as much as their peers. These findings have important policy implications. Since low performance at primary levels is likely to result in lower academic performance at subsequent levels, improving school quality and reducing discrimination may be the next challenge facing Indian educational policy. **Sonia Bhalotra and Bernarda Zamora (2006)** in research paper "Primary Education in India Prospects of Meeting the MDG Target" This paper uses two large repeated cross-sections, one for the early 1990s, and one for the late 1990s, to describe growth in school enrolment and completion rates for boys and girls in India, and to explore the extent to which enrolment and completion rates have grown over time. Two indicators, primary school attendance and the primary school completion rate had been taken for the analysis. Overall, the results suggest that a first step towards improving completion rates would be to close the gender-gap in completion. The results also suggest that the improvements in the overall female



literacy rate in the state will contribute to improving primary completion rates for boys and girls. The results caution against the common practice of using current data to make future projections on the assumption that the model parameters are stable. The analysis nevertheless performs illustrative simulations relevant to the question of whether India will be able to achieve the Millennium Development Goal of realizing universal primary education by the year 2015. The simulations suggest that India will achieve universal attendance, but that primary school completion rates will not exhibit much progress.

M.R. Narayana (2006) in his research paper "Measurement of education achievement in Human Development: Evidence from India" analyses the measurement issues in education achievement and integration of education goals and targets, in the context of Human Development in India. It shows a case of integration of educational goals and targets between global, national and sub-national levels. And the main objective of this paper is to analyse the measurement of education indicators and variables in India's national and sub-national HDR's, and to compare India's experiences with the UNDP-HDR's. It has been highlighted that additional educational variables should be focused to measure educational indicators. The policy integration provides a basis to resolve the divergences in measurement of education achievement index in Human Development at all levels.

Venkatanarayana Motkuri (2005) in his study on Educational development Index Based on DISE data for Districts of Uttar Pradesh examined the geographical spread of the educational infrastructure and identified the districts lagging behind in this regard. In addition an evaluation of the relationship between input indicators (schools, teachers, and incentives) and the output indicators (enrolment, wastage, completion rate) is attempted to comment on whether given levels of inputs correspond to corresponding levels of output. And the relation between certain categories in terms of indicators related to access, human resource, physical infrastructure and incentives and their



relation with output indicators has been also examined. He had also mentioned following issues in his study:

- Relationship between input and output indicators.
- Imbalance in the geographical spread of the educational infrastructure across regions of the state
- Contribution of private entrepreneurship in educational service to the educational development
- Whether social group disparity in enrolment is associated with that of teachers
- Adequacy of schools available, physical infrastructure and human resources in those schools.

Different statistical procedure is applied to get the composite index of educational infrastructure (input indicator) and educational development (input and output indicator). Using the DISE data composite index using PCA is calculated through various methods and ranking analysis is also done through different methods which assign rank orders. Correlation analysis is carried out to relate educational development and other socio-economic variables. Educational Infrastructure and Educational Development Indices are strongly correlated. Outcome index is found significantly associated with educational development index but less significant with educational infrastructure index. Hence educational outcomes are not only associated with educational infrastructure (endogenous factor) but also factors beyond the educational system (exogenous factors). The use of various statistical procedures for the construction of composite index has obtained different index values, which is not reliable. Some critiques, like **Lloyd** and **Hewitt** (2009), note that the content and quality of education matter more than the enrollment and completion rates. They find that primary school completion rates are not necessarily correlated with educational outcomes (as measured by literacy). Also, in their 2006 paper "A Millennium Le



arning Goal: Measuring Real Progress in Education,” **Filmer, Hasanand Pritchett** (2006) analyzing the MDG 2 recognize that a goal of school completion is very important but that at the same time it doesn’t necessarily include learning achievement, and argue that the outcomes of learning achievement matters. They demonstrate that “even in countries meeting the MDG of primary completion, the majority of youth are not reaching even minimal competency levels, let alone the competencies demanded in a globalized environment.” Therefore enrollment and completion indicators alone are not necessarily good or consistent predictors of outcomes.

Objectives:

1. To explore primary education and human development in Gujarat
2. To measure empirically education and human development

Methodology:

The present paper is based on primary education and human development of Gujarat state. We obtain both component statistics from district information system for education (DISE). To get the empirical result we attained Correspondence Analysis (CA) for chi-square for p and Alpha value of all the variables. Here Correspondence analysis generates graphical representations of the interactions between two categorical variables.

RESULT AND DISCUSSION:

Chi-square analysis:

The results are displayed once the user has selected and validated the axes on which the plots need to be displayed. A Chi-square test is computed to test if the rows and columns are independent. As the p-



value is lower than the significance level (0.05) we conclude that the rows and columns are not independent, which means there is relationship between the rows and columns. The quality of the analysis can be evaluated by consulting the table of the Eigen values or the corresponding screen plot. If the sum of the two (or a few) first Eigenvalues is close to the total represented, then the quality of the analysis is very high. The first two Eigen values sum is close to the total represented because first two Eigen values are high that is (0.132, 0.007). The correspondence analysis in this example is of good quality as the sum of the first two eigenvalues adds up to 90.51% of the total inertia. The most interesting result in Correspondence analysis is the map of the categories including both rows and columns. If the quality of analysis is good (90.51% as in this example), the map can be used to interpret the data. Correspondence analysis is a very effective technique for analyzing 2-way tables. When more than two categorical variables are used in a survey, the best technique to use is Multiple Correspondence analysis (MCA).

INERTIA values define:

The Quality of a point (see above) represents the proportion of the contribution of that point to the overall inertia (Chi-square) that can be accounted for by the chosen number of dimensions. Note that a particular solution may represent a point very well (high Quality), but the same point may not contribute much to the overall inertia (e.g. a row point with a pattern of relative frequencies across the columns that is similar to the average pattern across all rows). Relative inertia for each dimension, this column contains the relative contribution of the respective (row) point to the inertia "accounted for" by the respective dimension. Thus, this value will be reported for each (row or column) point, for each dimension.



Conclusion of Analysis: Here the screen plot area is up to 90.51% and in Chi-square all variable containing <0.0001 and null hypothesis H_0 is rejected and H_a is accepted, the calculated value of statistics means that human development has taken place due to education in Gujarat.

Absolute Data:

EDUCATION INDICATORS									
DISTRICT S	GER	NER	GPI	Drop out rate	Retention rate	% of schools with PTR>30	Literacy Rate	% of schools with SCR>30	Number of Primary Schools
Ahmedabad	93.2	75	0.85	54.6	92.5	54.3	86.7	61.4	244
Amreli	101.3	81	0.9	48.7	76.6	30.2	74.5	46.1	69
Anand	106.9	88	0.84	70.2	91.2	46	85.8	54.9	415
Banaskantha	158.7	100	0.86	55.7	72	51.6	66.4	61.3	1019
Bharuch	104.7	87.1	0.91	60.3	88.8	28.4	83	39.4	269
Bhavnagar	124.1	100	0.9	54.1	83.1	58.9	76.8	68.8	133
Dahod	162.7	100	0.93	63	74.5	61.6	60.6	70.8	829
Gandhinagar	105.6	84.1	0.84	65.2	81	34.4	85.8	47.4	125
Jamnagar	82	65.4	0.92	61.1	84.6	18.6	74.4	39.3	179
Junagadh	107.8	88.8	0.89	58.8	90.4	29.2	76.9	39.3	250
Kachchh	143.1	100	0.88	54	83.4	41.9	71.6	48.5	201
Kheda	107.5	89.2	0.87	58.8	92.8	30.1	84.3	36.1	738
Mehsana	109.3	88.1	0.82	63.7	80.8	43.2	84.3	49.2	166
Narmada	107.3	88.3	0.94	52.7	87.7	17.4	73.3	36.1	267
Navsari	91	75.5	0.91	55.1	82.3	26.5	84.8	32.2	289
Panchmahal	130.1	87.8	0.91	62.8	78.4	28.4	72.3	45.6	1203
Patan	123.8	97.6	0.87	53.8	80.3	43.3	73.5	55.8	172
Porbandar	104.2	83.6	0.89	47.6	95.2	27.3	76.6	34.8	53
Rajkot	93	76.6	0.83	55.3	100	37.3	82.2	39.7	100
Sabarkantha	119.1	97.8	0.88	65.3	81.5	22.3	76.6	32.1	1025
Surat	80.4	37.6	0.84	61.2	100	47.5	86.7	47.2	619
Surendranagar	122.3	97.6	0.86	45.6	79.8	39.8	73.2	59.1	116
The Dangs	175	100	0.94	61.1	76.8	48	76.8	57.1	266
Vadodara	94.2	77.6	0.91	58	96.2	25.1	81.2	41.9	1378
Valsad	114.7	94.3	0.92	50.9	85.8	36.3	80.9	49.9	489



HUMAN DEVELOPMENT INDICATORS										
DISTRICTS	Female Literacy Rate	% of schools with girls toilet	% of schools with boys toilet	% of schools with boundary wall	% of schools with electricity	% of schools with playground	% of schools with kitchen shed	% of schools providing mid-day meal	% of schools with computer	% of schools with water facility
Ahmedabad	80.3	98	100	91.8	98.4	75.8	24.9	97.5	33.6	100
Amreli	67	91	98.6	94.2	95.7	75.4	62.5	89.6	40.6	100
Anand	77.8	51	100	77.6	100	68	73.7	99.7	21	100
Banaskantha	52.6	34	100	81.3	95.1	65.8	69.3	93.5	21.2	100
Bharuch	76.8	100	100	81.8	97	57.2	78.8	96.3	27.1	100
Bhavnagar	66.9	100	100	87.2	100	65.4	31.4	76.2	23.3	100
Dahod	49	100	100	66.6	90.8	53.7	61.1	45.4	16.4	100
Gandhinagar	77.4	100	100	100	100	83.2	39.4	95.2	39.2	100
Jamnagar	66	41	100	64.8	98.3	59.2	33.5	80	20.1	100
Junagadh	67.6	100	100	76	94.8	66	51.2	89.4	28.4	100
Kachchh	61.6	50	100	68.2	92.8	61.2	64.2	84.2	21.4	100
Kheda	74.7	34	97.7	73.7	99.6	79	86.1	98.8	14.5	99.9
Mehsana	76.1	98	100	96.4	100	84.9	85	93.6	42.2	100
Narmada	63.6	36	98.1	83.1	100	44.6	79.5	98.5	5.6	100
Navsari	79.3	64	100	86.2	100	48.8	96	100	30.1	100
Panchmahal	60	28	100	66.4	99.2	61.1	90.8	99.5	12.5	100
Patan	62	100	100	98.8	100	75	71.5	89.2	30.2	100
Porbandar	68.3	74	84.9	84.9	88.7	69.8	32.4	64.7	20.8	96.2
Rajkot	75.3	64	89.8	83	88	68	22.4	51.7	39	100
Sabarkantha	65.3	61	99.8	70.4	99.4	82.9	91.1	99.8	18.5	100
Surat	81	53	100	98.9	99.4	67	87.5	97.4	31.2	100
Surendranagar	62.2	61	100	80.2	88.8	62.1	49.5	50.5	23.3	100
The Dangs	68.8	31	100	96.2	99.2	69.2	96.9	100	15.4	100
Vadodara	74.4	40	100	70.9	99.3	61.2	78.3	97.9	10.6	100
Valsad	75	45	100	83.4	95.1	49.5	49.4	99.8	9.6	100

Chi-square (Observed value)	6466.281
Chi-square (Critical value)	481.459
DF	432
p-value	<0.0001
Alpha	0.05

Test interpretation:

H0: The rows and columns of the table are independent.

Ha: there is a link between the rows and columns of the table.



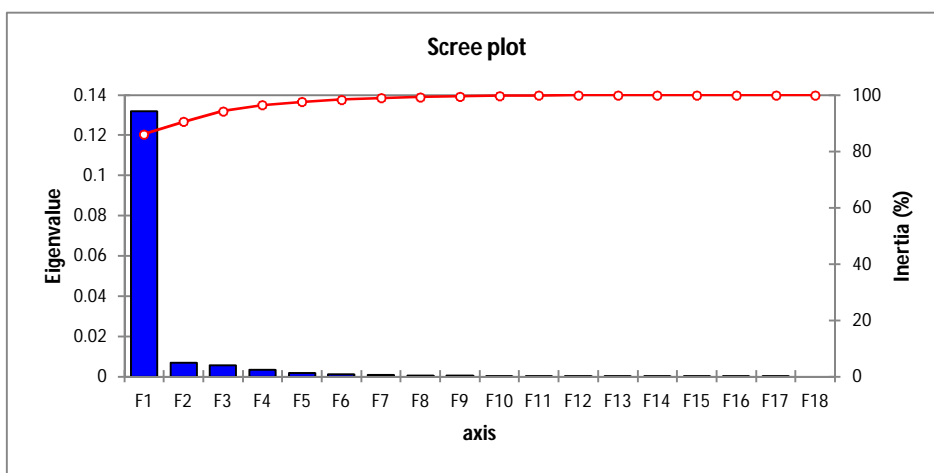
As the computed p-value is lower than the significance level $\alpha=0.05$, one should reject the null hypothesis H_0 , and accept the alternative hypothesis H_a .

The risk to reject the null hypothesis H_0 while it is true is lower than 0.01%.

Eigen values and percentage of inertia:

	F1	F2	F3	F4	F5	F6	F7	F8	F9
Eigen value	0.132	0.007	0.006	0.003	0.002	0.001	0.001	0.000	0.000
Inertia %	86.109	4.407	3.724	2.159	1.229	0.772	0.559	0.291	0.251
Cumulative %	86.109	90.516	94.240	96.399	97.628	98.399	98.958	99.249	99.501

F10	F11	F12	F13	F14	F15	F16	F17	F18
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.182	0.168	0.084	0.039	0.017	0.006	0.002	0.001	0.000
99.683	99.851	99.935	99.974	99.992	99.997	99.999	100.000	100.000

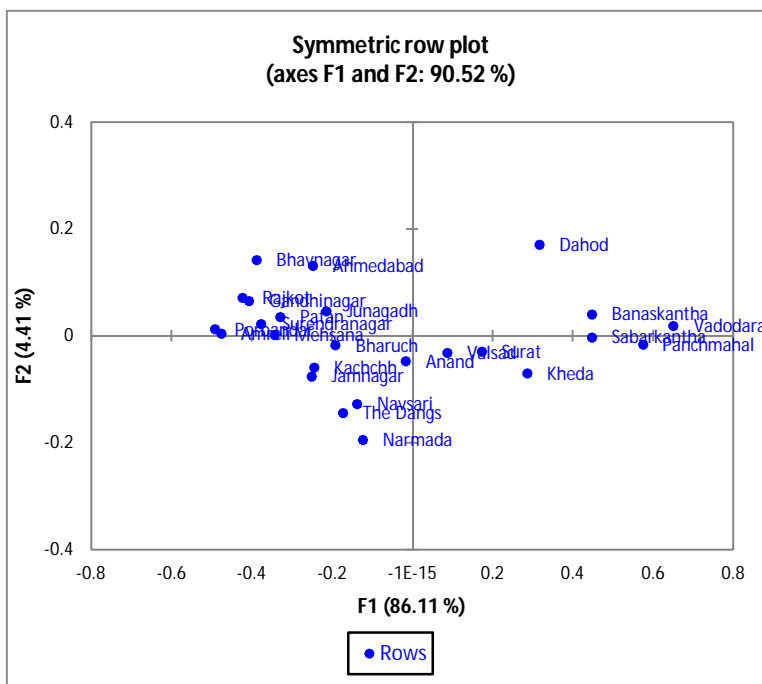




Inertia Value for the Districts

Inertia value for the Districts					
Weights, distances and squared distances to the origin, inertias and relative inertias (rows):					
	Weight (relative)	Distance	Sq-Distance	Inertia	Relative inertia
Ahmedabad	0.037	0.306	0.094	0.00347	0.023
Amreli	0.032	0.491	0.241	0.00767	0.050
Anand	0.041	0.093	0.009	0.00036	0.002
Banaskantha	0.054	0.461	0.212	0.01156	0.075
Bharuch	0.037	0.231	0.053	0.00200	0.013
Bhavnagar	0.034	0.428	0.183	0.00630	0.041
Dahod	0.050	0.384	0.148	0.00738	0.048
Gandhinagar	0.035	0.427	0.182	0.00633	0.041
Jamnagar	0.030	0.314	0.098	0.00296	0.019
Junagadh	0.036	0.242	0.059	0.00211	0.014
Kachchh	0.034	0.287	0.083	0.00284	0.019
Kheda	0.047	0.300	0.090	0.00427	0.028
Mehsana	0.037	0.368	0.136	0.00502	0.033
Narmada	0.034	0.250	0.063	0.00214	0.014
Navsari	0.037	0.225	0.051	0.00185	0.012
Panchmahal	0.058	0.575	0.330	0.01901	0.124
Patan	0.036	0.346	0.120	0.00434	0.028
Porbandar	0.029	0.510	0.260	0.00746	0.049
Rajkot	0.030	0.466	0.217	0.00652	0.043
Sabarkantha	0.055	0.455	0.207	0.01135	0.074
Surat	0.045	0.245	0.060	0.00269	0.018
Surendranagar	0.031	0.408	0.167	0.00518	0.034
The Dangs	0.039	0.297	0.088	0.00343	0.022
Vadodara	0.061	0.654	0.428	0.02626	0.171
Valsad	0.041	0.145	0.021	0.00085	0.006

Symmetric Plot



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EFFECT OF SPECIFIC PREPARATORY TRAINING ON SELECTED SKILL PERFORMANCE VARIABLES OF INTER COLLEGIATE FOOTBALL PLAYERS OF VARIOUS POSITIONS

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INTRODUCTION

A very simple version of the word 'load' can be told that will save you from going through a mass of data, by simply saying that on the average, an elite football player plays for 90 minutes at about 70% VO₂max, expends about 18kCal/minute, and covers between 10 and 15 km per match. But this would be obscuring the real challenges, he faces which playing like the multiple sprints, jumps, changes in direction and ball interactions. Let's look a little more closely at each match by taking into consideration a number of studies that have looked at the activity profiles of footballers. However, for comparison's sake let us include a profile for rugby, with backline players and forwards. Just a word on how this data was actually collected – the most common method was a system of cameras in the stadium, at fixed locations, which tracked the players in their recognized 'grids'. Some advanced software, complex trigonometry and mathematical algorithms was then able to put together a 2-dimensional reconstruction of where that player had moved, and how fast. Another method used for this purpose was GPS, where players wore a GPS unit that tracked where they moved and how quickly they ran, in the same manner as many players use a Garmin to monitor their training. The speeds of running are grouped into four categories – walking, jogging, high speed and



sprinting – and these are somewhat arbitrary. The purpose of the study was to find out the effect of specific preparatory training on selected skill performance variables of inter collegiate different positional football players

METHODOLOGY

The purpose of this study is to find out the effects of specific preparatory training on selected skill performance variables of inter collegiate football players in various playing positions. To achieve this purpose total subjects twenty four intercollegiate college men-football-players (8 forward, 8 mid fielder, and 8 defenders) from Faculty of General & adapted Physical Education and Yoga, Maruthi College of Physical Education and Sri Rama Krishna Mission college of Arts and Science Colleges in Coimbatore, were selected as subjects by applying the random sampling techniques. The subjects selected into their position wise namely forward, midfield and defender position each group consist of eight subjects. The subject's age ranged from 17 to 28 years and they formed a true random group design. The selected criterion skill performance variables were namely dribbling and general soccer ability. The dribbling and general soccer ability was measured by Werner soccer test and Mc Donald soccer test. The training period consists of twelve weeks Monday to Friday 5 pm to 6 pm. The data were collected pre, mid and post tests were conducted initial and middle and end of training periods. After the training, the collected data were analyzed by applying the one way repeated measures (ANOVA) test. If obtained 'F' was significant New manskeuls test was used to significant difference treatment means pre, mid and post means. Analysis of covariance (ANCOVA) was applied to determine the significant difference among the three groups. If obtained 'F' was significant Scheffe's post hoc test will be used. In all the cases 0.05 was fixed level of confidence.



RESULTS

TABLE-I

**ONE WAY REPEATED MEASURES ANOVA ON SELECTED
VARIABLES OF PRE, MID AND POST TESTS OF FORWARD
POSITION GROUP**

Variables	Sources of variance	Sum of Squares	df	Mean Squares	Obtained 'F' ratio
Dribbling ability	Between	6.201	2	3.100	27.959*
	Error	1.553	14	0.111	
General playing ability	Between	175.750	2	87.875	50.732*
	Error	24.250	14	1.732	

*Significant at 0.05 level. The table value required for significance at 0.05 level with df 2 and 14 is 3.738.

Table I shows that the obtained F-ratio values of forward position group on the selected variables namely dribbling ability and general playing ability are greater than the table value of 3.738 with df 2 and 14 required for significance at 0.05 level of confidence.

The result of the study indicate that there is a significant difference among the means of three tests of forward position group in dribbling ability and general soccer ability. To find out which of the three paired means had a significant difference, the Newman Keuls post hoc test is applied and the results are presented in table II to III.



TABLE-II

**NEWMAN KEULS TEST FOR THE DIFFERENCES BETWEEN
TREATMENT MEANS OF DRIBBLING OF FORWARD
POSITION GROUP**

Means		Ordered means			Range (r)	Critical Value
		Pre test	Mid test	Post test		
		10.0	9.5	8.8		
Pre test	10.0	-	0.5*	1.2*	3	0.435
Mid test	9.5	-	-	0.7*	2	0.356
Post test	8.8	-	-	-		

* Significant.

TABLE-III

**NEWMAN KEULS TEST FOR THE DIFFERENCES BETWEEN
TREATMENT MEANS OF GENERAL PLAYING ABILITY OF
FORWARD POSITION GROUP**

Means		Ordered means			Range (r)	Critical Value
		Pre test	Mid test	Post test		
		18.62	21.75	25.25		
Pre test	18.62	-	3.13*	6.63*	3	1.721
Mid test	21.75	-	-	3.5*	2	1.409
Post test	25.25	-	-	-		

* Significant.



TABLE-IV
ONE WAY REPEATED MEASURES ANOVA ON SELECTED
VARIABLES OF PRE, MID AND POST TESTS OF MIDFIELD
POSITION GROUP

Variables	Sources of variance	Sum of Squares	df	Mean Squares	Obtained 'F' ratio
Dribbling ability	Between	2.703	2	1.352	29.415*
	Error	0.643	14	0.046	
General playing ability	Between	332.333	2	166.167	84.084*
	Error	27.667	14	1.976	

*Significant at 0.05 level. The table value required for significance at 0.05 level with df 2 and 14 is 3.738.

Table IV shows that the obtained F-ratio values of midfield position group on the selected variables namely dribbling ability, general soccerability are greater than the table value of 3.738 with df 2 and 14 required for significance at 0.05 level of confidence.

The result of the study indicates that there is significant difference among the means of three tests of midfield position group in dribbling ability, general soccer ability. To find out which of the three paired means had a significant difference, the Newman Keuls post hoc test is applied and the results are presented in table V & VI.



TABLE-V

**NEWMAN KEULS TEST FOR THE DIFFERENCES BETWEEN
TREATMENT MEANS OF DRIBBLING OF MIDFIELD
POSITION GROUP**

Means		Ordered means			Range (r)	Critical Value
		Pre test	Mid test	Post test		
		10.0	9.4	9.2		
Pre test	10.0	-	0.6*	0.8*	3	0.280
Mid test	9.4	-	-	0.2	2	0.229
Post test	9.2	-	-	-		

* Significant.

TABLE-VI

**NEWMAN KEULS TEST FOR THE DIFFERENCES BETWEEN
TREATMENT MEANS OF GENERAL SOCCER ABILITY OF
MIDFIELD POSITION GROUP**

Means		Ordered means			Range (r)	Critical Value
		Pre test	Mid test	Post test		
		18.8	22.12	27.87		
Pre test	18.8	-	3.32*	9.07*	3	1.838
Mid test	22.12	-	-	5.75*	2	1.505
Post test	27.87	-	-	-		

* Significant.

TABLE-VII
ONE WAY REPEATED MEASURES ANOVA ON SELECTED
VARIABLES OF PRE, MID AND POST TESTS OF DEFENDER
POSITION GROUP

Variables	Sources of variance	Sum of Squares	df	Mean Squares	Obtained 'F' ratio
Dribbling ability	Between	4.517	2	2.259	4.910*
	Error	6.439	14	0.460	
General soccer ability	Between	221.083	2	110.542	44.322
	Error	34.917	14	2.494	

*Significant at 0.05 level. The table value required for significance at 0.05 level with df 2 and 14 is 3.738.

Table VII shows that the obtained F-ratio values of defender position group on the selected variables namely dribbling ability, general soccerability are greater than the table value of 3.738 with df 2 and 14 required for significance at 0.05 level of confidence.

The result of the study indicates that there is significant difference among the means of three tests of defender position group in dribbling ability, general soccer ability. To find out which of the three paired means had a significant difference, the Newman Keuls post hoc test is applied and the results are presented in table VIII to IX



TABLE-VIII

**NEWMAN KEULS TEST FOR THE DIFFERENCES BETWEEN
TREATMENT MEANS OF DRIBBLING OF DEFENDER
POSITION GROUP**

Means		Ordered means			Range (r)	Critical Value
		Pre test	Mid test	Post test		
		10.0	9.4	8.9		
Pre test	10.0	-	0.6	1.1*	3	0.887
Mid test	9.4	-		0.5	2	0.726
Post test	8.9	-	-	-		

* Significant.

TABLE- IX

**NEWMAN KEULS TEST FOR THE DIFFERENCES BETWEEN
TREATMENT MEANS OF GENERAL SOCCER ABILITY OF
DEFENDER POSITION GROUP**

Means		Ordered means			Range (r)	Critical Value
		Pre test	Mid test	Post test		
		18.75	21.62	26.12		
Pre test	18.75	-	2.87*	7.37*	3	2.065
Mid test	21.62	-		4.5*	2	1.691
Post test	26.12	-	-	-		

* Significant.



DISCUSSION ON FINDINGS

The results of One way repeated measures analysis of variance indicates that there is a significant improvement in dribbling, general soccer ability due to the effect of specific preparatory training in forward position group, midfield position group and defender position group.

However the results of the Newman Keuls indicates that there is a significant difference between pre and posttests; pre and mid tests; mid and posttests in midfield position group. And also it indicates that there is a significant difference between pre and mid tests; pre and post tests; there is no significant difference between mid and posttests in forward position and defender position groups.

Football players must have the dribbling ability for efficient movement with the ball and dodging the opponent and making the goal. The systematic and scientific creation of the specific preparatory training is advantageous for improving the dribbling ability.

Sakar., (1999), Draganidis, D., & Chatzinikolaou. A., (2013), Taskin H., (2008) proved that there is an improvement in dribbling ability.

Football players must have the general soccer ability for efficient movement with the ball and dodging the opponent and making the goal. The systematic and scientific creation of the specific preparatory training is advantageous for improving the general soccer ability.

Sakar., (1999), Sedano., et al., (2011), Draganidis, D., & Chatzinikolaou. A., (2013), Young, W.B., & Rath, D.A., (2011), Perez., et al., (2008) proved that there is an improvement in general soccer ability.



CONCLUSIONS

It was concluded that effect of specific preparatory training significant improvement in forward position, mid field position and defender position groups of selected skill performance variables dribbling and general soccer ability of inter collegiate football players.

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WATER CONSERVATION & MANAGEMENT, CHOTANAGPUR AREA IN JHARKHAND

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Brambe, Ranchi

Introduction

Water is essential for all form of growth and development for human, animals and plants. One of the emerging situations is however, shortage of water, either as a result of over exploitation or inadequate management strategies. Due to miss management of surface water bodies and over extraction of ground water has lead depletion of water table in Chotanagpur area of Jharkhand. In the resent era in chotanagpur area, low agriculture yield and farming became more uneconomical due to high agriculture input costs, unavailability of electricity and lack of technology. Most of the people of the area are migrating in other city for the search of alternate live hoods.

Objectives

- Increase surface and ground water availability through runoff control, soil moisture control.
- Improving agriculture yielding through sustainable and mixed crop farming pattern.
- To restore the ecological in the peripheral area of chotanagpur plateau.
- Minimize the migration.

Coverage Area

The Chotanagpur plateau is part of Gondwana land and thus making this land the oldest landmass of the INDIA. The land 22 degree-25 degree, 30 minutes.



Characteristics of Chotanagpur Area

The Chotanagpur plateau is a part of Deccan plateau that occupies peninsular area. The name taken from, Nagavanshi dynasty which used to rule in this part of country and Chota is a corrupt word of Chutia, a village in the outskirts of Ranchi. In the Chutia remaining of Nagavanshi old fort is still there. The plateau is formed by continental uplift force acting deep inside the earth. Chotanagpur plateau belongs to the period of Cretaceous periods extended from 146 to 65 million years ago. This plateau is part of Deccan and is used for the construction of roads and buildings. Moreover, quartz, bauxite, magnetite, agate and semi-precious stones are also found in the trap. It is also rich in magnesium, carbonate, potash and phosphates.

Soil and Natural Vegetation

The soil of the area is red soil and periphery of Deccan plateau. Red soil has been formed due to weathering of ancient crystalline and metamorphic rocks.

The vegetation of Chotanagpur area is tropical deciduous forest, they are also known as monsoon forest and receive rainfall between 200 cm to 70 cm, and they shed their leaves for six weeks in dry months. This area is rich in *sal* (*Shorea robusta*) a valuable hardwood, *asan* (*Terminalia tomentosa*), the leaves of the tree provide for the silkworm for the sericulture industry. The tree locally known as *mahua* (*Madhuca logifolia*) yield sweet flowers they are used to make liquor. Bamboo, *Shisham*, palas, *Kusum*, *Arjun* and *pipal* are valuable species found in this area.

Climate

Major climate type of Chotanagpur based under *Köppen's* classification has been given below:

1 Cwg-Monsoon with dry winter.



2 Aw-Tropical savanna.

Tropical climate, where mean monthly temperature throughout the year is 18Celsius. Dry climate, precipitation is very low comparison over temperature.

Agriculture

There are two main cropping season namely, Kharif and Rabi. Pea, gram and mustard are the main crop of rabi. Paddy is the main cultivation of Kharif. Cultivation of wheat, is also sown in few places. Due to lack of rainfall, poor irrigation facilities resulted from short supply of electricity and combination of other soil texture factor wheat cultivation is almost stopped in these areas.

Wheat is the main food crop grown in winter session. But due to declining of water table, the area under wheat cultivation is declining year after year. More ever declining of water table farmers are moving from wheat cultivation to mustard, pea and gram, cultivation in the area of Chotanagpur area of Jharkhand because these are rainfed crops and grow in less irrigation. It is cost effective to grow mustard.

Average land holding systems in these areas are 2 to 2.5 acres. Availability of agriculture input facilities like fertilizer; seeds and technical are not adequate. Once farmers have surplus production of any crop, market price suddenly goes down resulting huge loss to farmers due to lack of storage facilities.

Livestock

It is observed that the cattle population in the Chotanagpur villages seems good. Mainly, cows, buffaloes and goats are found in the project area. Among the milch animals the number of buffaloes is more than cows. According to villagers, farmers prefer to rear buffaloes as cost of one liter of buffaloes milk is more than one liter of cow milk. There is big apprehension among farmers about opting dairy occupation as a main



source of income as they are deprived of correct/deserving price of their milk product.

Rationale

The area used to have open wells in the past but these wells have gone dry from last 15 to 20 years because of declining of ground water level on regular basis. Drying of open well guided the farmers to go for construction bore wells fitted with submersible pump to meet their water demand. Initially, ground water level in region was found between 80 to 100 feet depth. However, ground water level further declined in past few years and now it is available at a depth of 275-300 feet. Thus, most of the farmers have gone for construction of new bore-well in search of water. Over exploitation of ground water is also seen at household's level and most of the household share having bore-wells for meeting domestic water requirement.

Overall, the successive drought years coupled with over exploitation of ground water, improper management of surface runoff and deforestation in catchments have affected severely the water sources and as a result rapid decline is noticed in the ground water level.

Thus, in order to cope up with prevailing problems there is a need for artificial recharge in area by constructing site specific measures and even the replication of the techniques from similar areas. To decrease the stress on deteriorating ground water reservoirs and use of less utilized reservoirs, better ground water management with conjunctive use of surface and ground water may be taken to supplement of irrigation and domestic supplies.

Planning and Process

A bottom up approach will work to intensifies or grow of ground water in chotanagpu area. The principles of ridge to valley approach for catchments treatment formed the basis of the operational mechanism



for selection of sites of water conservation and recharge measures in the area. Emphasizes on low cost structure by utilizing locally available material, greater community participation in water conservation and management, by enhancing the capacity of villagers to manage their water resources in sustainable manner. The sequence of process steps followed villages are as follows:

- 1 institution development and capacity building of the community.
- 2 Protection and conservation of water resources.
 - Drainage line treatment.
 - Rain water harvesting structure.
 - Ground water recharges measure.
- 3 promotion of agro base live hood option through technology implication.

1 Institution Development and Capacity Building Through Community

Capacity building of the community for strengthening village level institutions at local level plays important role to take up soil and moisture conservation measures in enhancing agricultural production. The embedded component of capacity building through training, exposure visit and participatory learning in the area helped to enhance the knowledge and skills of the local communities for achieving sustainable livelihoods.

2. Protection and Conservation of Water Resources

Develop implementation strategy, for the physical interventions of conservation and management. Sites will identify keeping in view covering maximum areas for recharge to help in increasing the water table of the area. The physical measures taken for soil and moisture conservation are following:-



Renovation of Percolation Tank

Percolation tank is one of the measures executions in the area to recharge the ground water reservoir. There is several traditional water bodies such as village ponds & tanks located in different parts of the area. In earlier days, these water bodies used to act as main source of water storage and ground water recharge however it has got silted up due improper care and maintenance. Together with local community, identify suitable sites for construction of percolation tank. . De-siltation of traditional ponds/tanks was done by taking out the hardly permeable layer of clay and silt sediments eroded from the surrounding area from the bottom of the pond.

Masonry Check Dam

Check dams will construct across stream area. These structures are of gravity type barriers/dams built using local materials (e.g. clay bricks) and concrete which provides required stability with lesser cost. The check dam's objective is to prevent runoff and store the water in the upstream area. Subsequently, water level and residue time of the waterway increases, resulting in higher infiltration. The site selected for check dams have sufficient thickness of permeable bed to facilitate recharge of stored water. The water store above the surface can also be utilized for cattle drinking and other purposes.

Low Height Recharge Structures

It is a barrier constructed across the stream flowing along the village boundary. The main purpose of low height recharge structure is to augment ground water recharge and conserve rain water near bore well & ground water recharge pits located in the village by breaking the sub surface flow of the water in sand allowing water to percolate down. The structures will have been designed in such a way so that small surplus water can be stored above surface and excess water is allowed to overflow the wall. In order to avoid scouring from excess run-off, water



cushions are provided at the downstream. It is expected that after rainy season the ground water table will be stabilized in the vicinity of the structure.

Underground Recharge Pit Renovations

Underground recharge pit is the artificial structure will construct to increase the ground water recharge. Run-off water is diverted into these structures to directly recharge the dried aquifer. In this way, soil moisture losses during the normal process of artificial recharge are reduced.

3. Livelihood Development

Considering the employment scenario and its concentration on agriculture sector, it is essential to expand opportunities for rural communities to contribute in growth by engaging in activities related to production system. Livelihood development approach certainly addresses the problem of unemployment and control migration. In this area, components like demonstrate and capacity building has been added to expose rural communities of varieties of livelihood options at local level.

Conclusion

The short term result will visible in terms of capacity of the communities to take up improved water management as well as agricultural practices at local level and water conservation structures for increasing soil moisture as well as recharge the ground water. The long terms impact of the water conservation and management is expected to improve livelihoods, protect & increase surface and groundwater availability in the villages. The key result is summarized below:



Communities are benefited either by increased ground water recharge or by using stored water for cattle drinking, irrigation or other domestic purposes.

The check dam will reduce the velocity of run-off water thereby increase time of concentration which will allow run-off water to percolate down in order to contribute to water availability.

The increase in soil moisture will help in enhancing the overall crop production in the area.

There is a further need and scope to aware community on water management for sustainability of the structures created that contributes in better management of water resources and improved livelihoods of the communities.

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COMPARATIVE PERFORMANCE EVALUATION OF INLINE AND DISTRIBUTOR TYPE FUEL INJECTION PUMP

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I. Introduction

A fuel Injection Pump is the device that pumps fuel into the cylinders of a diesel engine. The pump is driven indirectly from the crankshaft by gears, chains or a timing belt that also drives the camshaft on overhead-cam engines (OHC). It rotates at half crankshaft speed in a four-stroke engine. Its timing is such that the fuel is injected only very slightly before top dead centre of that cylinder's compression stroke [8]. The function of a fuel injection pump is to pump metered quantity of fuel into the cylinder at the right time. Therefore it's essential while testing a fuel injection pump to test and calibrate the injection timing of the various injectors and the quantity of fuel injected per injection [2].

A diesel fuel injector sprays an intermittent, timed, metered quantity of fuel into a cylinder, distributing the fuel throughout the air within. Therefore it's essential while testing a fuel injection pump to test and calibrate the injection timing of the various injectors and the quantity of fuel injected per injection. The injection timing is a crucial factor in deciding the combustion efficiency in a diesel engine and to avoid knocking. Therefore the first step of calibrating a fuel injection pump is to set the injection timing of each injector as per the firing order. The second important parameter is quantity of fuel delivered. Delivery of right quantity of fuel is very essential for efficient operation of an engine. Excessive fuel leads to loss of efficiency and incomplete combustion. Such combustion leads to increased pollutants and smoke in exhaust. Insufficient fuel leads to lean mixture in combustion chamber this causes excessive heating of combustion chamber [1].



It is also necessary for all the injectors to deliver same quantity of fuel to their respective cylinders. The fuel delivered by fuel injector is controlled by two parameters, control rack and speed (RPM) of the fuel injection pump. The following are the functional requirements of an injection system - a) Accurate metering of fuel injected per cycle. b) Timing of injection of fuel correctly. c) Proper control of rate of injection. d) Proper atomization of fuel. e) Uniform distribution of fuel droplets. f) To supply equal quantities of metered fuel to all cylinder in case of multi cylinder engines.

We have tested two types of fuel injection pumps – namely Inline FIP & Distributor FIP - to determine their operational characteristics and the relation between the various inputs and the fuel delivery. In order to determine the fuel delivery characteristics of the pumps we tested them on a fuel injection pump test rig. The effect of input parameters like rpm of the pump, control rack travel and number of strokes were observed on fuel delivery rate. The data collected was analyzed to generate mathematical models using regression analysis.

Javed Mohammad observed that No of strokes followed by Rpm were most influencing parameters on fuel delivery. The parametric effects on fuel delivered by FIP of Diesel engine have optimum control and economic usage of fuel. The parameters observed were fuel delivery. This study helps to explain the optimum parameters required to achieve optimum performance of FIP system of engine. The influence of biodiesel on the pump plunger surface is studied and concluded that greater roughness, obtained after biodiesel usage, will not worsen the sliding conditions at pump plunger skirt. After biodiesel usage, the average value of the root mean square roughness decreased which could even be an indication for improved lubrication conditions [1].

S Semin et al investigated the effect of fuel injection pressure on power performance and fuel consumption of diesel engine. The diesel engine power performance and fuel consumption values are investigated based on load variation, engine speed and fuel injection pressure. The power performance values such as; indicated pressure,



indicated horse power, shaft horse power, brake horse power and break mean effective pressure, is investigated both for various engine speed-fixed load and fixed engine speed-various loads. The fuel injection pressure changed from 180 to 220 bar. According to the experiment results, the best pressure injection performance has been obtained at 220 bar; specific fuel consumption has been obtained at 200 bar for fixed load-various speed and at 180 bar for various loads-fixed speed. The experiment of the fixed load-various speed and fixed speed-various loads has shown that; higher engine speed (rpm) and higher fuel injection pressure gives higher engine power. The increasing injection pressure is in-line with increasing power. The result of the fuel consumption experiment for fixed load-various speed and fixed speed-various loads also showed increasing injection pressure which will increase fuel consumption for the diesel engine [2].

K Kannan & Uday Kumar studied the effect of Fuel injection pressure on Diesel Engine performance and Emissions. The performance and emission characteristics of diesel engine depend on many parameters. One of the important factors which influence the performance and emission of diesel engine is fuel injection pressure. An experimental study was performed on a light duty direct injection diesel engine at 150 bar, 200 bar and 250 bar injection pressure to study its effect on performance and emission. The injection pressure was changed by adjusting the fuel injector spring tension. The performance and emission characteristics were presented graphically and concluded that they were found better at the fuel injection pressure 200 bar for the light duty engine [4].

Dr. Arakerimath. R. Rachayya conducted experiments on two MICO Bosch FIP of TATA Engine (TATA 207 and TATA Sumo FIP) as per DOE using three input parameters at different ranges and conditions. The mathematical models are developed for Torque and Fuel delivery of FIP. This paper also explains the optimization of control parameters using GA to study the optimum conditions for economic fuel delivery and optimum torque control. This paper explains the parametric effect on fuel delivered and torque developed by FIP of



Diesel engine to have optimum control and economic usage of fuel. The parameters observed were fuel delivery, input current to driving motor (Torque). The inputs varied are rpm of the pump, control rack travel and number of strokes. This study helps to explain the optimum parameters required to achieve optimum performance of FIP system of engine. This also helps in following functional requirements of an injection system: a) Accurate metering of fuel injected per cycle. b) Proper control of rate of injection. c) Proper atomization of fuel. d) Proper spray pattern. e) Uniform distribution of fuel droplets. f) To supply equal quantities of metered fuel to all cylinder in case of multi cylinder engines. g) No lag during beginning and end of injection to prevent dribbling [3].

II. Experimental Details

a) Design of experiments

The design of experiments technique is a very powerful tool, which permits us to carry out the modeling and analysis of the effect of process variables on the response variables [11]. The response variable is an unknown function of the process variables, which are known as design factors. In the present study the design factors selected are: Speed (RPM), Number of strokes and Control Rack Travel (CRT) while other parameters have been assumed to be constant. Fuel delivery is the response variable selected.

b) Experimental Set-up

A Series of experiment was conducted on BOSCH fuel pump test rig. Figure 1 show the actual photograph of the experimental set up used for experimentation with pump mounted on Test Rig. There are three inputs Parameters for Inline FIP and 2 parameters for Distributor FIP selected each having two levels. Details of parameters and their levels used are shown in the table. The levels are selected such as the broad range of Input parameters can be taken along with the constraints on working ranges. Details of the parameters and their levels are shown in

Table 1. Tables 2 & 3 shows the Design matrix for Distributor and Inline Fuel Injection Pumps.

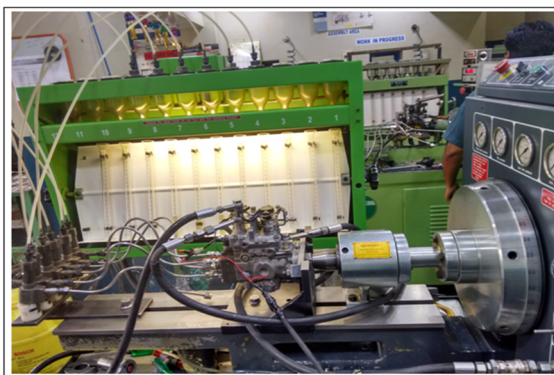


Figure 1. Actual photograph of pump mounted on Test Rig.

Table 1. Parameters & their Levels

Parameters	In line	Distributor
RPM	200-1200	200-1200
No of strokes	100-1000	100-1000
CRT	8-16	-

Table 2. Design Matrix for Distributor Type Fuel Injection Pump-Factorial Design

RunOrder	RPM	NO OF STROKES	FD (ml)
1	1200	100	9.8
2	200	1000	60.2
3	1200	100	9.7
4	200	1000	60
5	1200	1000	98
6	1200	1000	98.1
7	200	100	6
8	200	100	6.2



**Table 3. Design Matrix for Inline Type Fuel Injection Pump-
Factorial Design**

RunOrder	RPM	NO OF STROKES	CRT	FD (ml)
1	1200	100	8	3.2
2	1200	100	8	3
3	1200	1000	8	22.3
4	1200	1000	16	12.1
5	1200	1000	16	12.2
6	200	100	16	2.2
7	200	100	8	2.4
8	200	1000	16	2.2
9	1200	100	16	12.1
10	200	100	8	2.3
11	200	1000	8	2.2
12	200	1000	16	2
13	200	1000	8	2.4
14	1200	100	16	12.2
15	200	100	16	2.1
16	1200	1000	8	22.3

III. Results & Discussions

a) Effect of Process Parameter on Fuel Delivery (ml)

The effect plot of the significant effects is shown in Figure 2 to 4 for different parameters. It can be observed that No of strokes and RPM has a huge influence on fuel delivery. It is clear from the main effects plots that the one parameter namely Control Rack Travel (CRT) has least influence on fuel delivery. It can also be concluded that at same levels of the input parameters the performance of Distributor pump is better as compared to Inline pump.

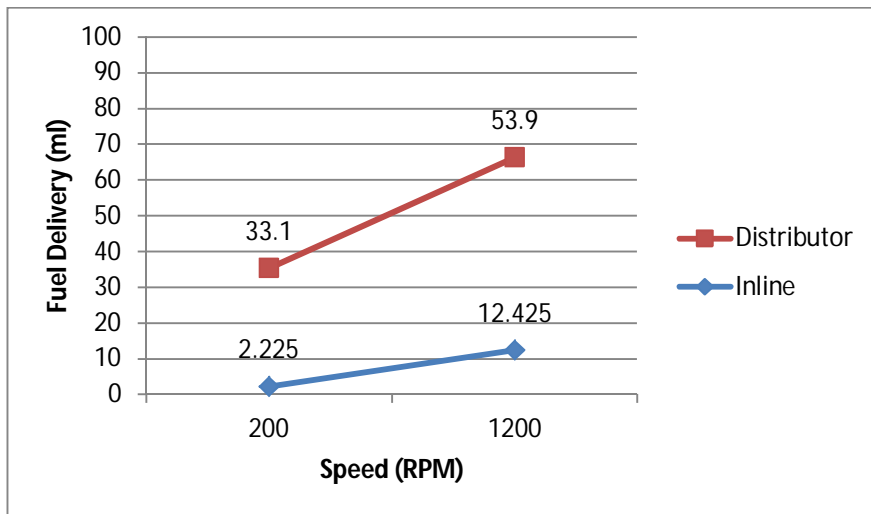


Figure 2. Effect of Speed (RPM) on Fuel Delivery (ml)

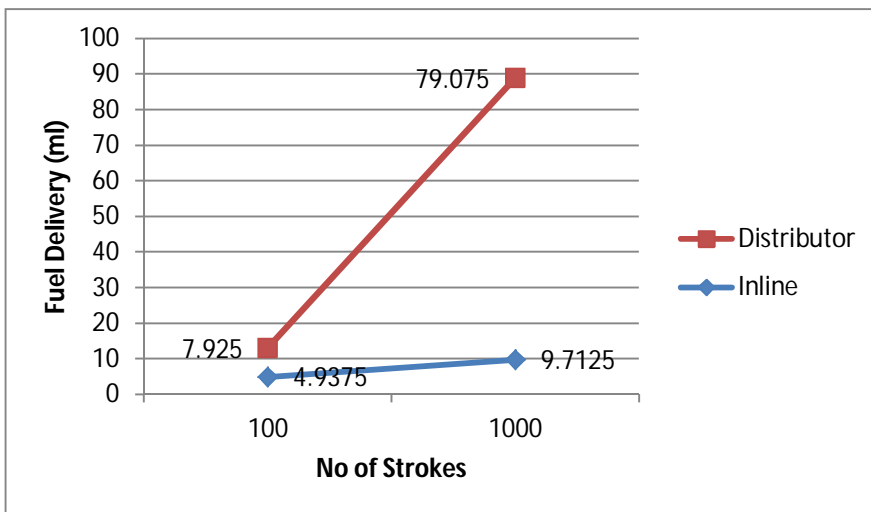


Figure 3. Effect of No of Strokes on Fuel Delivery (ml)

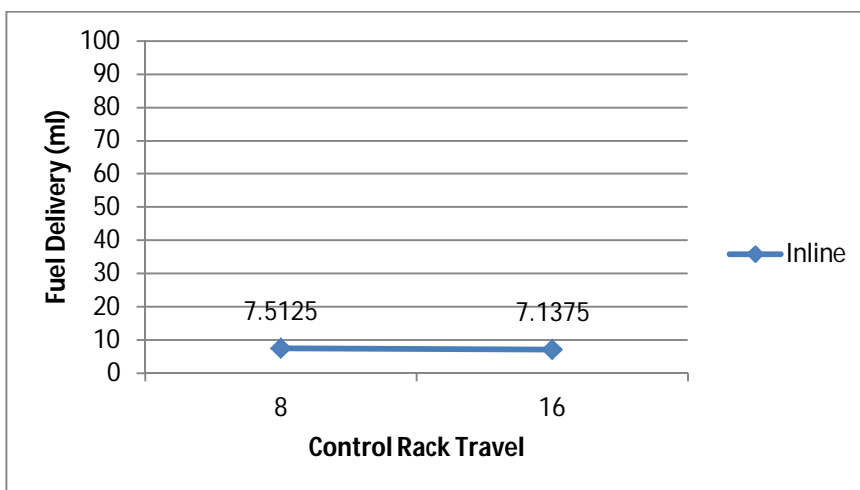


Figure 3. Effect of Control Rack Travel (CRT) on Fuel Delivery (ml)

b) Graphical Plots – Statistical Validation

Figure 4 and 5 shows Pareto plots of the effects for Fuel Delivery. The Pareto plot shows that effects of RPM and No of Strokes are most important to the process. For Inline pump, effect of Control Rack Travel (CRT) do not cross the line of significance and therefore can be treated as inactive effects. But as its interaction is important it need to be kept in the model.

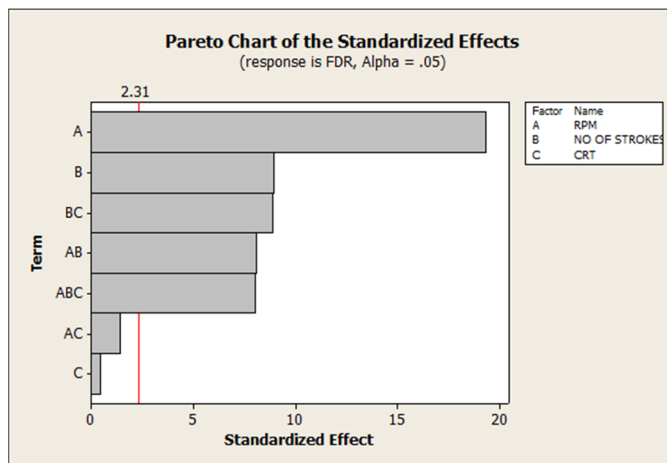


Figure 4. Pareto plot of Inline Pump

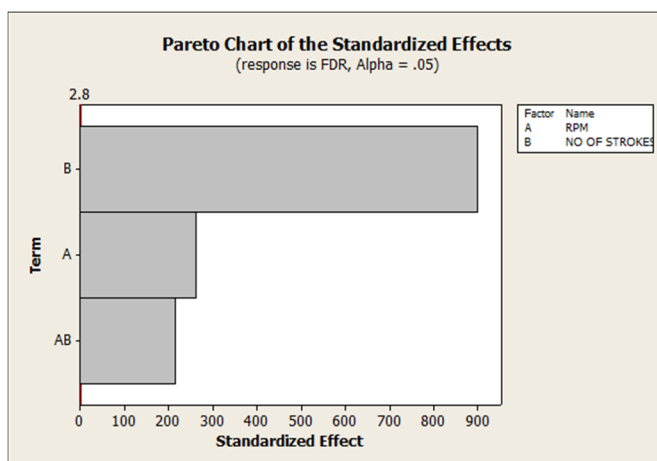


Figure 5. Pareto plot of Inline Pump

IV. Conclusion

- For Inline FIP, RPM and No of strokes are found to be significant parameters whereas CRT is found to be insignificant



- For Distributor FIP, both RPM and No of strokes are found to be significant
- It is found that with same levels of parameters in Inline and Distributor FIP, the Distributor FIP has given a very high value of FDR as compared to inline

Table 4. Result Analysis

TYPE OF PUMP	RPM	NO OF STROKES	CRT	FD (ml)
INLINE	1200	1000	8	22.2
DISTRIBUTOR	1200	1000	-	98.1

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IN THEORISING THE JUSTICE: AN APPLIED SOCIOLOGICAL APPROACH TO MANU SMRITI

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Meaning of Justice

Justice is the first virtue of social institutions, as truth is of systems of thought. A theory however elegant and economical must be rejected or revised if it is untrue; likewise laws and institutions no matter how efficient and well-arranged must be reformed or abolished if they are unjust. Each person possesses an inviolability founded on justice that even the welfare of society as a whole cannot override. It does not allow that the sacrifices imposed on a few are outweighed by the larger sum of advantages enjoyed by many. Therefore in a just society the liberties of equal citizenship are taken as settled; the rights secured by justice are not subject to political bargaining or to the calculus of social interests.

According to Rawls, "*Principles of justice are whatever principles we would all agree upon to govern our society if we were ignorant of our personal qualities and therefore unable to take advantage of one another. Is this the right way to think about principles of justice? Should we abstract from our personal qualities, strengths, and aspirations in choosing principles of justice to govern our society? It seems natural to think of the concept of justice as distinct from the various conceptions of justice and as being specified by the role which these different sets of principles, these different conceptions, have in common. Those who hold different conceptions of justice can, then, still agree that institutions are just when no arbitrary distinctions are made between persons in the assigning of basic rights and duties and when*



the rules determine a proper balance between competing claims to the advantages of social life."

Social justice is generally equated with the notion of equality or equal opportunity in society. Although equality is undeniably part of social justice, the meaning of social justice is actually much broader. Further, "equal opportunity" and similar phrases such as "personal responsibility" have been used to diminish the prospective for realizing social justice by justifying enormous inequalities in modern society. The most recent theories of and scholarly statements about social justice illustrate the complex nature of the concept. According to Mathew Robinson Social justice is defined as *".....Promoting a just society by challenging injustice and valuing diversity."* It exists when *"All people share a common humanity and therefore have a right to equitable treatment, support for their human rights, and a fair allocation of community resources."* In conditions of social justice, people are *"Not be discriminated against, nor their welfare and well-being constrained or prejudiced on the basis of gender, sexuality, religion, political affiliations, age, race, belief, disability, location, social class, socioeconomic circumstances, or other characteristic of background or group membership"*.

Theories of Justice

Theories of justice defines as the tools and techniques of explaining the meaning and scope of justice in general. Justice stands for shake of goodness of society and the universe, as described the primitive function of justice by all the scriptures of all the religions of the world. However, what is the difference of quality and quantity, individual and collectiveness and highness and lowness this is the important thing. Theories of justice typically are assembled from one or more of the following four elements. Principles of equality say people should be treated equally—providing equal opportunity, ensuring equal pay for



equal work, and so on—or that people should have equal shares of whatever is being distributed. Principles of desert say people ought to get what they deserve. People should be rewarded in proportion to how hard they work, or how much risk they bear in undertaking a given line of work, or how well they satisfy their customers. In a nutshell, principles of equality focus on what we have in common; principles of desert focus on how we distinguish ourselves. Principles of reciprocity say that when Joe does me a favor, he puts me in debt. I now owe Joe a favor, not in virtue of what kind of person Joe is but in virtue of what kind of history we share. Again in a nutshell, where a principle of desert might focus on the character of a person, principles of reciprocity focus on the character of a relationship. Finally, principles of need define a class of needs, then say a society is just only if such needs are met, so far as meeting them is humanly possible. A theory of justice that can serve as the basis of practical reasoning must include ways of judging how to reduce injustice and advance justice, rather than aiming only at the characterization of perfectly just societies – an exercise that is such a dominant feature of many theories of justice in political philosophy today. The two exercises for identifying perfectly just arrangements, and for determining whether a particular social change would enhance justice, do have motivation all inks but they are never the less analytically disjoined. The latter question, on which this work concentrates, is central to making decisions about institutions, behaviour and other determinants of justice, and how these decisions are derived cannot but be crucial to a theory of justice that aims at guiding practical reasoning about what should be done.

In the current reference there are three main theories of justice prevails, namely:

1. Mill's utilitarian theory of justice
2. Rawls's theory of justice



3. Nozick's Libertarian Theory of Justice

According to Mill's utilitarian theory of justice we should have rights, laws, and government intervention when doing so will best maximize the good, which he finds to be happiness, and minimize evil in the form of suffering. We often say that utilitarianism asks us to "maximize happiness" for short, and it's implied that suffering is incompatible and destructive to happiness. Mill says that something's just if it doesn't violate any rights, and there are ideal rights that would maximize happiness. Mill's utilitarian theory of justice doesn't tell us what the ideal rights are. Mill said that justice was a subset of morality—"injustice involves the violation of the rights of some identifiable individual". Mill suggests, "Justice implies something which is not only right to do, and wrong not to do, but which some individual person can claim from us as his moral right". Morality is larger than justice because it's plausible that we can be heroic or act beyond the call of duty to help others and such acts would not be best described as examples of "justice."

Second is Rawls' Principles of Social Justice: Equal Liberties, Equal Opportunity, and the Difference Principle. Rawls' theory of "justice as fairness," aimed at answering the above questions, can be summarized with two primary principles. They are:

1. Each person has the same indefensible claim to a fully adequate scheme of equal basic liberties, which scheme is compatible with the same scheme of liberties for all,
2. Social and economic inequalities are to satisfy two conditions: first, they are to be attached to offices and positions open to all under conditions of fair equality of opportunity; and second, they are to be to the greatest benefit of the least-advantaged members of society.



John Rawls' theory of distributive justice (A Theory of Justice) is based on the idea that society is a system of cooperation for mutual advantage between individuals. As such, it is marked by both conflicts between differing individual interests and an identity of shared interests. According to Rawls, These principles are ordered; meaning the first principle (the "equal liberties principle") should be achieved before efforts to achieve the second principle are attempted. Further, the first part of the second principle (the "equal opportunity principle") precedes the second part (the "difference principle").

Nozick's thinks that we have property rights to keep our possessions as long *as they were attained fairly*—without violating other people's rights, harming others, or defrauding them (95-96). The world's natural resources are all up for grabs. They are the property of anyone who takes them. This conception of property rights are described by three principles of justice:

1. A person who acquires a holding in accordance with the principle of justice in acquisition is entitled to that holding.
2. A person who acquires a holding in accordance with the principle of justice in transfer, from someone else entitled to the holding, is entitled to the holding.
3. No one is entitled to a holding except by (repeated) applications of 1 or 2.

Nozick's view seems to imply that taxation is a form of theft because it violates our property rights. People are coerced by governments to give up their property when they are being taxed. No one can take away our legitimately attained property without permission. Any public service funded by taxation would then also be illegitimate, such as public education or food for the poor. Nozick's theory of justice affirms that we have negative rights (to be left alone) but denies that we have positive rights (to social welfare or education). Nozick says taxation is a



form of coerced redistribution of wealth and it's unjust because we have a right to property and we don't have a right to social welfare. We have no ethical obligations to help others—and even if we did, his theory of justice would override any other moral considerations there might be. Nozick says public education is one more form of redistributing wealth. I expect that Nozick's government to be fully funded by donations and/or require volunteers. It would be wrong to tax people to have a police department because that's just one more unjust violation of our property rights. The police department, fire department, public schools, prisons, and everything else must either be "for profit," exist from volunteers, and/or be funded by donations.

It's possible that none of these theories of justice are true, but they have been the result of decades of philosophy. They could be the best philosophers have to offer at this time and they are certainly important to understand the history of the historical debate of justice. It's possible that no theory of justice needs to be endorsed and we could reason about justice using intuitive assumptions rather than a systematic attempt to capture justice in its entirety. That doesn't imply that justice is just a matter of opinion or meaningless. The fact that we are ignorant about justice neither implies that all beliefs concerning justice are not equal nor does it imply that we know absolutely nothing about it.

Justice According to Manu

According to Manu, Justice is a human expression of a wider universal principle of nature. And if men are entirely true to nature, their actions would be spontaneously just. Men experienced Justice, in the sense of a distributive equity, as moral justice, social justice, and legal justice. Each of these forms of justice was viewed as a particularization of the general principle of the universe seen as a total organism. Impartial administration of justice was always regarded as one of the main duties



of the king and he was considered to be the fountain of justice. The ethical code of a society and its cultural standards are inter-related. The cultural maturity and social amicability and even their deterioration are reflected in the law and order of that society. In the early Vedic times justice was administered by the tribe and clan assemblies, and the judicial procedure was very simple. But with the extension of the functions of the State and the growth of the royal powers, the King came gradually to be regarded as the fountain of justice, and a more or less elaborate system of judicial administration came into existence. Manu says that---

Where justice is destroyed by injustice, or truth by falsehood, while the judges look on, there they shall also be destroyed.

'Justice, being violated, destroys; justice, being preserved, preserves: therefore justice must not be violated, lest violated justice destroy us.'

But where justice, wounded by injustice, approaches and the judges do not extract the dart, there (they also) are wounded (by that dart of injustice).

For divine justice (is said to be) a bull (yrisha); that (man) who violates it (kurute 'Iam) the gods consider to be (a man despicable like) a shudra (vrishala); let him, therefore, beware of violating justice.

Depending on the eternal law, let him decide the suits of men who mostly contend on the titles just mentioned.

Neeti-Nyaya and Matseya-Nyaya

According to Manu 'Neeti' is about rules and institutions and 'Nyaya' is about their realisation. Underlying the notion of Neeti Manu says that Neeti (Righteousness) is, ethical principles as guiding one's conduct) is that of Dharma (Duty/ Righteousness/Religion) which considers the nexus of obligations and entitlements that connects individuals and encompasses the wider world. Manu coined the concepts of Vyavahara



and Acara. However, if all possessed Dharma, i.e. had internalized that upon which all is based, then no actual judging or Judges would be needed as no transgression could arise.

Nyaya refers to Justice, in the sense that Manu pointed out, of being a stasis or equilibrium rather than an active process. To say this is not Nyaya is to say this is unjust and contravenes either the law or the cosmic order. Underlying the notion of Nyaya is the older concept of Rta- the Cosmic Order. This was not conceived as eternal and unchanging. Rather Rta went through a sort of evolutionary cycle. The emergence of Matseya-Nyaya- by which Sen means the situation where the big fish eat the smaller fish- is evidence that the Cosmic cycle is in a phase of decline and dissolution. According to Manu Neeti and Nyaya are linked, as are Dharma and Rta, by the theory of karma-or re-birth. Ethical policy or behavior, good Neeti, upholds Dharma and enables Rta to right itself after the total dissolution at the end of the retrograde time cycle. The pay-off for the individual is that the good karma thus generated grants a better future birth-or, indeed, total salvation. It should be noted that while Neeti and Nyaya are words that can be used outside a theistic or Soteriological context, they then lose any ethical meaning. Neeti would mean a crafty policy or an individual religious observance expected to bring personal salvation without any benefit being provided for the wider community. Nyaya, outside a Theistic context, would mean the principles or laws that operate in the actual world according to our empirical experience of it. Thus 'the enemy of your enemy is your friend' is a statement of Neeti and 'Might is Right' is a statement of Nyaya.

Sen says that "*While Neeti is the organization of propriety and behaviour correctness, Nyaya is a comprehensive idea of justice*". The contrast between the two approaches to justice as the difference between "*Neeti*" and "*Nyaya*." "*Neeti*," translated as "organizational propriety and correctness," refers to the institutions that should be



created in order to have a just society. "Nyaya" on the other hand, translated as "*A comprehensive idea of realized justice*," is inescapably linked to the world and the lives of the people. Sen stated that the idea of justice in Holy Roman Emperor Ferdinand I's claim that justice ought to be done even though the world may perish, is that of "*Neeti*." However, justice done at the expense of a catastrophe in which the world may perish does not result in "*Nyaya*."

Raj Danda-The Sustainer of Social Harmony

According to Manu The state performed its duty of protection of society and the individual through coercive enforcement of the standards of justice, which were reduced for the purpose into the proceedings of positive law. According to Manu, Danda (Punishment) is very comprehensive in connotation. In a general sense, Danda means coercion. The lord created Danda or punishment, before he appointed a king, in order to make the discharge of duties properly and efficiently. Danda is considered as the protector of all creatures and of law. Danda rules all people and protects them. Through the fear of Danda, criminal tendencies were prevented even when public was asleep. Danda is not only a coercive force but also a reformatory force, because in modern age of rationality and scientific temper, it is necessary to keep the society clean and healthy.

The king shall protect the inherited (and other) property of a minor, until he has returned (from his teacher's house) or until he has passed his minority.

A righteous king must punish like thieves those relatives who appropriate the property of such females during their lifetime.

Manu strongly believed that the "Danda" "the scepter", a symbol of the power and authority was created by God and only fear alone would make the human beings to swerve not from their duties. Manu sturdily has advocated the theory of deterrence as the purpose of punishment



and the infliction of punishment should be according to the principles of natural justice. The king having fully considered the time and the place of the offence, the strength and the knowledge of the offender should justly inflict punishment on the offenders.

Manu cautions the king that if he does not punish the offenders who are worthy of punishment, then, the stronger would roast the weaker, like fish on a spit and a situation will arise, where, might may overrule the right. In a country where punishment is not properly inflicted, the ownership would not remain with any one; the lower ones would (usurp the place of) the higher ones. The whole world is kept in order only by punishment, because there is no one in the world who will always act in a just manner. Only the fear of punishment runs the world. Manu also feared that if there was no punishment then all castes (Varna) would be corrupted (by intermixture), all barriers would be broken through, and all men would rage (against each other) in consequence of mistakes with respect to punishment. Manu has identified ten places on the body in which punishment may be inflicted. The sexual organ, the belly, the tongue, the two hands, and fifthly the two feet, the eye, the nose, the two ears, likewise the (whole) body is the ten places in a body fit for punishment. From this view, we also come to know that Manu supported retributive justice. Manu is against unjust punishment and warns that unjust punishment will destroy reputation among men, and fame (after death), and will cause even in the next world the loss of heaven. Manu provides stages of punishment for an erring person if he continues to do the crime, first by (gentle) admonition, afterwards by (harsh) reproof, thirdly by a fine, after that by corporal chastisement. However, when the offender is not able to restrain such offence even by corporal punishment, then the four modes jointly should be applied. Punishments, then, should meet harsh—that is, strict—standards of transparency, impartiality, and impersonality both in their formal or conventional definition and their modes of application. These forms of



harshness are not cruel, arbitrary, or extraordinary but humane, reasonable, and ordinary. Manu treats them as the most effective ways of dealing with offenses committed within and between cities, in war or in peace. Since the goal of justice is not unilateral revenge but the restoration of limits needed for good order, even infractions caused by "malice" should be punished "humanely," not maliciously. Manu underlines this point by noting that the Aryans punished military commanders "with fines of money," that is humanely, although the same acts would have been punished in "another republic . . . with the capital penalty." The Aryans had less punitive laws "not because their sins did not merit greater punishment but because . . . the Aryans in this case wished to maintain their ancient customs." so long as their orders were robust they wanted to keep their punishments humane, relying on reason rather than brute force to uphold the laws' authority. Humane punishments helped to preserve a "free and ready spirit" among their soldiers and people, ensuring that the latter complied with the laws because they understood the reasons for them. Penalties that are too harsh rely too much on fear, and too little on reason and free will, to produce obedience.

Apradh Vritti-Classification of Crimes

According to Manu legal suits were of eighteen types, namely, (1) non-payment of debts, (2) deposit and pledge, (3) sale without ownership, (4) concerns among partners, and (5) resumption of gifts (6) Non-payment of wages, (7) non-performance of agreements, (8) rescission of sale and purchase, (9) disputes between the owner (of cattle) and his servants, (10) disputes regarding boundaries, (11) assault and (12) defamation, (13) theft, (14) robbery and violence, (15) adultery (16) Duties of man and wife, (17) partition (of inheritance) (18) gambling and betting.



According to Manu Justice was administered in accordance with legal rules which fell under one or other of the following four heads: (a) Sacred Law (Dharma), (b) Secular Law (Vyavahara), (c) Custom (Charitra), and (d) Royal Commands (Raja-Sasana).

Manusmriti tells us that the judicial proceedings in a case consisted of four stages, namely, (1) the statement of the plaintiff (Purva-Paksha), (2) the reply of the defendant (Uttara- Paksha), (3) the actual trial, consisting of the evidence to establish the case and the arguments on both sides (Kriya), and (4) the decision (Nirnaya). Manusmriti had specified on the part of the judge to discover the internal disposition of men by probing the heart of the accused and the witness by studying their postures gait, the gestures, the speech, and the changes in the eye and of face.

Manu and Present

According to Manu Justice is a complex idea which has everything to do with everyone being treated fairly. But the Social theory of justice must be concerned with the systematic assessment of how to reduce injustice in the world, rather than concern ourselves with what a hypothetical "perfectly just society" would look like. There may be no agreement on the shape of perfect justice but we can still have reasoned agreement on many removable cases of manifest injustice, for example, the presence of widespread hunger and deprivation, or the lack of schooling of children, or the absence of available and affordable healthcare. If we do not eliminate removable injustices, then we are living without justice in a more practical sense. In India, we need to concentrate on removing all manner of injustices. The idea of human rights is being invoked by activists these days, often with admirable effect. However, critics argue that the idea of such non-legal rights is lacking in foundation. A frequently asked question is: where do human rights come from and what gives them force. One of the aims of the book is to show in what



sense--and in what way--human rights have a strong foundation through public reasoning, and how that foundation relates to the basic analysis of social justice, which too is very dependent on the opportunity of public discussion. It is not so much that the concept of justice has come only to mean human rights but that the two related ideas go together. Democracy and the real practice of democracy do assist in the advancement of justice. But this is not to say that if you do not have democracy, there is no way that you can advance justice because that can still be done. Many countries which are not democratic have done so.

Global poverty and injustice are some of the most pressing problems of our times. There are many controversies about the content, form and range of global ethics and global justice, there is now more or less a consensus that the prevalence and severity of global poverty is morally wrong and that no one should live under such conditions. Still, there is dispute about the best or most viable means to accomplish the goal of alleviating this. If someone shifts away from the philosophical literature to social-scientific poverty research, unfortunately, the picture is not getting clearer. Manu gives an ultimate solution of all these problems through Theory of Social justice based on Varana-System based upon actions, because modern society and world is active and fast. Whole the society is systematized according to actions (Karma).

In our Indian constitution, about 70% is covered of Manu's ideas and doctrines of practice, state, Citizenship, rights and directive policies of a states is full-fledged command of Manu to a king. Indian Penal Code is nothing but The photo-copy of Dharam-Shastra. Actually Manu is not wrong as seems Manu always advocates the foundation of a society based upon the Human values. Manu established a Society depend upon Varna System which is based upon Karma (Actions), not Birth.



So it should be clear that Manu is not responsible for any indiscrepancies. This later linguistic problem occurs.

Conclusion

Principles of justice should 'define the appropriate distribution of the benefits and burdens of social co-operation'. Justice is the most important political value and applies to the 'basic institutions of society' – the political constitution and the institutions that regulate the market, property, family, freedom, and so on – because it is intimately connected to what society is and what it is for. If society is a matter of cooperation between equals for mutual advantage, the conditions for this cooperation need to be defended and any inequalities in social positions must be justified. And so the principles of justice, Rawls thinks, must be 'the principles that free and rational persons concerned to further their own interests would accept in an initial position of equality as defining the fundamental terms of their association'. Justice, then, is fairness.

Manu advocates that that no one is advantaged or disadvantaged in the choice of principles by the outcome of natural chance (*Prakriti-Varanam*) or the contingency of social circumstances. Since all are similar situated and no one is able to design principles to favour his particular condition (*Swa-Dharama*), the principles of justice (*Nyaya-Tattva*) are the result of a fair agreement or bargain. Manu calls this the Original Position (*Shubhra-Nyayatva*). Manu is not supposing that anyone has ever made decisions on this basis. The original position is simply a hypothetical thought experiment that seeks to 'make vivid to ourselves the restrictions that it seems reasonable to impose on arguments for principles of justice, and therefore on these principles themselves. In nutshell, Justice according to Manu,



1. Each person is to have an equal right to the most extensive total system of equal basic liberties compatible with a similar system of liberty for all; and
2. Social and Economic inequalities are to be arranged so that they are assimilated both to the greatest benefit of the least advantage and attached to offices and positions open to all under conditions of fair equality of opportunity.

Which is also the central theme of Modern Society and Democracy.

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INVESTIGATION ON CNC MILLING OF INCONEL600 FOR OPTIMIZATION OF SURFACE ROUGHNESS USING RESPONSE SURFACE METHODOLOGY AND ARTIFICIAL NEURAL NETWORK

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INTRODUCTION:

The main objective of modern industries is to manufacture low cost, high quality products in short time. The selection of optimal cutting parameters is a very important issue for every machining process in order to enhance the quality of machining products and reduce the machining costs. The surface roughness parameter commonly designated as R_a is found out for a particular machined work piece through manually inspecting the machined surfaces and using surface profilometer with a contact stylus. As it is a post-process operation, it becomes both time-consuming and labor-intensive. In addition, a number of defective parts can be found during the period of surface inspection, which leads to additional production cost. Milling process is one of the common metal cutting operations and especially used for making complex shapes and finishing of machined parts. The quality of the surface plays a very important role in the performance of the milling as a good quality milled surface significantly improves fatigue strength, corrosion resistance or creep life. Therefore the desired finish surface is usually specified and the appropriate processes are selected to reach the desired surface quality.

In recent years, the trends are towards modeling of machining processes using artificial intelligence due to the advanced computing capability. Researchers have used various intelligent techniques, including Artificial Neural Network (ANN), Response Surface Methodology (RSM), Fuzzy Logic, neuro-fuzzy, ANFIS, etc., for the prediction of machining parameters and to enhance manufacturing automation. ANN and Fuzzy Logic are two important methods of artificial intelligence in modeling non-linear problems. A neural network can learn from data and feedback, however understanding the knowledge or the pattern learned by it is difficult. A neural network with their learning capabilities can be used to learn the fuzzy decision rules, thus creating a hybrid intelligent system.

In the present work, the ANN has been developed for the prediction of surface roughness. The predicted and measured values are fairly close to each other. The developed model can be effectively used to predict the surface



roughness in the machining of INCONEL 600 within the ranges of variables studied. The ANN results are compared with the RSM results and results from experiments conducted. Comparison of results showed that the ANN results are superior to others.

OVERVIEW OF MATERIAL

Inconel 600 is a nickel-chromium alloy used for applications that need high temperature resistance and corrosion. This nickel alloy was developed for service temperatures from cryogenic to elevated temperatures in the range of 2000° F.

It has excellent mechanical properties, is non-magnetic and presents the desirable combination of high strength and good weldability under a wide range of temperatures.

The high nickel content in Inconel 600 enables it to retain considerable resistance under reducing conditions, makes it resistant to corrosion by a number of organic and inorganic compounds, gives it excellent resistance to chloride-ion stress-corrosion cracking and also offers excellent resistance to alkaline solutions. The chemical, mechanical and physical properties are indicated in the tables 3.1, 3.2 and 3.3 respectively.

Chemical Composition & Mechanical Properties

Chemical Composition (in % weight)

The chemical composition of Inconel Alloy 600 is provided in the table below:

Table 3.1 CHEMICAL COMPOSITION

ELEMENTS	MIN (%)	MAX (%)
Ni	72.00	-
Cr	14.00	17.00
C	-	0.15
Mn	-	1.00
Cu	-	0.50
Si	-	0.50
S	-	0.015
Fe	6.00	10.00



Table 3.2 MECHANICAL PROPERTIES

Tensile Strength, Ultimate	655 MPa
Tensile Strength, Yield	310 MPa
Elongation at Break	45%
Hardness Vickers	257 VH

Table 3.3 PHYSICAL PROPERTIES

DENSITY	8.47 g/cm ³
MELTING POINT	1413°C
COEFFICIENT OF EXPANSION	13.3 $\mu\text{m/m } ^\circ\text{C}$ (20 - 100°C)
MODULUS OF RIGIDITY	75.6 k N/mm ²
MODULUS OF ELASTICITY	206 k N/mm ²

RESPONSE SURFACE METHODOLOGY (RSM)

In Response surface methodology (RSM) an empirical model building is done using a collection of mathematical and statistical techniques. A response (output variable) which is influenced by several independent variables (input variables) is optimized by careful design of experiments. An experiment is a series of tests, called runs, in which changes are made in the input variables in order to identify there as on for changes in the output response.

In this technique, the main objective is to optimize the response surface that is influenced by various process parameters. RSM also quantifies the relationship between the controllable input parameters and the obtained response surfaces.

The design procedure of RSM is as follows.

- Designing a series of experiments for adequate and reliable measurements of the response of interest.
- Developing a mathematical model of the response surface with the best fittings.

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- The regression coefficients are found.

Central composite design with three variables (factors) is given in table 4.1. The column Y in table 4.1 is the response column to be obtained from the experiments.

In this case of CCD with three variables we use MINITAB software for solution to get the fitted model. By using this software we also get other related statics and generate contour and response surface plots. The data collected is optimized in MINITAB software.

The following are the steps that are involved during the run of the software:

- The values of the coefficients are tabulated.
- The values of the coefficients are calculated.
- The required equation for roughness is determined.

TABLE 4.1 DATA FOR CCD WITH THREE FACTORS

X_0	X_1	X_2	X_3				$X_1 X_2$	$X_1 X_3$	$X_2 X_3$	Y
1	-1	-1	-1	1	1	1	1	1	1	
1	1	-1	-1	1	1	1	-1	-1	1	
1	-1	1	-1	1	1	1	-1	1	-1	
1	1	1	-1	1	1	1	1	-1	-1	
1	-1	-1	1	1	1	1	1	-1	-1	
1	1	-1	1	1	1	1	-1	1	-1	
1	-1	1	1	1	1	1	-1	1	-1	
1	1	1	1	1	1	1	1	1	1	
1	-1.682	0	0	2.282	0	0	0	0	0	
1	1.682	0	0	2.282	0	0	0	0	0	
1	0	-1.682	0	0	2.282	0	0	0	0	
1	0	1.682	0	0	2.282	0	0	0	0	
1	0	0	-1.682	0	0	2.282	0	0	0	
1	0	0	1.682	0	0	2.282	0	0	0	
1	0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	0	

EXPERIMENTAL OBSERVATION& ANALYSIS

The scope and objectives of the present work have already been mentioned in the foregoing chapter. Accordingly the present study has been done through the following plan of experiment.

1. Checking and preparing the CNC Milling machine ready for performing the machining operation.
2. Cutting Inconel 600 by CNC milling machine to get desired dimension of the work piece.
3. Setting the carbide end mill tool of 10mm diameter in fixture.
4. Setting the work piece on the vice of the milling machine and finding the reference point of the tool.
5. Writing the program for the required slots on the Inconel600 slab with required speed, feed and depth.
6. Executing the program and checking whether there is an error in that or not and running the program.
7. Making the slots of length 25mm on the Inconel 600 slab with required speed, feed and depth by entering the values into the program.
8. About 15 slots are made on the slab with different speeds, feeds and depths.

OVERVIEW OF APPARATUS, PROCESS VARIABLES AND THEIR LIMITS



Fig 5.1 CNC milling machine

Specifications of The Taylor-Hobson Talysurf used to measure the Surface Roughness R_a value:

Apparatus Name Surf test SJ
 201P
 Model No. SJ-201P
 Sample length 2.5mm
 Manufacturer Mitutoyo



Fig 5.2 R_a

Fig. 5.2 Taylor-Hobson Talysurf

The working ranges of the parameters for subsequent design of experiment, based on Response Surface Method design have been selected. In the present experimental study, spindle speed, feed rate and depth of cut have been considered as process variables. The process variables with their units (and notations) are listed in Table 5.1.

Table 5.1 PROCESS VARIABLES AND THEIR LIMITS

Values in coded form	Spindle Speed (X_1) (rpm)	Feed (X_2) (mm/min)	Depth of cut (X_3) (mm)
-1	4000	300	0.6
0	5000	600	0.8
1	6000	900	1.0

Table 5.2 LIST OF TEST RUNS WITH R_a

S No	Speed (rpm)	Feed(mm\min)	Depth(mm)	R_a (microns)
1	4000	300	0.6	0.247
2	6000	300	0.6	0.297
3	4000	900	0.6	0.353



4	6000	900	0.6	0.193
5	4000	300	1.0	0.200
6	6000	300	1.0	0.217
7	4000	900	1.0	0.353
8	6000	900	1.0	0.183
9	3318	600	0.8	0.217
10	6681	600	0.8	0.167
11	5000	95	0.8	0.073
12	5000	1104	0.8	0.263
13	5000	600	0.4	0.147
14	5000	600	1.1	0.247
15	5000	600	0.8	0.263
16	5000	600	0.8	0.263
17	5000	600	0.8	0.263
18	5000	600	0.8	0.263
19	5000	600	0.8	0.263
20	5000	600	0.8	0.263

DATA ANALYSIS

Analysis is to be done after obtaining roughness values. The following steps are to be followed

1. Experimental table with roughness values is entered into Minitab by creating a response surface.
2. Analyze the data to obtain regression table.
3. Solve for regression equation.
4. T is the ratio of Coefficient and Standard Error Coefficient.
5. Modified regression equation is obtained after eliminating the non-significant terms



Table 5.3 TABLE WITH ESTIMATED REGRESSION COEFFECIENTS

Term	Coefficient	Standard Error of Coefficient	T	P	Remark
Constant	-0.601482	0.6641	-0.91	0.386	Significant
Speed (X ₁)	0.000189	0.0002	1.09	0.302	Significant
Feed (X ₂)	0.000978	0.0005	2.07	0.065	Significant
Depth (X ₃)	0.304919	0.8039	0.38	0.712	Non-Significant
Speed*Speed	-0.000000	0.0000	-0.63	0.541	Non-Significant
Feed*Feed	-0.000000	0.0000	-1.21	0.256	Significant
Depth*Depth	-0.190862	0.3712	-0.51	0.618	Non-Significant
Speed*Feed	-0.000000	0.0000	-2.49	0.032	Significant
Speed*Depth	-0.000027	0.0001	-0.27	0.793	Non-Significant
Feed*Depth	0.000244	0.0003	0.73	0.481	Significant

The obtained Regression equation is

$$Ra = -0.601482 + 0.000189X_1 + 0.000978X_2 + 0.304919X_3 - 0(X_1^2) - 0(X_2^2) - 0.190862(X_3^2) - 0(X_1X_2) - 0.000027(X_1X_3) + 0.000244(X_2X_3) \quad \text{----- (5.1)}$$

The modified regression equation after removing the non-significant coefficients is

$$Ra = -0.601482 + 0.000189X_1 + 0.000978X_2 + 0.000244(X_2X_3) \quad \text{-- (5.2)}$$

CONTOUR AND SURFACE PLOTS

5.4.1 Contour Plots

The Contour plots as shown in Figures 5.3, 5.4 and Fig 5.5 show the effect of Speed, Feed, Depth of cut on Surface-roughness R_a .

The contour plot in the Fig 5.3 shows the co-relationship between Feed, Speed and R_a while the Depth of cut is held constant at 0.8mm. The plot clearly shows the value of R_a is minimum at low speeds and low feeds. The thick coloured area shows high surface roughness value.

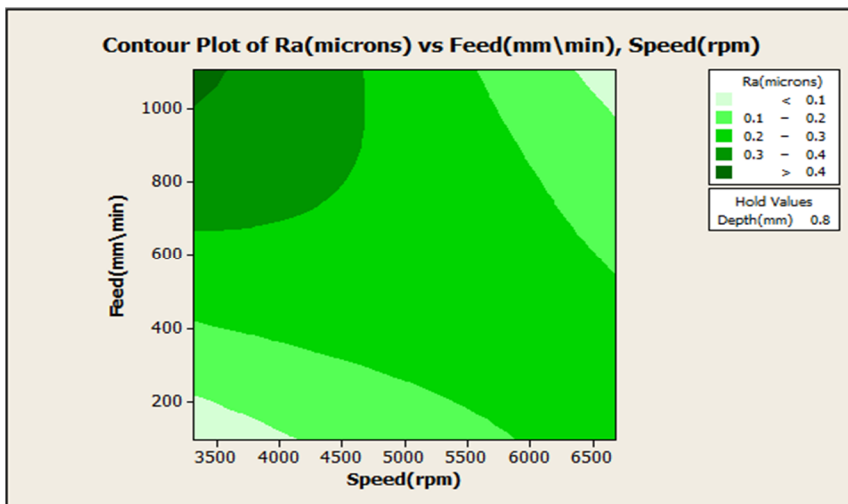


Fig.5.3 Contour Plot of R_a (microns) vs. Feed (mm/min), Speed (rpm)

The contour plot in the Fig 5.4 shows the co-relationship between Feed, Depth of cut and R_a while the Speed is held constant at 5000rpm. The plot clearly shows the value of R_a is good at low feeds and high depth of cuts. The thick coloured area shows high surface roughness value.

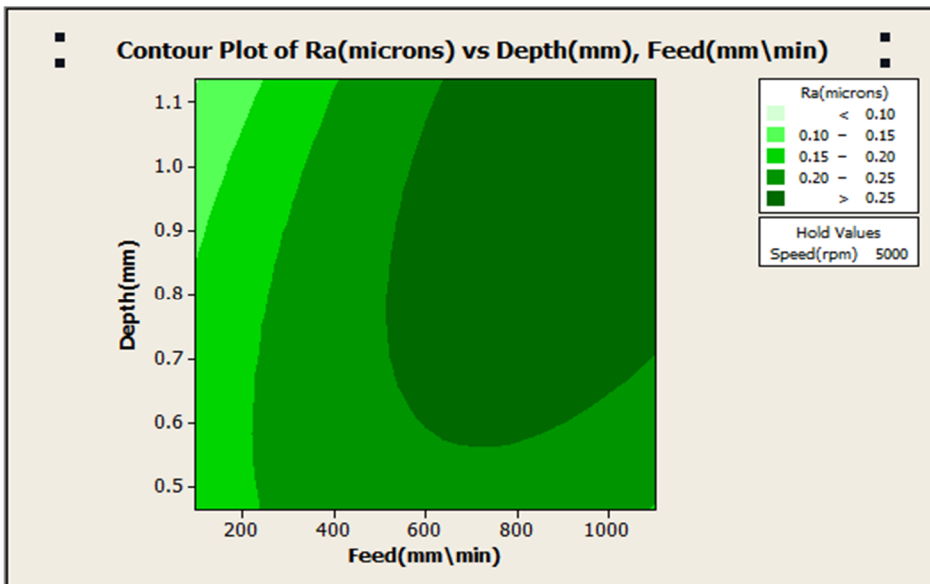


Fig.5.4 Contour Plot of R_a (microns) vs. Depth (mm), Feed (mm/min)

The contour plot in the Fig 5.5 shows the co-relationship between Speed, Depth of cut and R_a while the Feed is held constant at 600mm/min. The plot clearly shows the value of R_a is good at high speeds and high depth of cuts. The thick coloured area shows high surface roughness value.

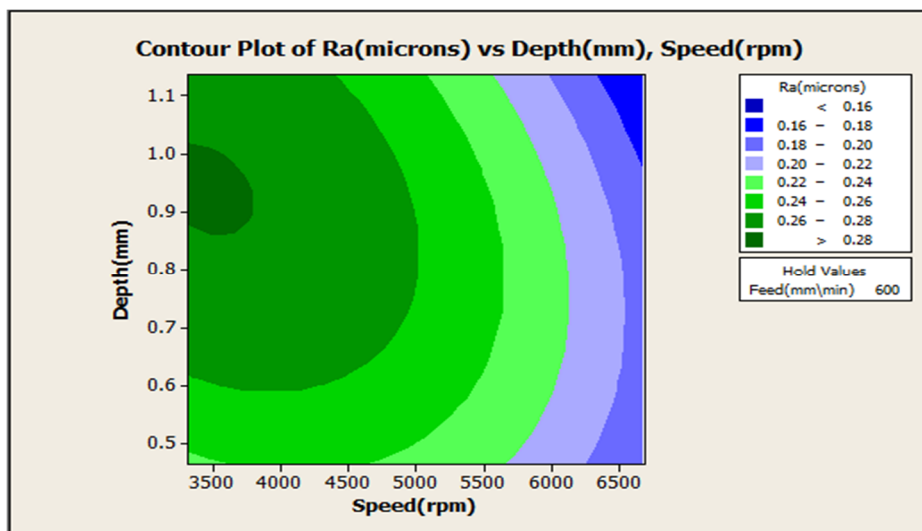


Fig.5.5 Contour Plot of R_a (microns) vs. Depth(mm),Speed(rpm)

Surface Plots

It is clear from Figures 5.6, 5.7 and 5.8 that a low speed, low feed and high depth of cuts play a significant role in obtaining lower values of surface-roughness R_a . Among these three parameters speed, feed are the key factors in getting optimum values of surface-roughness, R_a .

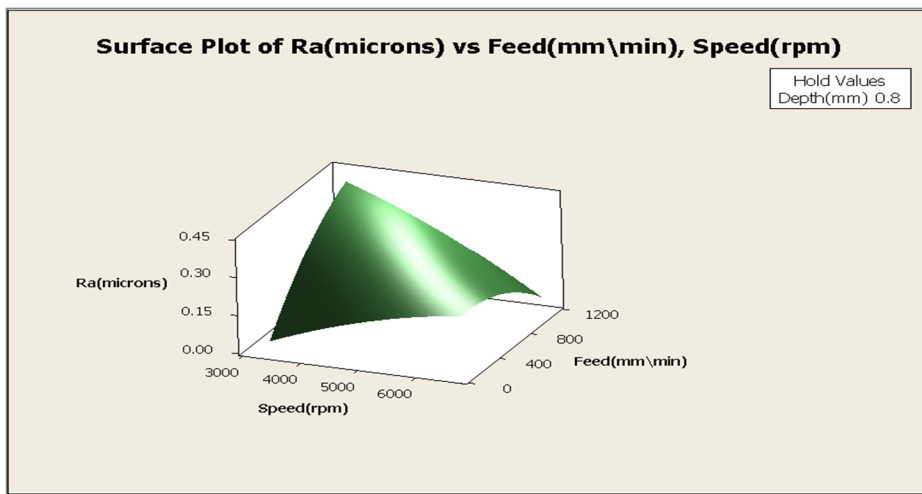


Fig 5.6 Surface Plot of R_a (microns) vs. Feed(mm/min),Speed(rpm)

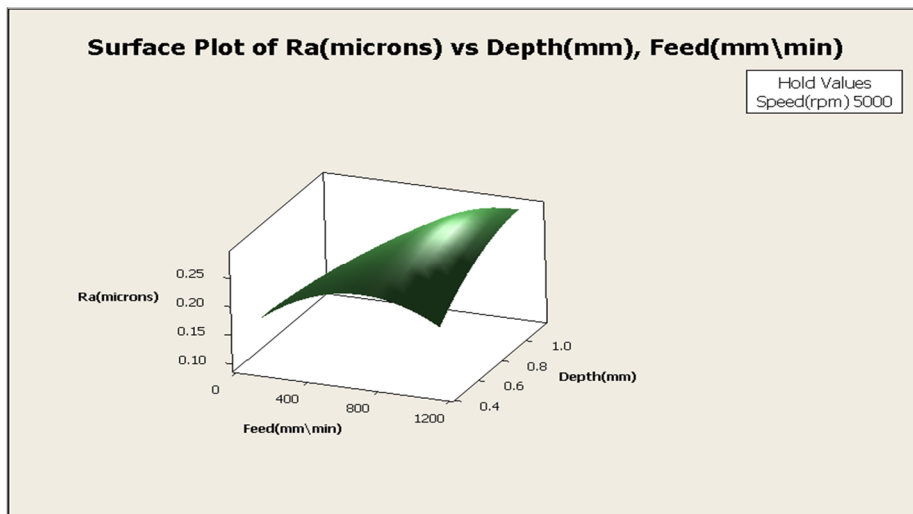


Fig 5.7 Surface Plots of R_a (microns) vs. Depth (mm), feed (mm/min)

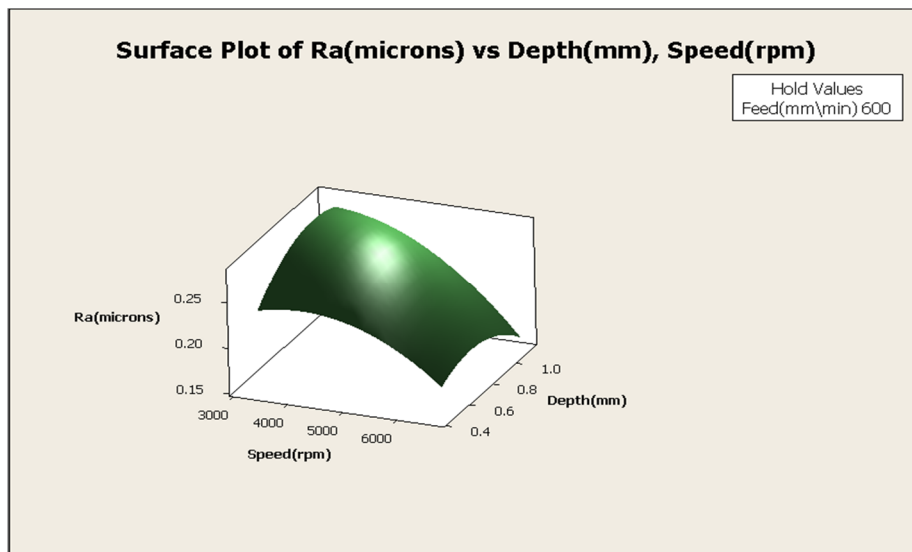


Fig 5.8 Surface Plot of R_a (microns) vs. Depth (mm), Speed (rpm)

RESPONSE OPTIMIZATION

The optimum values of parameters speed, feed and depth of cut that are required to achieve the surface roughness values of $0.15\mu\text{m}$ and $0.3\mu\text{m}$ are first obtained using Minitab software's Response optimizer.

Then, two slots are made on the Inconel 600 sheet by using the above optimum parameters and the surface roughness values are measured. The Table 5.4 shows both the RSM Approach values and the Experimental values of R_a (microns).



Fig 5.9 Roughness Measurement of optimization slots

Table 5.4 Experimental values and RSM Approach values of R_a (microns)



S.N o.	Speed (rpm)	Feed (mm/min)	Depth of cut (mm)	RSM Approach value R_a (microns)	Experime ntal values R_a (microns)	Error (%)
1	4000	247.11	0.4636	0.15	0.157	4.46
2	4000	695.56	1.1364	0.30	0.337	10.97

The validity of the results for R_a of 0.15 μ m and 0.3 μ m are compared with the experimental values. The error percentage is observed to be in a positive trend with values 4.46% and 10.97% as shown in the Table 5.4.

The graphs in Figures 5.8 and 5.9 show the optimum values of the three parameters for the two responses 0.15 μ m and 0.3 μ m. The graph in the Fig.5.8 shows that the R_a value 0.15 μ m is obtained in good agreement when the three parameters speed, feed and depth of cut are of the values 4000rpm, 247.11mm/min and 0.46mm respectively within their specified higher and lower limits.

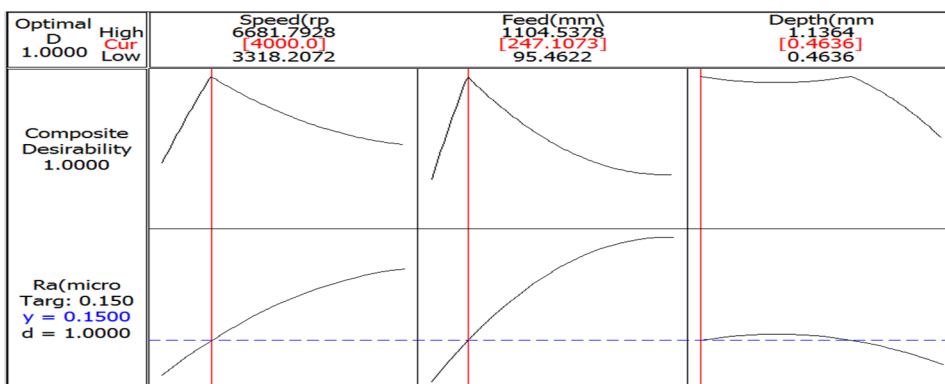


Fig.5.8 Response optimization for Response $R_a=0.15\mu$ m

The graph in the Fig.5.9 shows that the R_a value 0.3 μ m is obtained in good agreement 4at the values of speed 4000rpm, feed 695.56mm/min and depth of cut 1.1364mm within their respective higher and lower limits.

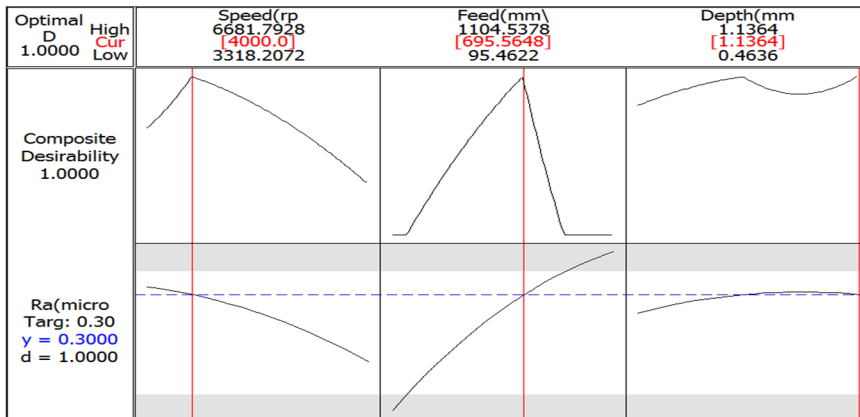


Fig.5.9 Response optimization for Response Ra=0.30µm

NEURAL NETWORK ARCHITECTURE

Table 6.1 NEURAL NETWORK ARCHITECTURE

Object modeled	Surface Roughness
Input neuron	Speed(v), Feed (f), DOC (d)
Output neuron	Surface Roughness(R _a)
Network structure	
Network type	Feed-forward back-propagation
Transfer function	transig /purelin
Training function	Trainlm
Learning function	Learngdm
Two Error function	Mean square error
Learning conditions	
Learning scheme	Supervised learning
Learning rule	Gradient decent rule
Number of hidden layer	Two
Neurons in hidden layer	6,4
Learning rate	0.1
Minimum epochs	500

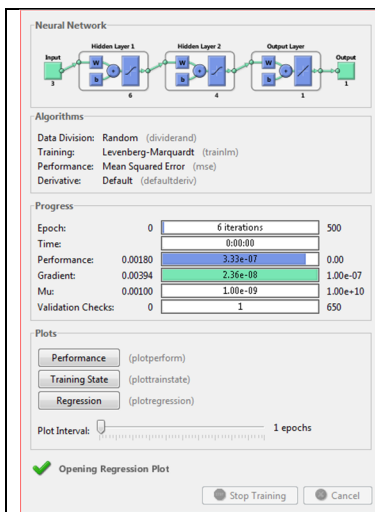


Fig 6.1 Final ANN Model Developed for Prediction of Surface Roughness

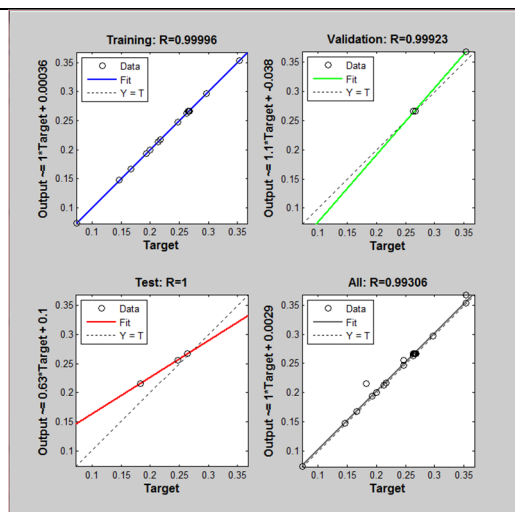


Fig 6.2 Network Regression

The Fig 6.1 shows the optimal ANN parameter levels for predicting R_a for Inconel 600 Alloy. ANN has 6 hidden neurons in first and 4 in second hidden layer, using transig transfer function in both hidden layers and purelin transfer function in output layers and trained with LM algorithm using $\mu=0.1$ as initial learning parameter. The Fig 6.2 shows corresponding Regression plot.

Validation of Test Data

After obtaining the final ANN model, the trained network is now simulated as shown in Fig 6.9 using the test data and the roughness value corresponding to the test data is obtained.

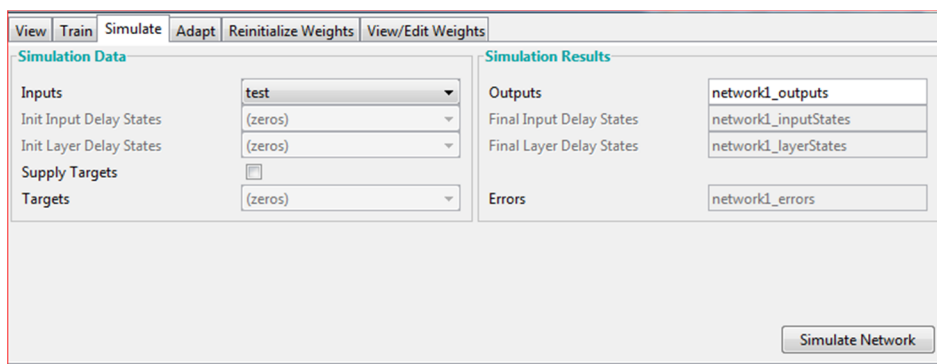




Fig 6.3 Simulation of test data

VERIFICATION OF RESULTS

Experimental Analysis

Table 7.1 Experimental Analysis

S.No	Speed (rpm)	Feed (mm/min)	Depth of cut (mm)	R _a value (microns)
1	4000	247.11	0.4636	0.157
2	4000	695.56	1.1364	0.34

7.1.2 RSM Approach

Table 7.1 RSM Approach

S.No.	Speed (rpm)	Feed (mm/min)	Depth of cut (mm)	R _a value (microns)
1	4000	247.11	0.4636	0.15
2	4000	695.56	1.1364	0.30

7.1.3 ANN Approach

Table 7.2 ANN Approach

S.No.	Speed (rpm)	Feed (mm/min)	Depth of cut (mm)	R _a Predicted value (microns)
1	4000	247.11	0.4636	0.153
2	4000	695.56	1.1364	0.327



Comparison of the Experimental Analysis, RSM Approach, ANN Approach

S.No.	Speed (rpm)	Feed (mm/min)	Depth of cut (mm)	RSM R_a value (microns)	ANN R_a value (microns)	Experimental R_a value (microns)	RSM vs Experimental Error (%)	ANN vs Experimental Error (%)
1	4000	247.11	0.4636	0.15	0.15	0.157	4.46	2.6
2	4000	695.56	1.1364	0.3	0.33	0.337	10.97	3.05



CONCLUSIONS

- The Response Surface Methodology and Artificial Neural Network analysis have been reviewed. RSM and ANN can be used for the approximation of both experimental and numerical responses.
- The standard second order quadratic equation for predicting surface roughness is expressed as:

$$Ra = -0.601482 + 0.000189X_1 + 0.000978X_2 + 0.000244(X_2X_3)$$

- This modified equation is used to obtain surface roughness values other than specified limits.
- Comparison of results showed that the ANN results are superior to RSM in obtaining accurate values.
- Significantly less error is obtained in the optimization plots and hence the experiment is verified.

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A STUDY OF THE RELATIONSHIP BETWEEN SOCIO-ECONOMIC STATUS AND ACADEMIC ACHIEVEMENT OF THE SECONDARY SCHOOL STUDENTS

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Socio-Economic Status:

Society is an organisation of interacting people whose activities enter around a set of common goals and who tend to share common beliefs, attitudes and modes of action. It is obvious that the society limits the activities of the individuals, by setting up standards which they have to follow and maintain. Thus, society is a system of wages and procedures and involves authority as well as natural aid. There are many groups of people doing different kinds of work and following different kinds of norms in a complex and pluralistic society. The concept of stratification is closely linked with the concept of status. In a broad way it may be asserted that social status associates to a person on the basis of the possession by him, of the characteristics valued by his society. Thus the term status is meaningful in every kind of society. Status may be based on strength and skill or on the basis of the possession of land and wealth or on the basis of education and knowledge and so on. Every society, whether rural or urban, whether industrial or agricultural has a status system. People are recognized as differing in status, some being perceived as of superior status and some as inferior of status. The



objective characteristics most frequently used are education occupation and income. This is why it is called socio-economic status.

Achievement

Achievement in an educational institution maybe taken to mean any desirable learning that is observed in the student. Since the word desirable implies a value judgment, it is obvious that a particular learning may be referred to as achievement or otherwise depending on whether it is considered desirable or not. Understood in this way any behaviour that is learned may come with inn the scope of achievement. Achievement according to Smith (1983) is the task oriented behaviour that allows the individuals performance to be evaluated internally or externally that involves the individuals in competing with others, or that otherwise involves some standard of excellence.

Importance of the study

The society in India as else where, consists of different classes, it is but natural for the researchers to think of the extent of which home conditions influence the scholastic achievement of children. These home conditions which are generally known as the socio-economic status may be further sub divides as parent's occupation and education, family income, family possession, and social participation. Researchers generally include socio-economic status as one of the variable in their studies. The present study to study the relationship between socio-economic status and academic achievement of secondary school students

Objectives

1. To find out the socio-economic status of secondary school students



2. To find out the academic achievement of secondary school students
3. To identify the difference in the relationship between socio economic status and academic achievement of rural and urban ,government and private, boys and girls of secondary school students.

Null Hypothesis:

1. The secondary school students do not possess high socio-economic status
2. The secondary school students do not possess high academic achievement
3. There is no significant relationship between socio-economic status and academic achievement
4. There is no significant difference in the relationship between socio-economic status and academic achievement of rural and urban secondary school students.
5. There is no significant difference in the relationship between socio-economic status and academic achievement of private and government secondary school students
6. There is no significant difference in the relationship between socio-economic status and academic achievement of boys and girls.

Educational Implications

1. Measures will be taken to improve the socio-economic status of the students and their families through various social welfare programmes in case of their low socio-economic status.
2. The positive or negative relationship of socio-economic status and academic achievement may help the educators and



administrators to take up necessary decisions to help the students.

Methodology

The descriptive or normative survey method of educational research is very common. It is that method of investigation which attempts to describe and interpret what exists at present in the form of conditions practices, process, trends, effects, attitudes, beliefs, etc. the study is aimed out the relationship between socio-economic status and academic achievement of secondary school students on the basis of their gender, location, management of the school.

Sample

For the present research work the universe included all the students of IXth class studying in secondary schools of Guntur district of Andhra Pradesh. The study was limited to a particular geographical area to facilitate appropriate sample selection and to avoid bias and prejudice. An equal number of sample was taken both rural and urban areas, 100 from rural and 100 from urban secondary schools.

Tool

The present research on the study of relationship between socio-economic status and academic achievement of secondary school students, the researcher has selected "Socio-economic status scale" of Beena Shah to study the socio-economic status of secondary school students. The quarterly examination marks of the sample are taken to identify the academic achievement of secondary school students.



Analysis of data

The scores of socio-economic status scale was taken to find out the socio-economic status (SES) of the secondary school students. On the advice of experts, the SES was divided into three categories viz, low status, middle status, and upper status for statistical convenience and easy identification. The student who scored below 24 was put in low status group, the student who scored between 25 and 62 was put in middle status group, and the student who scored 62 and above was put in high status group.

The mean score was used to identify the socio-economic status of total secondary school students and to compare the sub sample variation. The values of standard deviation were used to measure the spread or dispersion of scores in the distribution. The C.R. was calculated to test the significant difference in the means of the two sub samples.

Academic achievement:

To measure the achievement in each student, the average marks of quarterly examinations were taken as raw scores. In Andhra Pradesh a student who secured 39 percent and less than it will be put in third class, a student who secured in between 40-49 percent will be put in second class and a student who secured 60 percent and above will be put in first class. By following this classification in this study, a student who secured 39 and less was put in low achievement group, a student who secured in between 40 and 49 was put in average and who secured 60 and above was put in high achievement group.



Hypothesis-1 "The secondary school students do not possess high socioeconomic status"

To test the validity of hypothesis 1, the total scores of socio-economic status scale of the whole sample were calculated to arrive at the mean and standard deviation. The results are as follows.

Table -1

SES of Secondary School Students			
Sample	Sample Size	Mean	S.D
Whole	200	43.96	17.86

From the above table, it is clear that the secondary school students had middle socio-economic status. The hypothesis that "the secondary school students do not possess high socio-economic status" can be rejected as the students are with middle socioeconomic status.

Hypothesis- 2 "The secondary school students do not possess high academic achievement"

To test the validity of hypothesis 2, the total of academic achievement scores of the whole sample were calculated to arrive at mean and S.D. and the results are given below.

Table -2

Achievement of Secondary School Students			
Sample	Sample Size	Mean	S.D
Whole	200	55.36	17.90

It is clear from the above table that the secondary school students possessed an average level of academic achievement. The hypothesis



that "the secondary school students do not possess high academic achievement" can be rejected as the students are with an average academic achievement.

Hypothesis - 3 "There is no relationship between socio-economic status and academic achievement"

Table -3

Comparison of SES and Academic Achievement				
Variable	Sample	Mean	S.D	Correlation
SES	200	43.96	17.86	0.016*
Achievement	200	55.36	17.90	

Not Significant at 0.05 Level

As per the table there is no relationship between socio-economic status and academic achievement. The hypothesis that "there is no relationship between socio-economic status and academic achievement" can be accepted as there is no relationship between them.

Hypothesis- 4 "There is no significant difference in the relationship between socio-economic status and academic achievement of rural and urban secondary school students".

Table - 4

Comparison of SES and Academic Achievement of Rural and Urban Secondary School Students

Variable	Sample Size		Mean	S.D	Correlation(r)	Critical Ratio
Rural	SES	100	43.1	16.84	0.061	0.91
	Achievement	100	51.42	16.17		
Urban	SES	100	44.98	18.78	0.152	
	Achievement	100	59.30	18.73		

Not Significant at 0.05 Level



As per the table value, there is no significant difference between socioeconomic status and academic achievement of rural and urban students. The hypothesis that "there is no significant difference in the relationship between socioeconomic status and academic achievement of rural and urban secondary school students" can be accepted.

Hypothesis - 5

"There is no significant difference in the relationship between socioeconomic status and academic achievement of private and government of secondary school students"

Variable	Sample Size		Mean	S.D	Correlation(r)	Critical Ratio
Government	SES	100	36.28	11.50	0.065	0.03*
	Achievement	100	50.29	16.51		
Private	SES	100	51.48	19.72	0.68	
	Achievement	100	59.2	18.71		

Not Significant at 0.05 Level

As per the table there is no significant relationship between socioeconomic status and academic achievement of private and government secondary schools. The hypothesis that "there is no significant difference in the relationship between socioeconomic status and academic achievement of private and government school students" can be accepted.

Hypothesis 6 "There is no significant difference in the relationship between socioeconomic status and academic achievement of boys and girls of secondary school students"



Table-6

Variable	Sample Size		Mean	S.D	Correlation(r)	Critical Ratio
Boys	SES	100	43.1	19.18	0.165	0.78*
	Achievement	100	55.36	18.08		
Girls	SES	100	44.99	16.35	0.87	
	Achievement	100	55.36	17.83		

Not Significant at 0.05 Level

The result states that there is no relationship between socio economic status and academic achievement of boys and girls. The hypothesis that "there is no significant difference in the relationship between socioeconomic status and academic achievement of boys and girls" can be accepted.

Conclusions and Discussion:

1. The Secondary School Students were with middle Socio-Economic Status

As the socio economic status of the students plays a major role in academic excellence, it is the duty of the parents to improve their socio-economic status by way of higher earnings, participation in community programmes, saving their earnings for future needs, etc. the government and other social agencies are also supposed to help the low socio-economic status people to improve their status by way of implementing social welfare schemes. Once the socio-economic status of the parents is improved, they provide better educational facilities to their children. Even the confidence that gives by socio-economic status to a child will help him achieve well in all spheres of life.



2. The Secondary School Students were with average Academic Achievement:

The factors contributing for this average achievement are many and multifarious such as the competition among different types of schools, availability of adequate teaching learning facilities, etc. If better education facilities are providing there will be no chronic under achievement and the students will pass the examinations in flying colours.

3. There is a low relationship between Socio-Economic Status and Academic Achievement:

The parents have to take due care of their socio-economic status as it has invariably influences the children's achievement. They can improve their socio-economic status by educating and improving their educational qualification, by which they can get promotions in their employment that improves their economic as well as social status. They can, even change their occupation depending on their educational qualifications and with the available financial resources. They can improve their home environment. From the government side also there is a great deal to be done to improve the economic status of the students as well as parents. The students should also utilize properly the financial resources obtained either from parents or from government.



4. There is no significant difference in the relationship between Socio-Economic status and Academic Achievement of rural and urban secondary school students:

As the sample is a mix of different types of schools and students, there might have been no relationship between achievement and socio-economic status. Still, it is the duty of the concerned people to improve both socio-economic status and achievement of school students through different ways and means.

5. There is no significant difference in the relationship between socio-economic status and academic achievement of private and government secondary school students:

As there is no significant difference between socio economic status and academic achievement in government and private school students, one can say that the opinion that the rich people or socio-economically advantageous students study in private schools is not true. With this, it seems that the student's choice in selecting a school depends on the learning atmosphere of the institute. So, the administrators of each and every school have to develop a conducive learning facility.

6. There is no significant difference in the relationship between socio-economic status and academic achievement of boys and girls.

Many people in our Indian society try to educate their male children rather than their female children. This may be due to the expectations kept on the male community or may be due to the customs and



traditions our society. So the males might be from high socio-economic status group when compared with the females. This study indicates that the girls with or without better socio-economic status are doing well in their education. So equal opportunities must be provided for both boys and girls.

Suggestions for further Research

The present study "A Study of the Relationship between Socio-Economic Status and Academic Achievement of Secondary School Students", brings to light a good number of new areas to be studied by future researchers. The areas and variables which are not covered by this study may be put to test to enlighten the other associated factors of achievement. So, the researchers may think of the following areas to study in detail.

- Studies on SES and academic achievement may be extended to other levels of education, viz., graduation and post graduation at district and state level. Studies may be conducted to identify the role of environmental factors that promote academic achievement.
- Studies may be conducted to identify the role of various psychological variables in enhancing academic achievement.
- Study of relationship between achievement of students whose female parent is a member of DWACRA group and whose parent is not a member of DWACRA group in villages.

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PROBLEMS AND SOLUTIONS PERTAINING TO HUMAN CAPITAL IN THE INFORMAL SECTOR

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Introduction:

The value of human resources contribution for any productive work depends on the deployable skills and competencies for creating wealth for the organization in terms of sellable products and services. The skills and competencies of any person are developed and accumulated as capital over a period of time by means of education, training, development and employment in the specified work. Human capital management is a strategic activity for the well being of any organization and the society at large, and is the fulfilling reason for setting up an organization in the name "Human Capital" for its systematic development and management.

To most people, capital means a bank account, a hundred shares of IBM stock, assembly lines etc. These are all forms of capital in the sense that they are assets that yield income and other useful outputs over long periods of time. But such tangible forms of capital are not the only type of capital. Schooling, a computer training course, expenditures on medical care, and lectures on the virtues of punctuality and honesty are also capital. That is because they raise earnings, improve health, or add to a person's good habits over much of his lifetime. Therefore, economists regard expenditures on education, training, medical care, and so on as investments in human capital. They are called human capital because people cannot be separated from their knowledge, skills, health, or values in the way they can be separated



from their financial and physical assets. Education, training, and health are the most important investments in human capital.

Human capital is the stock of knowledge, habits, social and personality attributes, including creativity, embodied in the ability to perform labor so as to produce economic value. Alternatively, Human capital is a collection of resources—all the knowledge, talents, skills, abilities, experience, intelligence, training, judgment, and wisdom possessed individually and collectively by individuals in a population. These resources are the total capacity of the people that represents a form of wealth which can be directed to accomplish the goals of the nation or state or a portion thereof.

The existence of any organisation depends on the four factors of production i.e., land labour, capital and organisation. Out of these factors labour is considered the most vital factor to carry on the production activity. Therefore, labour is the most important economic asset which needs to be developed. Just as land became recognized as natural capital and an asset in itself, and human factors of production were raised from this simple mechanistic analysis to **human capital**. In modern technical financial analysis, the term "balanced growth" refers to the goal of equal growth of both aggregate human capabilities and physical assets that produce goods and services.

Definition

Economist Theodore Schultz invented the term in the 1960s to reflect the value of our human capacities. He believed human capital was like any other type of capital; it could be invested in through education, training and enhanced benefits that will lead to an improvement in the quality and level of production.

Schultz (1961a) classified skills and knowledge that people acquire as a form of human capital, and in so doing he sparked the revival of interest in the notion of human capital. Since then, a variety



of definitions of human capital have prevailed. For example, the Penguin Dictionary of Economics defines human capital as “the skills, capacities and abilities possessed by an individual which permit him to earn income.” Recently this concept has been extended to incorporate non-market activities, and a broader definition of human capital is “the knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being” (OECD, 2001, p18). Laroche et al (1999) further extend the notion to include innate abilities. As it is defined, human capital is a complex concept; it has many dimensions and can be acquired in various ways, including at home, at school, at work, and so on.

Justin Slay defined four types of fixed capital (which is characterized as that which affords a revenue or profit without circulating or changing masters). The four types were:

1. Useful machines, instruments of the trade;
2. Buildings as the means of procuring revenue;
3. Improvements of land;
4. The acquired and useful abilities of all the inhabitants or members of the society.

Adam Smith defined human capital as follows:

“Fourthly, Of the acquired and useful abilities of all the inhabitants or members of the society. The acquisition of such talents, by the maintenance of the acquirer during his education, study, or apprenticeship, always costs a real expense, which is a capital fixed and realized, as it were, in his person. Those talents, as they make a part of his fortune, so do they likewise that of the society to which he belongs. The improved dexterity of a workman may be considered in the same light as a machine or instrument of trade which facilitates and abridges labour, and which, though it costs a certain expense, repays that expense with a profit.”



According to Schultz (1961a), economists have long recognised that people are an important component of the wealth of nations. Schultz cited Smith (1776) who included all acquired and useful abilities of a country's inhabitants as part of capital.

Today, with the importance of 'knowledge' in the economy, human capital has increasingly attracted both academic and public interest. Human capital theory suggests that it is human capital – the knowledge and skills embodied in people – rather than physical capital that is vital to a country's economic prosperity. In practice, private and public investment in human capital, in the form of expenditure in education and training, accounts for over 10 percent of national income in most OECD countries (Healy, 1998). Understanding human capital must therefore be of great interest to politicians, economists, and development strategists. In the recent economic literature, interest in human capital revolves around economic growth. Traditionally, the focus on creating more economic growth was to give workers access to more physical resources, like land, factories, and machines. But modern theories of economic growth, such as those of Romer (1986), Lucas (1988) and Jones and Manuelli (1990), emphasise human capital in their explanation of growth. According to these theories, human capital can boost growth through stimulating technological creation, invention and innovation, as well as facilitating the uptake and imitation of new technologies. Numerous empirical studies have sought to establish a relationship between human capital and economic growth.

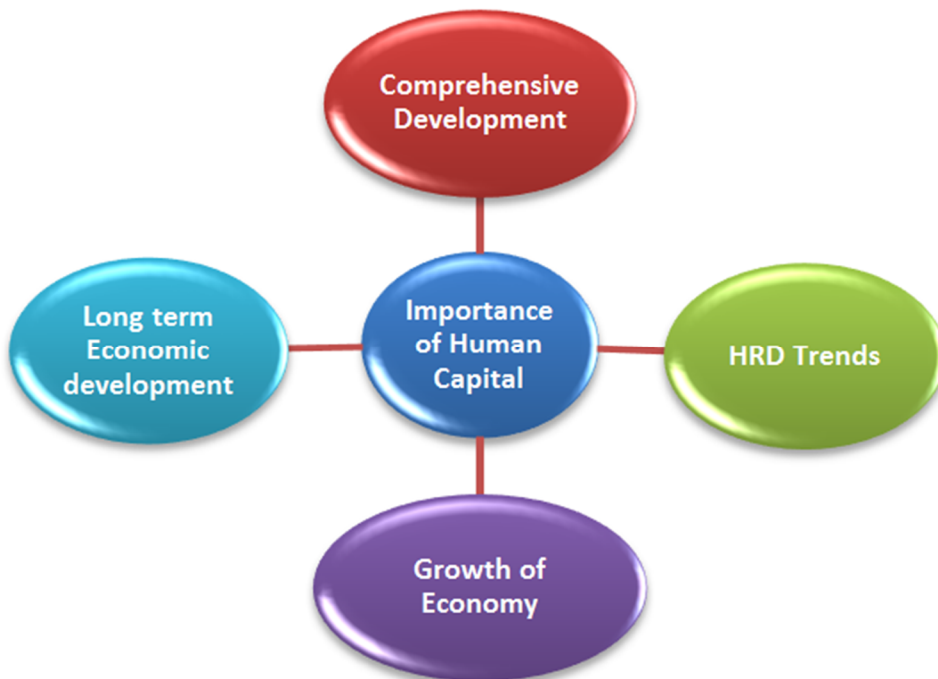
Importance of Human Capital:

The concept of Human capital has relatively more importance in labour-surplus countries like India. The surplus labour in these countries is the human resource available in more abundance than the tangible capital resource. This human resource can be transformed into Human capital with effective inputs of education, health and moral values. The transformation of raw human resource into highly



productive human resource with these inputs is the process of human capital formation. The problem of scarcity of tangible capital in the labour surplus countries can be resolved by accelerating the rate of human capital formation with both private and public investment in education and health sectors of their National economies.

- **Instrument of promoting comprehensive development:**
The intangible human capital, on the other hand, is an instrument of promoting comprehensive development of the nation because human capital is directly related to human development, and when there is human development, the qualitative and quantitative progress of the nation is inevitable.
- **Escalating Trend in HDI:** The statistical indicator of estimating Human Development in each nation is Human Development Index (HDI). It is the combination of "Life Expectancy Index", "Education Index" and "Income Index". The Life expectancy index reveals the standard of health of the population in the country; education index reveals the educational standard and the literacy ratio of the population; and the income index reveals the standard of living of the population. If all these indices have the rising trend over a long period of time, it is reflected into rising trend in HDI. The Human Capital is developed by health, education and quality of Standard of living. Therefore, the components of HDI viz, Life Expectancy Index, Education Index and Income Index are directly related to Human Capital formation within the nation. HDI is indicator of positive correlation between human capital formation and economic development.



Source: Parameters o Importance Of Human Capital

- **Growth of the economy:** If HDI increases, there is higher rate of human capital formation in response to higher standard of education and health. Similarly, if HDI increases, per capita income of the nation also increases. Implicitly, HDI reveals that higher the human capital formation due to good standard of health and education, higher is the per capita income of the nation. This process of human development is the strong foundation of a continuous process of economic development of the nation for a long period of time.
- **Long term Economic Development:** This significance of the concept of Human capital in generating long-term economic development of the nation cannot be neglected. It is expected that the Macroeconomic policies of all the nations are focussed towards promotion of human development and subsequently



economic development. Human Capital is the backbone of Human Development and economic development in every nation.

Objective of the Study:

- To study the unorganised sector of the economy and their contribution to the human capital
- To know the problems pertaining to this sector in relation to the human capital formation
- To study on the initiative taken by the government for the upliftment of the skills of the human capital in the unorganised sector
- To examine the effectiveness of HRD interventions for unorganised labour.

Methodology of the study:

This study is based on the descriptive analysis of the problems related unorganised sector of the economy. The study will also focus on how these labour force contribute the segment of human capital formation. It is a content study done on the basis of the secondary data gathered from the articles, books and also website. The main purpose of this research is the description of the state of affairs as it exists at present. This study is based on the generalisation of the events.

HUMAN CAPITAL IN INFORMAL SECTOR

Although human capital has been found to enhance growth in some cases, positive results have failed to prevail in others. This is due to the fact that the human capital management is lagging in some section of the economy which consists of the unorganised and informal sector which covers most of the rural labour and a substantial part of urban labour.



The term **unorganised sector** when used in the Indian context is defined by National Commission for Enterprises in the Unorganized Sector, in their Report on Conditions of Work and Promotion of Livelihoods in the Unorganised Sector as -consisting of all unincorporated private enterprises owned by individuals or households engaged in the sale or production of goods and services operated on a proprietary or partnership basis and with less than ten total workers. The informal or the unorganised economy which accounts for an overwhelming proportion of the poor and vulnerable population in India.

It includes activities carried out by small and family enterprises, partly or wholly with family labour. In this sector wage-paid labour is largely non-unionised due to casual and seasonal nature of employment and scattered location of enterprises. This sector is marked by low incomes, unstable and irregular employment, and lack of protection either from legislation or trade unions. The unorganised sector uses mainly labour intensive and indigenous technology. The workers in unorganised sector, are so scattered that the implementation of the Legislation is very inadequate and ineffective. There are hardly any unions in this sector to act as watch-dogs. But the contributions made by the unorganised sector to the national income, is very substantial as compared to that of the organised sector. It adds more than 60% to the national income while the contribution of the organised sector is almost half of that depending on the industry.

The term 'unorganised' is often used in the Indian context to refer to the vast numbers of women and men engaged in different forms of employment. These forms include home-based work (for example: rolling papads and beedis), self-employment (for example: selling vegetables), employment in household enterprises, small units, on land as agricultural workers, labour on construction sites, domestic work, and a myriad other forms of casual or temporary employment.



The term 'unorganised' is often used interchangeably with the term 'informal', or employment in the informal sector. Strictly speaking, 'informal' is used to denote those forms of enterprise that are not governed by any legal framework (for example, registration under Company Laws). Although it is quite logical that an 'informal' enterprise will employ 'informal'/'unorganised' labour, it must be remembered that 'formal' enterprises also have 'unorganised' employees, and, in fact, there is an increasing tendency to in formalise employment relationships in the formal sector.

The concept of an informal/ unorganised sector began to receive world-wide attention in the early 1970s, when the International Labour Organisation (ILO) initiated serious efforts to identify and study the area through its World Employment Programme Missions in Africa. Since then, the informal sector has been the subject of several studies and seminars covering various aspects like its size, employment potential, its relationship with the formal sector, technological levels etc. In 1987, the Director General of the ILO submitted a report to the International Labour Conference on the "Dilemma of the Informal Sector." In it, he referred to the role of this sector in promoting employment, the absence of adequate laws for providing protection to workers in this sector, and the scope for application of international labour standards in this area. In India, however, the term informal sector is of recent origin, and has been in use only during the last two decades. A number of studies have been conducted to assess the size and employment structure of the sector in different urban localities by agencies like The Institute of Applied Manpower Research (IAMR) etc. during the late eighties and early nineties. The first National Commission on Labour, under the Chairmanship of Justice Gajendragadkar, defined the unorganised sector as that part of the workforce 'who have not been able to organise in pursuit of a common objective because of constraints such as (a) casual nature of



employment, (b) ignorance and illiteracy, (c) small size of establishments with low capital investment per person employed, (d) scattered nature of establishments and (e) superior strength of the employer operating singly or in combination.' The Commission listed 'illustrative' categories of unorganised labour: 'These are: (i) contract labour including construction workers; (ii) casual labour; (iii) labour employed in small scale industry; (iv) handloom/ power-loom workers; (v) beedi and cigar workers (vi) employees in shops and commercial establishments; (vii) sweepers and scavengers; (viii) workers in tanneries; (ix) tribal labour; and (x) 'other unprotected labour' (p.417)

Year	Employment		
Unorganised Sector	Formal	Informal	Total
2009-2010	2.3	385.1	387.3
2004-2005	1.4	393.5	394.9

Source: 12th Plan Document Volume III, Planning Commission

What causes in-formalisation?

The factors affecting the process of in-formalisation can be classified as (i) labour and (ii) non-labour factors. The labour factors include the quality of labour in terms of education and training. In India the level of education is low and there is lack of vocational skills in the workers entering the labour force. Studies have shown that more than 50 per cent of those entering the labour force are having up to primary level of education. As per NSS 66th round, only 6.7 per cent persons in the age group 15-59 years fall in this category with the proportion of women being further low at 4.1 per cent. The per cent share of people having received or undergoing formal vocational training is even lower at 1.6 per cent and 0.6 per cent respectively. With about 92.6 per cent of the persons in this age group not having received



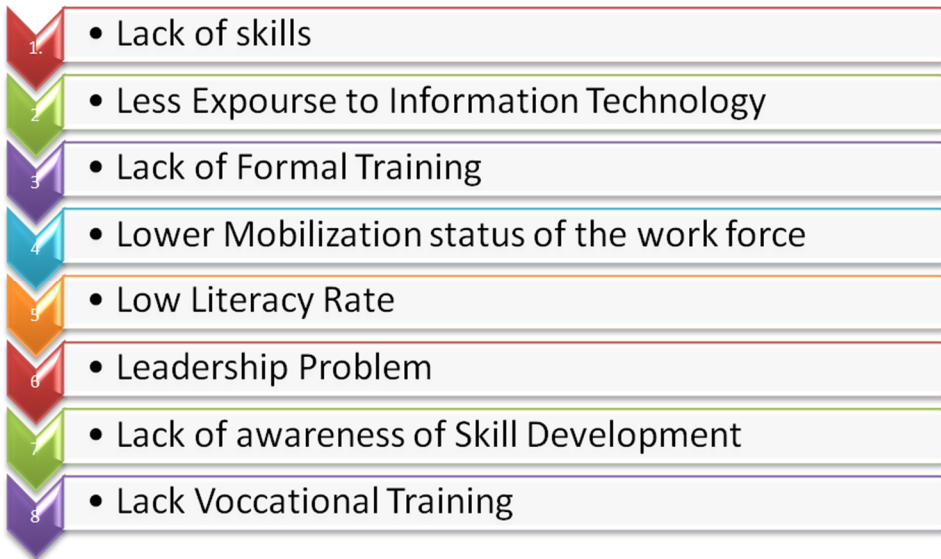
any form of skill training speaks volume about the inability of these people to get formal / organised sector jobs – they are compelled to take up low paid, unproductive jobs in the informal sector. The structural transformation associated with the process of development is reflected in the declining share of agriculture in the GDP but the relatively slower pace of decline in employment is worrying. Even those who are migrating from farm to non-farm work are not able to adjust due to skill mismatch. This also restricts the shift of labour towards manufacturing and services particularly in low skilled construction work. The plethora of labour legislations often act as obstacles to growth of private entrepreneurship and industry reliance on capital and resorting to use of contractual labour.

Besides these labour related factors, there are non-labour factors viz. regulatory procedures such as initial procedural requirements to obtain a number of clearances when applying for building permits; utility connections like electricity, water etc. In addition, the absence of quality infrastructure including roads, uninterrupted power supply, etc. also acts as hindrance to development of manufacturing industries, of which the MSMEs (which are one of the largest sources of employment) face greater problems due to their inability to access credit and funding from institutional sources. Another constraint in setting up industry is land acquisition. In many cases, the MSMEs are unwilling to expand in size to avoid further regulations and taxes. The huge informal sector and the necessity to generate decent employment opportunities within this sector necessitates the requirement of improved availability of skill training of the workers so that their productivity and in turn income improves. The issue of skill building has been one of the key objectives of the policy makers. It has been realised that for India to make use of its youth bulge it is necessary to equip its workforce with relevant skills to seize the opportunities both nationally and internationally.



Problems related to human capital in unorganised sector:

- 1) **Lack of Skills:** The workforce in this sector is devoid of the necessary skills of primary educations. This has led to the exploitation of these workers by their employers. These workers are usually unskilled or semiskilled.
- 2) **Less exposure to Info & Tech:** These workers do not have exposure to information and technology due to their low level of literacy. These still follow the traditional way of working and do not have the knowledge that their work can be done through latest technologies. This leads to an employment opportunity in lower graded jobs.
- 3) **Lack of Formal Training:** Though there has been many interventions by the Government of India to encourage vocational training to the unemployed group of the economy still proper implementation of the schemes have not been made in many areas. Therefore, these people enter into the unorganised sector of the economy.
- 4) **Poor human capital base as well as lower mobilization status of the work force:** The poor human capital base in terms of education, skill and training leads lower mobilization status of the workforce. These workers feel comfortable to work in their native places rather than mobilising to better jobs elsewhere.
- 5) **Low literacy among them:** The poverty status of these workers act as a barrier for education of the child and the adult. The parents are in the vocation that a child can contribute to the income and the adults don't feel the necessity of being literate as they are more satisfied with the existing job conditions and don't aspire for a better job.



Source: Problems of Human Capital In Unorganised Labour

- 6) **Leadership Problem:** unorganised sector workers are unaware that they also contribute to the human capital of the economy. They do not feel the necessity that they also need to be developed in the context of improving their skill set. Due to this workers lack a good leader who realises this aspect like education, training etc which is essential for these workers and encourage them for the development and improvement of their skills.
- 7) **Lack of awareness on skill development:** the workers are not aware that there are a lot of programme interventions which are introduced by the Government of India for their skill development benefit.
- 8) **Lack of vocational Training:** the workforce which is above to enter the labour market do not realise that they could get better jobs if they had any vocational training. As these workers lack



vocational training they end up being the unorganised sector workers of the economy.

HRD INTERVENTIONS FOR HUMAN CAPITAL:

Skill System in India

The low level of education and skills are the prime reason for the vulnerability of the workforce in the rapidly developing economy. The heterogeneous nature of informal sector together with differing nature and condition of work necessitates different kinds of training. There is no mechanism to validate and estimate the training needs of different units in the unorganised sector. The workers are either not aware or deliberately avoid training for loss of income.

In the 11th Plan, a Coordinated Action on Skill Development was initiated for the focused attention on skill development aiming at an appropriate policy formulation; synergizing efforts of different Ministries/departments in the skill field to achieve efficiency of expenditure, and catalysing private sector participation. This has been replaced by the National Skill Development Agency in June, 2013. The National Policy on Skill Development announced in 2009 emphasized on policy coherence, inclusivity, improvement of quality, and employment outcome to achieve the massive ambition of skilling and achieving inclusivity. It laid special emphasis on the skill development for the informal/unorganised sector. The Scheme of Vocationalisation of School Education along with polytechnics and ITIs are catering to the requirement of various sectors including informal. The private initiatives supported by the National Skill Development Corporation are also helping the training needs of the unorganised sector. Through Sector Skill Councils and the skill gap studies of the NSDC effort is being made to link the skill demand with the industry and the market. More than 20 central Ministries are implementing various plan programmes for skilling.



The 12th Plan has identified certain issues for the skill development of the people in the unorganised sector:

- a) Recognition of prior learning.
- b) Skill up-gradation and certification.
- c) Expanding the outreach of skill development activities throughout the country. particularly in the backward/ LWE areas by setting Skill Development Centres (SDCs) as the sector is heterogeneous and spread across the country.
- d) Provision of literacy and basic education.
- e) Replication of successful models.
- f) Use of ICT and mobile vans for expanding outreach
- g) Cluster approach for apprenticeship training.
- h) Using the process of Train—Loan-Link—Support system for improvement in the success rate of training in self-employment or job employment.
- i) Developing a pool of certified trainers with adequate technical competency.
- j) Developing a transparent system for conduct of the programmes, registration of participants and so on and putting it in the public domain.

Government of India has initiated various steps for improving the employability of its labour force which is mainly in unorganised sector

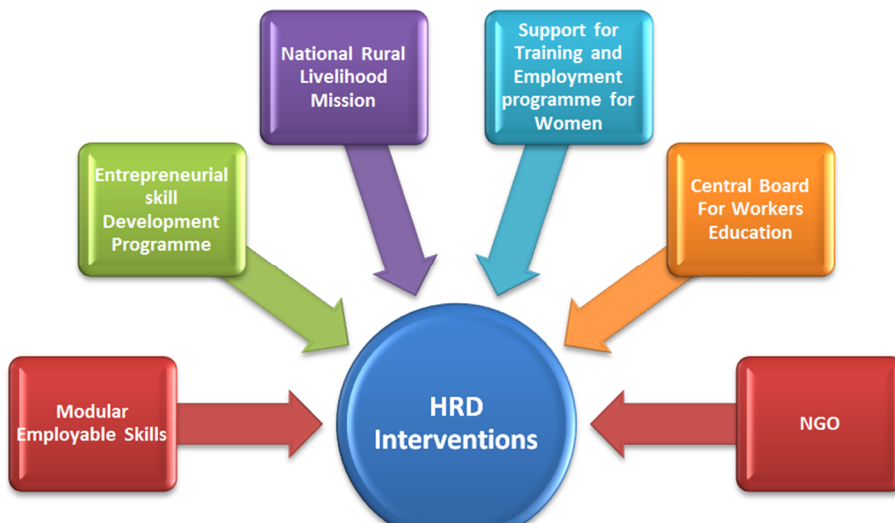
HRD Intervention programmes

- Skill Development Initiative based on Modular Employable Skills (MES) is implemented by the Ministry of Labour & Employment. This has been developed in close consultancy with Industry, State Governments & Experts in pursuance of excellence in vocational



training. MES is the 'Minimum Skill Set' which is sufficient to get an employment in the world of work. MES allows skills upgradation / formation, multi entry and exit, vertical and horizontal mobility and lifelong learning opportunities in a flexible manner and allows recognition of prior learning. The major objective is to provide vocational training to school leavers, unorganised sector workers, ITI graduates, etc. to improve their employability by optimally utilizing the infrastructure available in Government, private institutions and the Industry. Existing skills of the persons can also be tested and certified under this scheme and to build capacity in the area of development of competency standards.

- Entrepreneurial Skill Development Programme (ESDP) implemented by the Ministry of Micro, Small and Medium Enterprises with objectives of (a)upgrading existing skills and to create new skills in workers and technicians of existing units and educated unemployed youth; (b) providing training to unskilled/ semi-skilled workers engaged in SME sector and to equip them with better and improved techno-managerial skills of production; and (c) implement specific tailor made programmes for the skill development of socially disadvantaged groups in remote regions/ pockets of the States are offered. Also called "Out-Reach Programmes".
- The major objectives of the Aajeevika / National Rural Livelihood Mission (NRLM) are (i) to create efficient and effective institutional platforms for the rural BPL youth. The Special Projects under Aajeevika scheme provides placement linked market driven skill trainings; and (ii) to train rural BPL youth in the age group of 18-35 years in marketable skills and place them in suitable jobs.



HRD INTERVENTIONS

- Support to Training and Employment Programme for Women (STEP) implemented by the Ministry of Women & Child Development targets the marginalized, asset less rural women and urban poor. This includes wage labourers, unpaid daily workers, female headed households, migrant labourers, tribal and other dispossessed groups. The scheme's objectives include (i) mobilising women in small viable groups and making facilities available through training, access to credit and other inputs; (ii) provide training for skill up gradation; (iii) enabling groups of women to take up employment-cum-income generation programmes of their own, or to access wage employment.
- A new scheme "Roshni" within NRLM/ Aajeevika Skill Development Programme for tribal areas and critical LWE affected districts involving training of 3, 6, 9 or 12 months. 50 per cent of the beneficiaries under the scheme would be women. In addition, allocation for skill development under National Rural Livelihoods



Mission (Ministry of Rural Development) from 15 per cent to 25 per cent has been enhanced.

- Role of Central Board for Worker Education (CBWE) in the development of the informal sector workers is overwhelming. It is an organization dedicated to improving the skill and motivation level of workers across the country. The Board organizes training programmes for workers in formal as well as informal sectors at all levels. It also seeks to involve managements as well as trade unions in this activity.
- Role of NGO Education, training and healthcare are the most important instruments in the development of human capital. Most of the NGO's seek to promote timely education to the unorganised labour. They have mobilized the local community to contribute for the improvement of the schools. Many healthcare facilities are also provided to the unorganised workers by the NGO's.

Conclusion:

From the above discussion it has been found out that there has been some problems which relate to the human capital base of the unorganised sector. These problem are being realised by the Government and hence certain regulatory measures are also been provided to these workforce for their upliftment. Still there are certain barriers which are yet to be focussed which relate to evaluation of these programmes framed for the unorganised sector. The evaluation of the implemented programmes are not emphasised in this paper due to certain constraint factor which can be a basis of further analysis of study.

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'BARNARD'S SURVEY REPORT' AS A SOURCE OF EARLY MODERN HISTORY OF MADRAS PRESIDENCY: WITH SPECIAL REFERENCE TO CHINGLEPUT JAGIR AND DISTRICT

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I. INTRODUCTION

History can speak to the present only, when the historian properly reads the records, documents the evidences and interprets the events and the process which he or she intends to do so. If it does not fall under the process as mentioned, it would lead the readers and viewers of the history to understand everything about the past in mythical as well as fictional perspectives. As a result, the truth of the past in relation to the persons who lived in the past as well as in relation to what they have left to us become prejudiced, biased and unbelievable stories. Therefore, it is necessary to interrogate the sources in order to arrive at the truth about the particular source.

Though many have written and rewritten the pan Indian histories of different periods, they do not specifically focus on a particular region. The people which may enlighten the readers to know more accurately and authentically of the facts and processes that had happened in a given time and space. Therefore one must take a micro region for the historical analysis, the historian can come across various unknown facts which may prompt historical scholarships in future. The study has been undertaken in this paper, Chingleput Jagir and district as a micro region within the Madras Presidency of the British and attempts to bring out the social economic conditions of the above mentioned Jagir and district. To substantiate as well as to support the



historical narrative of this study, the paper takes up the Barnard survey report as the source to study the Chingleput Jagir and District.

There are various debates going on about the writing of Modern Indian History and one of these is about the authenticity of various sources. For example, in documenting the Modern Indian History, it could be construed that archival data¹ has been documented by the British officials for their own administrative requirements. At the same time, it is also learnt that other sources such as village accounts were available in the indigenous language (Tamil) prior to the data recorded by the British. In this research paper, the focus is mainly laid on the comparative aspects on the points of originality of the Barnard Survey Report² in English and the *Chingalpattu* Survey Report in Tamil (J.K. Bajaj and M.D. Srinivas 1995); the former probably inspired and influenced by the latter.

In this paper an attempt is made to bring out in what way the Barnard Survey Report is historically important and differing from the other similar reports, we evaluate this Report in order to investigate, changing trends in the socio economic conditions before and during the British conquest. The Barnard Survey Report is a collection of the village accounts in the Chingleput Jagir. In February 1767, Thomas Barnard (Phillimore 1945, 189, 272) was appointed by the chief engineers of Madras to conduct the survey area then called "the Jagir" (Edney 1997), after many interruptions, completed in November 1773 (Mizushima 2013, 12). He submitted his survey maps and village accounts in 1774. The survey carried out with the help of Indian Assistants.

¹The Barnard report, Mr. Place report, Mr. Greenway report (Permanent Settlement report), etc.

²Tamilnadu State Archives, Board of Revenue, Board of Miscellaneous Volumes, Chingleput Jagir, Vol. No; 50, 50A, 51, 51A, 52, 52A, 53, 53A, 54, 54A, 55, 56, 56A, 57, 58, 58A, 59, 60, 60A, 61, 61A, 62, 63, 64, 64A, 65, 65A, 66, 67, 67A, 68, 69, 69A, 70, 70A, 71, 72, 73 and 89.



1.1. Historical Background

Before proceeding to analyse the undertaken the research study one must know a brief outline of present Chingleput. The area is one of the parts of old *Tondaimandalam* and present State of the Tamilnadu known as Chingleput District also called as the Chingleput Jagir. Chingleput which literally means 'Lilly Pond village' has been mentioned in Sanskrit literature as '*Kuvalayapura*' meaning water Lilly Town. The inhabitants of the ancient Chingleput district called as the *Dandacaranniya* or forest of the massive Dandaca, were known as Pallavas, Pallis, Kurumbars and Vanniyars (C.S.Crole 1879, 141-142). This district had shared its bounded with present the Nellore of Andra Pradesh in the West and Bay of Bengal in the East, and lies between North Arcot and South Arcot. The Chingleput district was under control of the northern powers such as the Hoysalas Dynasty, the Delhi Sultanate Alla-udin- Khalji's General Malik Kafur, Orissa king of the Kesari dynasty and the Vijayanagra Empire (C.S.Crole 1879, 139-142). The district came under the European powers; the Portuguese put their trading station in St. Thome on the Coromandel Coast, followed by them the English, Dutch and the French.

The British Re-arranged for the administrative purpose, the Chingleput Jagir was named a Chingleput District. (M.Gopalakrishnan 2000, 1) At present the Chingleput District is administratively insignificant. However the district had an important historical past. In that way the present research work would find out part of Chingleput District of Madras Presidency in the historical analysis. The Chingleput District, the first of the districts established by the English East India Company for their revenue administration in Madras Presidency and the name was continued as Chingleput till 1990, and renamed as The Chengi-Anna District, as commemoration of C. N. Annadurai, former Chief Minister of Tamilnadu, who came from Kanchipuram, headquarters of the District. (M.Gopalakrishnan 2000, 1-2)



At the same time, some historians fear that all the historical events of this territory have not been documented adequately. Apart from the documented texts, there is available a variety of sources such as Literature, Epigraphic, Numismatic and Archaeological remains which could help understand better the social, economic and cultural organization of the Tamils. It shows how various social groups and their works have emerged, how they maintained economic activities and village organisation, and also the role played by the community in equally distributing the land and property with people and the state. In the agrarian structure, land right indicates not only the right to use the land and earn profit but also provides economic, administrative and judicial power to the landholders. The land rights controlled the agrarian society; the village communities regulated the relations of landholders with other members of village service groups. Kings and the elites who had superior rights over land not only controlled the agricultural economy and political power at the village level, but also maintained relations with political and administrative powers beyond the village level. This facilitated the smooth collection of taxes and also the maintenance of the ancient rights of the landholders.

In 1639, the Madras city was established; the local Nayaka chief gave the coastal side of the land to the British with autonomous authority over territory permitted by the Nayaka. The town comprised Fort St. George,³ where the British merchants stayed and the house of the administrative centre. Similarly, on north side of this town, where the settlement of native called as the 'Black town.' (Mukund 2005, 10) The Court of the Director ordered the Fort St. George of Madras to acquire a competent knowledge of the territory under their charge and to establish a systematic administrative policy for their future management. (Phillimore 1945, 88) To achieve that aim a committee of five Council members at Fort St. George was appointed.

³Present day Legislative Assembly of Tamilnadu State is located.



To inquire into the state of the Northern Circars and Jagir by ascertaining, with all possible accuracy, the produce of the respective countries, the number of inhabitants, the state of the manufactures, the fortified places, the military strength of each rajas, Zamindars or landholders, the expanse of his households and that of his troops, and the means he had of financing those expanses; the gross amount of the revenue, the articles from which they arose, the mode by which they were collected, the charges of collections, the specified proportion usually received by the rajah or Zamindari, and that, which custom or usage allotted to the cultivators, as the reward of his labour... (The Fifth Report, From the select Committee on the affairs of East India Company, Vol.2 1869, 3-4)

In the early stages of the English East India Company rule, Madras was governed by an agent known as the Governor who was assisted by a council. Both the governor and the council were collectively responsible to the company's Board of Control. As governance and territory developed, improved structures of administration were needed and several departments were formed. Initially a common department was formed to which looked after all the important aspects of the company known as the Public Department. Gradually, the Board of Revenue was started by 1786 to facilitate easier management of revenue from the acquired territories around the areas of the Chingleput Jagir and North Arcot districts.

Meanwhile, the new settlement of Madras town attracted a variety of crowd including weavers, several trading groups, labourers and other artisans. (Mukund 2005, 10) As a result of such migration, the town developed in terms of population. In 1670s the Company authorities from London advised the Company administration of Madras town to manage financial expenditure on their own (self-financing) as was practised in many parts of Europe. (Mukund 2005, 10) However, the mid-eighteenth century saw an increasing



governmental accountability of the East India Company and to the study of India and its people, especially as of history, law, customs, existing systems of village administration, tax collection etc. Land revenue administration was considered one of the vital tools in maintaining the early British rule in India. Several surveys were conducted and reports were collected by the British officers for their administrative purpose; a few examples are Trigonometric survey of India, Botanical survey of India, Geological Survey of India and other land oriented surveys from different parts of India. Consequently, the early British officers and administrators gathered as much information as possible on local resources to introduce new reforms or land revenue policies. A large number of such records and reports like the Barnard Survey Report (Mr. Thomas Barnard), the Place report (Mr. Lionel Place), the Permanent Settlement report (Mr. Greenway report), the Ryotwari Assessment (Baramahal Records) etc. are available at Tamil Nadu State Archives, Chennai. These records are considered the most important records from the early British Indian period of south India.

The history of land revenue policies in Madras Presidency of early period is divided into three significant policies namely Permanent settlement, village settlement and Ryotwari settlement. Permanent settlement was first introduced in 1793 by Lord Cornwallis in Bengal. Simultaneously, a proclamation declared the appointment of a Collector in the Northern Circars which showed the administration's intention to introduce Permanent settlement in other parts of the country.⁴ The Court of the Directors of the East India Company suggested taking actions to introduce Permanent settlement in the Northern Circars, Chingleput Jagir, and portions of Baramahal and Dindigul. (Baliga

⁴The Revenue Despatches to England, Vol.5, dated 14th Feb 1795, p. 202



1960, 82) Similarly, the successor Lord Cornwallis, Lord Wellesley, took steps to implement Permanent settlement in Madras Presidency.⁵

1.2. Chingleput Jagir

This study is an attempt to reconstruct the regional history with the help of Archival data combined with field work. The district of Chingleput was also called Chingleput Jagir. The Jagir comprised of the surrounding areas of Fort St. George in the Madras Presidency - the seat of British Colonial power in South India. The British referred to these areas as 'Jagir' which was defined as "a tenure common under the Mohammadan government, in which the public revenues of a given tract of land were made over to a servant of the state, together with the powers requisite to enable him to collect and appropriate such revenue, and administer the general government of the district." (H.H.Wilson 1855, 224) The Chingleput Jagir consisted of 15 'Simais'⁶ such as Kovalam, Chengalpattu, Kavanthandalam, Kanchipuram, Manimangalam, Uttiramerur, Periapalayam, Poonamalee, Ponneri, Salappakam, Sattumaganam, Thirupatchur, Karunguzhi, Perambakkam and Sriharikota. Each Simai was further divided into nearly 250 '*Maganams*'. These divisions of the eighteenth century Chingleput are probably related to the traditional division of Thondaimandalam into Kottrams and Nadus. (J.K. Bajaj and M.D. Srinivas 1995, 2) The Chingleput Jagir⁷ or Estate was a part of the Carnatic region; this region had a boundary extending on south of the river Krishna to Cape Comorin in the tip of the Peninsular. The Jagir was granted to the English East India Company for services rendered to the Nawab of Arcot and came under the control of English East India

⁵Board of Revenue, Consultation, Vol.11-12, dated 21st May 1798, Para 35., Revenue Despatches to England, Vol. 5, dated 18th October 1794, Para. 16-17

⁶*Simais* compared with taluks of a district at present.

⁷The Jagir lands, surrounding areas of Fort St. George from three sides, were of obvious strategic importance to the British.



Company on 16th October 1763 (Aitchison 1864, 3,86). This grant was confirmed by the Sunnad of the Mughal Emperor Shah Alam on 12th August 1765^{8**}. However, the Jagir was given to the Nawab for renewal of lease every year until 1780 when the Fort St. George of Madras Presidency took direct management. In 1782, the Committee of Secrecy was appointed, to examine the accounts and assess the revenue of the Jagir. (The Fifth Report, From the select Committee on the affairs of East India Company, Vol.2 1869, 36)

The Jagir was a thickly populated and rich tract about 100 miles by 50 in extent, and Barnard's survey, begun in 1767, was a model of what a survey should be. It was carried out on a scale of 2 inches to a mile on strict scientific principles, and, besides showing all topographical features, gave a wealth of information for revenue purposes: the maps were not completed till 1774.... (Phillimore 1945, 3)

1.3. Barnard Survey Report

Consequently, to regulate the value of these lands and also to arrive at appropriate ways of governing the Jagir, the British undertook detailed survey gathering information around the hinterland of Chingleput Jagir consisting more than 2,100 villages. In 1775 the Court of Directors had advised Fort St. George to appoint a committee of Circuit to investigate the state of Northern Circar, and the same committee was extended to the Jagir. The committee discovered the actual produce and revenue, described and ordered to respective places in the Northern Circars. (John Walker, Charles Walker 1855, 234) In 1767, Thomas Barnard was appointed by the chief engineer of

⁸Chronology of this land grant was mentioned almost in all secondary sources, erroneously. For example the land grant of Chingleput Jagir was originally on 16th October 1763; however, it was recorded in the District Gazetteer as in 1760. Similarly, this grant was confirmed on 12th August 1765, but it had been mentioned as in 1763. For more details, see p. 208 of C. U. Aitchison 1864.



Madras to conduct the survey in the Jagir on the instructions from his superior in the British administration. The survey's information throws light, in a detailed and arranged manner, on a lot of small parts village administrations. This was also considered a primary step in building a British administrative zone in the southern part of India. The Barnard report is in a way a collection of the village accounts in the Chingleput Jagir. He collected information on and details of every village from the statements of the *Karnam* (an administrative official) and local people. (John Walker, Charles Walker 1855, 235)

The survey was carried out with the help of Indian assistants and was considered at the time of its completion one of the finest pieces of mapping the regions in India. (Irschick 1994, 19) Rajasri Chengalvaraya Mudaliar served as *dubashi*⁹ for Mr. Thomas Barnard. They started the work in February 1767 and took more than seven years to complete the survey by November 1774. Barnard submitted his survey maps and village account in 1774.

To accomplish what was required of me, in reporting the state of the country, and the improvements which might be made, I had recourse to the records which are kept in every locality of the transactions, which relate to revenue, cultivation and trade. The existence of any such materials was I believe unknown, when Col. Call sent me out, the insight I obtained of this matter, was furnished me by the interpreter appointed by Col. Call... (M.D. Srinivas, T.G. Paramasivam, T. Pushkala 2001, 3)

The sources of the survey report are originally from the palm-leaf manuscripts of the village accounts written in old Tamil script, in a format of traditional village accounts preserved by village heads or institutions. These records were occasionally referred to in the government records of eighteenth century. By 1795, such a collection of

⁹One who speaks two or more languages, an interpreter, a native man of business in the service of a European in Madras, but the office and the name are almost out-of-date.



palm-leaves of village accounts were deposited with the Collector of Chingleput. This collection consists of about 160 bundles of palm-leaf manuscripts. Each bundle covers about six hundred full-length and unprocessed palm-leaves written on both sides; each leaf is a metre long and three to four centimetres wide. (M.D. Srinivas, T.G. Paramasivam, T. Pushkala 2001, 3-4) Among these, about twenty bundles give detailed information on the agrarian economy of Chingleput Jagir. This collection has been preserved by the Department of Palm-Leaf Manuscripts of the Tamil University at Thanjavur after obtaining it from the Collector office of Kancheepuram, previously located at Chingleput.

The English archival records are available at Tamil Nadu State Archives, at Egmore in Chennai. The survey reports are in the form of English manuscript registers, nearly thirty-nine volumes in the Miscellaneous Series of the Board of Revenue including duplicated volumes,¹⁰ and ten volumes in Chengalpattu District Record Series;¹¹ and forms the data of the current study. These volumes also recorded in the Governor's council proceedings dating across 1775 and 1776. (J.K. Bajaj and M.D. Srinivas 1995, 64)

Barnard survey report could be considered one of the first steps made by the British to recognize the way of the Indian people before the methodical planning to efficiently overpower them and build a British Empire in India. The information recorded in the survey is significant as it helps understand the life of people, society and agrarian economy of the latter half of the eighteenth century India in general

¹⁰Boards of Revenue, Miscellaneous Volumes, Chingleput Jagir, No; 50, 50A, 51, 51A, 52, 52A, 53, 53A, 54, 54A, 55, 56, 56A, 57, 58, 58A, 59, 60, 60A, 61, 61A, 62, 63, 64, 64A, 65, 65A, 66, 67, 67A, 68, 69, 69A, 70, 70A, 71, 72, 73 and 89.

¹¹Chingleput District Records, Volumes. No; 527, 542, 543, 544, 545, 546, 547, 548, 549 and 550.



and Madras Presidency in particular prior to the establishment of British administration.

The Survey Report lists Land use patterns, Inam land holdings (tax free), houses and castes, types of shares, Divisions of shares between the State and the Cultivators, Names of the land holdings - their shares and their residing places, Names of the village accountants - the Poligars, Revenue from different crops between 1766-74, Cash revenue etc. According to the Survey, the village land was divided into three main categories namely *Nanjai*(wet)¹², *Punjai*(dry)¹³ and Purampokku(Common land)¹⁴ lands. The Nanjai and Punjai lands were measured by Kanis; one kani is equal to 240 square feet.¹⁵

2.1. Sections of the report

The Survey Report is divided into several sections based on the villages having a title referred to as the *Tarappadi Vagai Edu*¹⁶ which contains the details of the land and families of the village area and occasionally the crop production and income of the villages. It is again sub divided into *Tugai Edu* containing further detailed data of the

¹²Irrigated Soil that is fit for the cultivation of rice, admitting of artificial irrigation, and hence commonly termed wet ground or soil. - H. H. Wilson, A Glossary of Judicial and Revenue terms of British India, London, 1855, p.368

¹³Dry land or cultivation, land not admitting of complete irrigation, and therefore unfit for the growth of rice, bearing dry grains of inferior value - H. H. Wilson, A Glossary of Judicial and Revenue terms of British India, London, 1855, p.427

¹⁴such portions of an estate or village lands liable to revenue as do not admit of cultivation, and are therefore exempted from the assessment, as sterile or waste land, rock, water, wilderness, site of dwellings, and the like : also common land near a town : any place situated out of or beyond certain limits. - H. H. Wilson, A Glossary of Judicial and Revenue terms of British India, London, 1855, p.428

¹⁵Tamilnadu State Archives, Board of Revenue Miscellaneous series, Barnard report, Kavanthandalam register, Chingleput, Vol.60, Gl. No.18102, p.96

¹⁶Tamilnadu State Archives, Board of Revenue Miscellaneous Volumes from Gl.no;18069 to 18120 (Vol.No. from 50-80)



villages. The *TarappadiVagaiEdu*¹⁷ volumes provide a detailed survey of the land and households in a village. It categorised and measured every piece of land in the villages, its location and the nature of the land. In addition, every temple, tank, large wells, canal, lake, etc. were listed and recorded. It identified and enrolled every household, the head of the family and his community, location of the household, size etc.

2.2. Land Usages

Barnard survey report mentioned the different types of land usages in existence. The village administration and economy of eighteenth century was considered by various features of the lands. According to the *Tarappadi*¹⁸*VagaiEdu*, the land of the Chingleput Jagir was divided into three portions namely the *Purampokku* lands (common lands), *Maniyam* (*Innam land*) and *Varapattu* (taxable by the government).

As per the details of the *Purampokku* land recorded in the *TarappadiVagaiEdu*, such kinds of lands were not included in the revenue assessment. Temples, water bodies (ponds, tanks, wells, canals, lakes etc.), streets, gardens, forests, waste lands, hills, sandy lands, threshing grounds, cremation grounds, grassing grounds etc. came under this category. (M.D. Srinivas, T.G. Paramasivam, T. Pushkala 2001, 14)

The term *Maniyam* or *Innam* refers to a share of the village land which was allotted to individual for his service towards the village. In some cases it was found that when the land holder is not able to

¹⁷Tamilnadu State Archives, Board of Revenue Miscellaneous, Vol.70, Gl. No.18112, para, 6.s

¹⁸The term '*Turappadi*' referred sometime *Tarapaddy*, *Turubuddy* : it is also supposed to be the original account of the village lands, distinguishing the varieties of soil, produce, and tenure, and the ancient dues and perquisites of the village officers and servants. H. H. Wilson, *A Glossary of Judicial and Revenue term of British India*, London, 1855, p. 594



cultivate the land allotted to him it was given to the villager to cultivate in return a share of produced crops in the land. The Maniyam lands recorded in the *TarappadiVagaiEdu*, under the title of *Swatantiradittam*¹⁹ and *Meraidittam*,²⁰ gives a detail account of the land which cultivatable, lands free of revenue assessment and the names of the beneficiaries. The *Swatantiradittam* insisted that the share of allotted land was to be paid before threshing the corn; hence all cultivatable land came under this category. Similarly, the *Meraidittam* insisted that one third of the total production of the land should be paid to the village. There are various *Merais* such as *sarimerai* (equal shares), *Erimerai* (for water bodies repair works), *Gramamerai* (Village officials), *Kanakkumerai* (village accountant) etc.

There are two kinds of obligations on cultivable land; the revenue of a particular land could be assigned to various institutions called *maiyaams*, or the allocation of a share of the produce to various services and functions called as *Swatantirams* and *Merais*. Arrangements were made with several functions and services of the villages and the details of produce distribution among various recipients of different occupations and institutions were recorded. Such beneficiaries were mostly from the village level or regional levels like temples, administrative units etc. The village functionaries and services included law and order, registry, irrigation, health, cultural and religious affairs and some artisan and industrial activities. (M.D. Srinivas, T.G. Paramasivam, T. Pushkala 2001, 9-10)

¹⁹ "Certain fees of corn in straw before threshing, received by the Mirasidars in the Tamil provinces: any fee or privilege claimable by the village servants, musicians, or the like" - H. H. Wilson, A Glossary of Judicial and Revenue term of British India, London, 1855, p. 496

²⁰ "Regulation or rule for the proportionate allowances from the crops" - H. H. Wilson, A Glossary of Judicial and Revenue term of British India, London, 1855, p. 339



The details of the *Varapattu* land are also recorded in the *TarappadiVagaiEdu*. *Varapattu* land was taxable by the government. The heads of *SekalKarambu*²¹ and *AnadikarambuKarambu*²² detailed the cultivatable lands and non-cultivable lands respectively and divided those into Nanjai and Punjai land measured in Kanis.

The distribution of the shares is followed in four separate stages of the harvest:

“Before measurement and threshing of the harvest, after threshing but before measurement of the grain, after the measurement of grain, and finally from the revenue after the cultivators have taken their share.” (M.D. Srinivas, T.G. Paramasivam, T. Pushkala 2001, 5)

In addition, various other types of shares are also mentioned in the survey. *EriAlavuor EriMera*²³ contains details of the expenditures and expected revenues from the reparation of irrigation reservoirs, lakes and tanks. Similarly, *Tirvai*²⁴ *VagaiEdu* contains details of the control of income from the gross produce. There was also *BerizTugaiEdu* (total assessments of a particular place) that recorded only the assessed revenue.

2.3. Various Measurements in the survey report

The survey report could also be read as a record of various measurements in the eighteenth century Chingleput Jagir. Many of those measurements used for measuring land, grain and cash are now out dated. The units of measurement of grain used in the survey report

²¹ *Sekal-karambu* which was cultivatable land, however, ‘neglected’ for some time.

²² *Anadi-karambu* was waste land that couldn’t be cultivated with any prospect of advantage.

²³ “A portion of the crop set apart to meet the expense of keeping the reservoir and watercourses in repair” -H. H. Wilson, A Glossary of Judicial and Revenue term of British India, London, 1855

²⁴ a money assessment of revenue on land, or on its produce.



include *Kalam*, *Marakal* and *Padi*; one *Kalam* is equal to twelve *Marakals* or equal to 125 kilogram. Similarly, one *Marakal* is equal to eight *Padis*. Barnard report records the measurement of land in *Kani* and produce in *Kalam*. (M.D. Srinivas, T.G. Paramasivam, T. Pushkala 2001, 28)²⁵ The measurement units of cash are Pagodas, Fanam, Casu etc. The survey report shows that the land produces were measured and converted into cash values. The value of one Pagoda is equal to 36 Fanam, whereas one Fanam is equal to 80 Casu. (M.D. Srinivas, T.G. Paramasivam, T. Pushkala 2001, 69)

The report has also mentioned the details of various village communities, which involved in the activities of the village economy, such as *Siva Brahmanas*, *Vaishnava Brahmanas*, *Pandaram*, *Kondaikati Vellalar*, *Payirkottai Vellalar*, *Kanakkar*, *Palli*, *Talaiyari*, *Kaikkolar*, *Idaiyar*, *Chetty*, *Kammalar*, *Devadasi*, *Vaniyar*, *Sanar*, *Vannar*, *Navitar*, *Kuyavar*, *Taccher*, *Panisever*, *Muhammadiyar*, *Vettaikkarar* etc. Agricultural crops such as *Nel* (paddy), *Varagu*, *Kelvaragu*, *Kambu*, *Tinai*, *Samai*, *Kollu*, *Ellu*, *Tuvarai*, *Ulundu* and so on are also mentioned and provides information about the various crops and the amount of produce from 1762 to 1766.

Conclusion

To sum up from the passages one may conclude that there might be many sources for reconstructing the history of Chingleput Jagir. Yet, they are not reliable because of its dearth of veracity, credibility and genuineness. Moreover, most of them were written in English and they seem to serve the purpose of the British colonial administration. But, the Barnard report relied in vernacular manuscripts in the medium of Tamil written in palm leaves. The length and breath in which the Jagir was surveyed by Thomas Barnard clearly gives us compact and

²⁵ Tamilnadu State Archives, Board of Revenue Miscellaneous, Vol.70, Gl.No.18112. p. 15



comprehensive information about the life and property of the people in above said Jagir. Not only the report focus on the elaborate summary off the classified land types and capacity of the people to pay tax to the State, but also it elaborately outline the Socio Economic condition of the people in various dimensions. Thus, this study opens a research vacuum for the budding scholars in the discipline of history.

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SCIENTIFIC APTITUDE AMONG STUDENTS: AN INTER DISTRICT COMPARISON

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Introduction

In the context of contemporary society which is highly scientific and technical, science learning is being recognized more and more. Effective science learning not only ensures individual development but also contributes towards nation development. Science learning is not only important for the two reasons, as mentioned. In fact, it is also considered as a symbol of recognition of a learner in his/her surrounding environment i.e. school, home and society (Ganguli & Vashistha, 1991). Students feel a strong urge to enroll themselves in science courses particularly in senior secondary stage due to number of causes, among which to ensure their well acceptance in surroundings is also a major one. Parents are also driven strongly by this type of external motivation, considering science learning of their children as the symbol of social status. But mere enrollment is not enough. Student once opted science subjects should be able to do well otherwise there is wastage of human resources. There are a number of factors which are supposed to influence science learning among which scientific aptitude is the major determiner, which helps a learner to apply skill and competency in learning science successfully and indicates the possibility of future accomplishment in the field of learning science. Proper scientific attitude inclines a learner towards scientific knowledge, a scientific process, eminent scientists, and towards scientific inventions encouraging learner's spirit of scientific enquiry. Therefore learners' felt urge in learning science along with their sound scientific aptitude



only may result in expected achievement (Ghosh, 1986). Although admission to various professional courses is purely on the basis of aptitude and merit, but students scientific aptitude is hardly recognized as a matter of consideration while getting admission in academic colleges. As a result, in spite of increasing enrollment rate of students in various science courses, their achievement is not at par the level of expectation. Failure in science learning increases the wastage of human resources and therefore has become a grave concern of teachers and administrators. Keeping the importance of scientific aptitude into consideration, the present study was conducted to study the scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts.

Objectives of The Study

- 1) To find significant difference in Experimental bent as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts
- 2) To find significant difference in Ability to reason and solve problems as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts
- 3) To find significant difference in Detection of inconsistencies or illogical conclusions as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts
- 4) To find significant difference in Caution and thoroughness as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts



- 5) To find significant difference in Accuracy of Interpretation as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts
- 6) To find significant difference in Accuracy of observation as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts
- 7) To find significant difference in Ability to deduce conclusion from the data as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts

Hypotheses of the Study

- 1) There will be no significant difference in Experimental bent as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts.
- 2) There will be no significant difference in Ability to reason and solve problems as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts.
- 3) There will be no significant difference in Detection of inconsistencies or illogical conclusions as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts.
- 4) There will be no significant difference in Caution and thoroughness as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts.
- 5) There will be no significant difference in Accuracy of Interpretation as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts.



- 6) There will be no significant difference in Accuracy of observation as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts.
- 7) There will be no significant difference in Ability to deduce conclusion from the data as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts.

Sample

For this study, a sample of 207 students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts was drawn by using systematic random sampling technique.

Tool Used

Scientific aptitude test for college students by A.K.P.Sinha and L.N.K.Sinha was used for collecting the desired data.

Analysis and Interpretation of Data

Table 1

Summary of Analysis of Variance for Experimental Bent as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts

Source of variation	d	f	Sum of squares	Mean squares
$S S_{\text{Between}}$	4		7 7 . 0 4	1 9 . 2 6
$S S_{\text{Within}}$	2	0	3 2 4	1 6 . 2
$S S_{\text{Total}}$	2	4	4 0 1 . 0 4	

F

F 1.18

Review of Table 1 shows that the calculated value of F for Experimental bent as a component of scientific aptitude among



students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts is 1.18 which is lower than the table value 2.87 at 0.05 level of significance for degrees of freedom 4 and 20. Therefore, it can be inferred that there is no significant difference in Experimental bent as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts. Hence, the hypothesis that there will be no significant difference in Experimental bent as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts is accepted.

Table 2

Summary of Analysis of Variance for Ability to reason and solve problems as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts

Source of variation	d	f	Sum of squares	Mean squares
S S _{B e t w e e n}	4		1 3 6 . 3 6	3 4 . 0 9
S S _{W i t h i n}	2	0	3 5 9	1 7 . 9 5
S S _{T o t a l}	2	4	4 9 5 . 3 6	

F

F 1.90

Perusal of Table 2 shows that the calculated value of F for Ability to reason and solve problems as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts is 1.90 which is lower than the table value 2.87 at 0.05 level of significance for degrees of freedom 4 and 20. Therefore, it can be inferred that there is no significant difference in Ability to reason and solve problems as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts. Hence, the hypothesis that there will be



no significant difference in Ability to reason and solve problems as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts is accepted.

Table 3

Summary of Analysis of Variance for Detection of inconsistencies or illogical conclusions as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts

Source of variation	d	f	Sum of squares	Mean squares
S S _{B e t w e e n}	4		8 6 . 5 6	2 1 . 6 4
S S _{W i t h i n}	2	0	1 2 5 1 . 2	6 2 . 5 6
S S _{T o t a l}	2	4	1 3 3 7 . 7 6	

F

F 0.34

Perusal of Table 3 shows that the calculated value of F for Detection of inconsistencies or illogical conclusions as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts is 0.34 which is lower than the table value 2.87 at 0.05 level of significance for degrees of freedom 4 and 20. Therefore, it can be inferred that there is no significant difference in Detection of inconsistencies or illogical conclusions as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts. Hence, the hypothesis that there will be no significant difference in Detection of inconsistencies or illogical conclusions as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts is accepted.



Table 4
Summary of Analysis of Variance for Caution and thoroughness as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts

Source of variation	d	f	Sum of squares	Mean squares
S S _{B e t w e e n}	4		4 2 . 2 4	1 0 . 5 6
S S _{W i t h i n}	2	0	8	0 . 4
S S _{T o t a l}	2	4	5 0 . 2 4	

F

F 26

Review of Table 4 shows that the calculated value of F for Caution and thoroughness as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts is 26 which is higher than the table value 4.43 at 0.01 level of significance for degrees of freedom 4 and 20. Therefore, it can be inferred that there is significant difference in Caution and thoroughness as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts. Hence, the hypothesis that there will be no significant difference in Caution and thoroughness as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts is not accepted.

Table 5
Summary of Analysis of Variance for Accuracy of Interpretation as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts

Source of variation	D	f	Sum of squares	Mean squares
S S _{B e t w e e n}	4		6 6 . 6 4	1 6 . 6 6
S S _{W i t h i n}	2	0	5 8 8	2 9 . 4
S S _{T o t a l}	2	4	6 5 4 . 6 4	

F

F 0.57



Review of Table 5 shows that the calculated value of F for Accuracy of Interpretation as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts is 0.57 which is lower than the table value 2.87 at 0.05 level of significance for degrees of freedom 4 and 20. Therefore, it can be inferred that there is no significant difference in Accuracy of Interpretation as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts. Hence, the hypothesis that there will be no significant difference in Accuracy of Interpretation as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts is accepted.

Table 6

Summary of Analysis of Variance for accuracy of observation as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts

Source of variation	D	f	Sum of squares	Mean squares
$S S_{\text{Between}}$	4		2 4	6
$S S_{\text{Within}}$	2	0	1 4 0	7
$S S_{\text{Total}}$	2	4	1 6 4	

F

F 0.86

Table 6 shows that the calculated value of F for Accuracy of observation as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts is 0.86 which is lower than the table value 2.87 at 0.05 level of significance for degrees of freedom 4 and 20. Therefore, it can be inferred that there is no significant difference in Accuracy of observation as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts.



Hence, the hypothesis that there will be no significant difference in Accuracy of observation as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts is accepted.

Table 7

Summary of Analysis of Variance for Ability to deduce conclusion from the data as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts

Source of variation	d	f	Sum of squares	Mean squares
S S _{B e t w e e n}	4		1 5 . 8 4	3 . 9 6
S S _{W i t h i n}	2	0	1 5 . 1 2	0 . 7 5
S S _{T o t a l}	2	4	3 0 . 9 6	

F

F 5.28

Persual of Table 7 shows that the calculated value of F for Ability to deduce conclusion from the data as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts is 5.28 which is higher than the table value 4.43 at 0.01 level of significance for degrees of freedom 4 and 20. Therefore, it can be inferred that there is significant difference in Ability to deduce conclusion from the data as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts. Hence, the hypothesis that there will be no significant difference in Ability to deduce conclusion from the data as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts is not accepted.



Main Findings

- 1) No significant difference has been found in Experimental bent as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts.
- 2) There is no significant difference in Ability to reason and solve problems as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts.
- 3) No significant difference has been found in Detection of inconsistencies or illogical conclusions as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts.
- 4) Significant difference has been found in Caution and thoroughness as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts.
- 5) There is no significant difference in Accuracy of interpretation as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts.
- 6) No significant difference has been found in Accuracy of observation as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts.
- 7) There is significant difference in Ability to deduce conclusion from the data as a component of scientific aptitude among students belonging to Jammu, Kathua, Samba, Udhampur and Reasi Districts.



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A NOTE ON THE ECONOMIC STATUS OF PONDICHERRY DURING THE TIME OF DUPELIX

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Joseph Francois Dupleix was appointed as Governor of French India on 14th January, 1745. His period marked the Zenith of the French Power both political and Economy in Pondicherry. Pondicherry not only affected the political atmosphere and economic prosperity but also opened a new vista in the spheres of society and economy. This paper concentrate on economics status of the Indians during French settlement more particularly during the Governorship of Dupleix. Slavery was prevalent in several places of Pondicherry region. The Government of Pondicherry had maintained a register of slaves. The French had neither interfered with nor abolished the custom of slavery in their settlements. During the time of Duipleix, the slave trade was widely in existence, slaves were kidnapped and punished severely. There was no significant development in Educational field because he involved many wars against native as well as British. The system of marriage underwent a series of changes a after the arrival of the French in India particularly Pondicherry region. The intermarriage between French and non-french citizen resulted into the extension of French nationality to their spouses and offspring. There is a curious mixture of western and eastern culture. The occupation of Pondicherry by the French left some permanant foot print even in their food habit. Once Dupleix told that the Tamil food was not of worth and he praised the European food items. Women wore with jewels, costly pearls and gems decorated their ears. The people spent their evening time and other important festivals with joy and gaiety, some in recreational



clubs and others in sports club. Pentangue is game unique to pondicherry brought by the French to India. This is usually played by retired soldiers of the French army, who are settled in Pondicherry. Thus the French settlement Pondicherry was flourished economically during the Governorship of Dupleix.

On 14th January, 1742, Joseph Francois Dupleix was appointed as Governor of French India. Pondicherry became the capital of the French in India. His period marked the Zenith of the French Power both political and Economy in Pondicherry. After the establishment, Pondicherry was ruled by many Governors. Among these Governors Dupleix was a great and efficient ruler in Pondicherry. The supremacy of France began to decline there after there were internal disturbances in Pondicherry. During his rule in Pondicherry not only affected the political atmosphere and economic prosperity but also opened a new vista in the spheres of society and economy. Every nation has its own pattern of social system and Economic condition. Pondicherry also has its own pattern of Social life and Economic prosperity. Economy is the back-bone of a nation. All Societies have some common characteristics. Society carries on a set of activities in general i.e., political, economic, educational and so on that influence social life. The impact of the French Colonial policy in French settlements in India particularly in Pondicherry was mostly felt in the spheres of Economical development, administration, trade and religion. This paper concentrate on economics status of the Indians during French settlement more particularly during the Governorship of Dupleix.

Slavery:

During the eighteenth and nineteenth centuries slavery was prevalent among several places of Pondicherry region. A few indegenous documents throw light on the transactions of human beings as mere commodities. When the French extended its activities to the coromandel coast, slaves were exported in large number by the French



to meet their demands. The French at Pondicherry at first did not in any way control the export of slaves from their settlements. Their Government at Pondicherry had maintained a register of slaves. According to this list 166 children all from the age group between 7 and 15 years were sold in auction or on contract for a price varying from Rupees 3 to 2015. Such transactions were generally confirmed by a deed executed before local officials in which absolute right over the slave and in his or her future issues was also reserved in favour of the purchaser. Thus the French had neither interfered with nor abolished the custom of slavery in their settlements. The famous diarist Ananda Ranga Pillai has recorded the incidents connected with slavery. French Pondicherry was thus involved in the export of slaves to other countries especially the French colonies of Isles de France and Bourbon. Poverty as well as unemployment drove many to fall into the trap of slavery. Both Boys and girls between the age of 18 to 25 were bought even by the French Governors Lenoir and Dumas. Most of them were sent to work in plantations in the French colonies. During the time of Duipleix, the slave trade was widely in existence, slaves were kidnapped and punished severely. They were treated crudely by the French officials. Sometimes slaves were exchanged from French - African colonies to Pondicherry.

Education:

Education is acknowledged to be a vital instrument in socio-cultural and economic development of a country. Education is a powerful agent of change. Indeed it holds the key for Social transformation and national development. There is no precise information about the facilities that were available for education, since then and until the arrival of the French in the seventeenth century. A total revolution took place in the field of education under the French rule. They only sowed the seed for the existing pattern of education in Pondicherry region. The French administrators were interested to



educate the people of Pondicherry for the social intercourse between the French and Pondicherrians. Earlier the education in Pondicherry was given only to the Brahmins. Some of the higher castes had their own schools known as Thinnai Palligal, Where students from other castes were not admitted. After the arrival of the French in the field education the French had a real Mission Civilisatrice. France a country which held aloft the banner of Liberty, Equality and Fraternity could not nothing but open education to all. After the arrival of the French in the 17th century educational institution were established in large numbers with the influence of foreign missionaries.

The effort of foreign missionaries in the field of education became evident from the beginning of the eighteenth century. As early as 1703 A.D., the Jesuits opened a few schools for the children of the settlers. In these schools many students from paris, london, africa, spain and native children were educated. After their schooling, most of the students were sent to France for higher studies through the superior council. In fact the education provided by the Jesuits at Pondicherry gave an intellectual reputation to this region. They started many schools similar to those of France. The educational pattern of the French was divided into four i.e., primary 4 years and under graduate 3 years, thereafter the students had to go to France for higher studies, In fact the French administrators gave much more importance to French education but enrolment in French language was always meagre. During the time of Dupleix, there was no significant development in Educational field because he involved many wars against native as well as British.

Marriages and Festivals:

The Marriage system in pondicherry was followed in the basis of the their religious customs and rituals. Marriages took place only after ensuring the agreement of the horoscopes of the bride and grooms. The system of marriage underwent a series of changes a after the arrival of



the French in India particularly Pondicherry region. The Good old practice was fast disappearing among the educated Hindus. Besides the intermarriage between French and non-french citizen resulted into the extension of French nationality to their spouses and offspring. Festivals were celebrated with joy and feasting. This reveals much about the cultural, historical and religious past of the territory. The Hindus celebrated Deepavali, Pongal, Sivarathiri, Navarathiri and common festivals with great enthusiasm. Car festivals are also celebrated in the temples of Pondicherry by the concerned regional people. The Christians also celebrated many festivals at St.Pauls church. They usually observed Easter Sunday in the month of March or April. The company did not bring in much of new innovation in the field of society. Still the Indian conservatism is dominating the society. There is a curious mixture of western and eastern culture and in cast Pondicherry served and even now serves as a connecting link between these two different cultures.

Food, Dress and Ornaments:

Before the arrival of the French, rice was the staple food of the people, vegetables, fruits, nuts, milk, butter and ghee also formed part of their food. They knew the use of salt and pepper to increase the taste of the food. Except brahmins, most other communities were non-vegetarian. They used to take mutton, chicken fish. Poor people consumed cold rice or kanji in the morning, sonic used to take kamru kuzhu prepared out of ragi on auspicious occasions like amnavasai and kiruthigai food is offered to their god before they began to eat. The occupation of Pondicherry by the French left some permanent foot print even in their food habit. Food item in the afternoon are rice, dhal, ghee, pepper-water and pachadi. Once Dupleix told that the Tamil food was not of worth and he praised the European food items in the following manner. Tamil food is not worth eating, they eat animals food, when the French came to Pondicherry they had the practice of



drinking coffee early in the morning. They took bread, butter, jam followed by the coffee which formed their usual breakfast. This was followed by the people of Pondicherry. People of Pondicherry were very much attracted by the smart French suits. Coats and hats and this was used only on festivals occasions. At the time of all souls days and mahalayaparaksham the Governor of the territory and his officials wore black clothes and the people of Pondicherry also wore such cloths made up of cotton which is known as broad cloth and they wore shoes and shirts. The rich women wore silk sarees probably imported from China. While the poor in Tamil wore Jackets. Women wore with jewels, costly pearls and gems decorated their ears. Some of the jewels commonly used in villages are attikai, jadabillai, mustheepiti and vakkuchitti. The upper class people used neckless, girdles, bangles, earrings and nose screws, attikai a chain made of gold studded fully with stones of red or green color was yet another favorite ornament used by some. All married girls wear tali and metti in their toes occurred in regard to ornaments in the territory of Pondicherry. The native people followed their own customs and manners of wearing the ornaments.

Entertainments

The people spent their evening time and other important festivals with joy and gaiety, through Terukoothu, Kathakalakshepam and Villupattu, some in recreational clubs and others in sports club. There were also some places where cock fighting with bets were arranged. Dramatic and other cultural performances by troops from outside the territory were also organised by local peoples from time to time providing entertainment to the people. After the arrival of French in Pondicherry, the town and the rural areas are recently providing facilities for playing caroms, chess and weight lifting. Pentangue is game unique to Pondicherry brought by the French to India. This is usually played by retired soldiers of the French army, who are settled in Pondicherry. At present it has become a popular



game among the people of pondicherry. The advent of movies and cinema halls in large number came up in the town of pondicherry due to the french occupation. They are frequently visited by individuals, groups or families. During the time of pongal festival and kaman festival the natives used to celebrate with music and dance. Dancing girls and musicians were there to feast own eyes and ears. The Mascared is another form ol popular festival in pondicherry wearing fantastic masks and fancy costumes, revellers go around the streets singing and dancing to the accompaniment of accordin and tambour (drum) pipe and trumpet music on certain festivals.

Thus the French settlement Pondicherry was flourished economically during the Governorship of Dupleix. Anandaranga Pillai in his diaries reveals the fact that slavery and *devadasi* were existed in the society. Moreover the costly ritual namely the marriage ritual was held in the society widely. From the food habits, dress and ornaments we can surmise that they lived in sophisticated life in the society through their economic prosperity and economic wealth.

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A STUDY OF GENDER INEQUALITY IN LITERACY STATUS OF HAORA SADAR SUB-DIVISION, HAORA, WEST BENGAL

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INTRODUCTION

Literacy and education are considered as important indicators of socio-economic development of a region. It acts as a catalyst for social upliftment enhancing development quality of population health, hygiene, environmental degradation control, empowerment of women and weaker sections of the society. Literacy and universal education for all children (6-14 years) are the crucial input for nation building. Our constitution as well as in the successive five year plans have also recognized this and a major number of significant policies and programmes have launched since independence to achieve a sustainable threshold level of literacy. In spite of the various efforts made by the government of India, female literacy rate had been very low in the past. The male-female gap in literacy rate continued to be unacceptably high. Despite progress in female education over the past four decades, the vast majority of women have remained illiterate. The gap between male and female literacy is an important indicator of social discrimination. It is needless to acknowledge that women's literacy is the key to all aspects of development and helps to secure social equality and human development, higher economic productivity and a tolerant democratic society. The narrowing of the gender gap in the literacy rate is the key to a vibrant India.

In India there are striking variation in the literacy rates of males and females. Table.1 shows the male-female literacy gap of India from 1971 to 2011 and it depicts that the gender disparity in literacy rates has reduced with the increase in literacy rates of both males and females.



Though there exists a high variation in micro-level. After more than 60 years of Independence, there are so many areas of rural India where girl child is deprived from basic education as women are viewed as producers of child and their work has been denied of economic valuation.

TABLE:1 GENDER DISPARITY IN LITERACY STATUS OF INDIA

SEXWISE LITERACY RATE FROM 1971-2011				
Year	Literate %	Male	Female	M/F Literacy Gap
1971	34.45	45.96	21.98	23.98
1981	43.57	56.37	29.75	26.62
1991	52.21	64.13	39.29.	24.84
2001	65.38	75.85	54.16	21.69
2011	74.04	82.14	65.46	16.68

Source:Census of India,2011

The West Bengal Human development Report, 2004 reflects the prevalent gender disparity in West Bengal with the Gender Disparity index value of 0.549.Kolkata ranks one with highest GDI value of 0.642 and Malda holds the lowest rank with 0.465 GDI value. Haora district ranks 5th with 0.570 GDI value (HDR,West Bengal,2004). **Haora** is the second largest city of West Bengal and is the headquarters of the district, table II shows in literacy rate ranking o Haora stood 4th in both 2001 and 2011.



Table: II **RANKING OF HAORA DISTRICTS BY LITERACY RATE IN 2001 AND 2011**

DISTRICT	2001			2011		
	Male Literacy (%)	Female Literacy (%)	Male - Female Literacy Gap (%)	Male Literacy (%)	Female Literacy (%)	Male - Female Literacy Gap (%)
Haora	81	73	8	86.95	79.43	7.52

Source: Provisional Census Report, 2011

STUDY AREA

Haora is the second largest city of West Bengal. It is the headquarters of the district, and also the headquarters of the Haora Sadar subdivision of the district. Haora district (22°35'N 88°19'E, 22.59°N 88.31°E). It is located along the west bank of river Hugli, adjacent to Kolkata and it is very important as far as industries are concerned, because there are various heavy and light engineering industries in the district. Table 3, shows that in 10 years (from 2001 to 2011) the gender gap between male-female literacy has come down to 7.52 from 8. Two sub-division of the districts are Haora Sadar and Uluberia. For the present paper, Haora Sadar sub-division has been selected for study area (Fig:1) as it includes two important urban units as Haora Municipal Corporation and Bally Municipality and five other blocks which have a substantial rural part, therefore chances of male-female literacy variation as well as urban-rural literacy differences might be obtained.

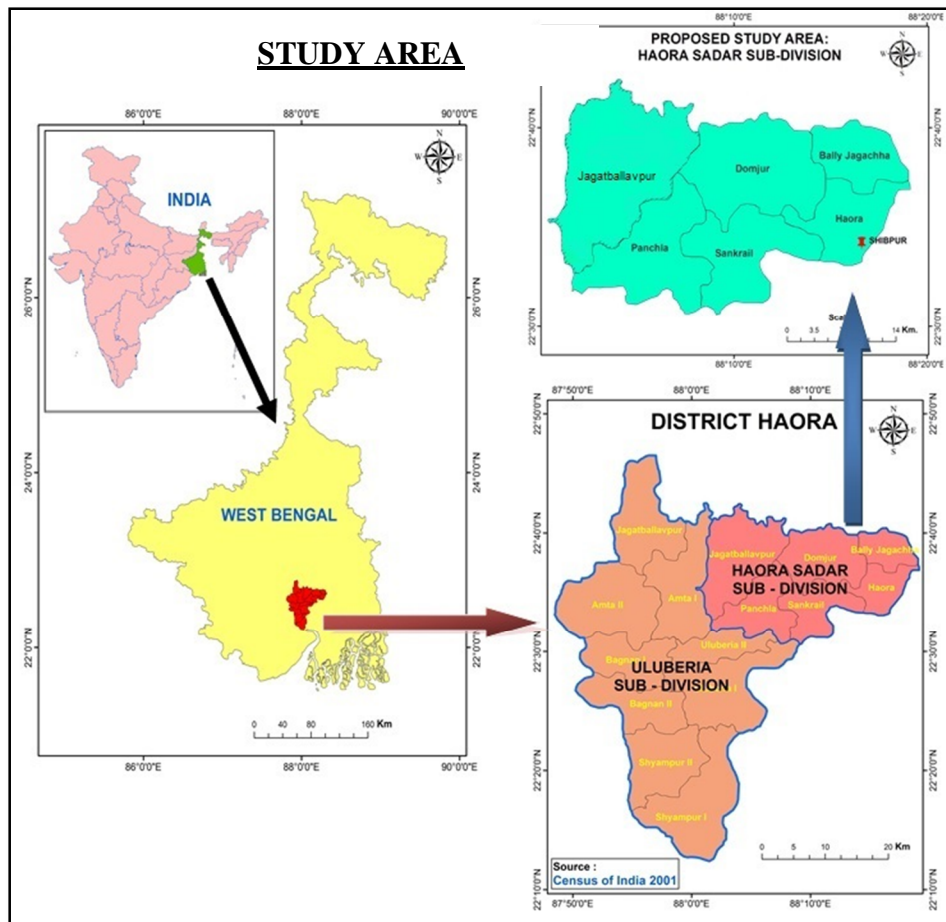


FIGURE: 1 STUDY AREA

OBJECTIVES:

The present paper aims to attempt to analyze the status and gender gap of literacy rate in Haora Sadar Sub-Division of district Haora in West Bengal. The paper was pursued with the following objectives:

1. To find out the micro-regional (block) variations among male female in total literacy rate in study area.



2. To investigate disparity and level of gender gap the total literacy rate.
3. To analyze the causes of gender disparity in literacy rates.

DATABASE AND METHODOLOGY:

The present paper intends to analyze gender gap in literacy in Haora district of West Bengal entirely based on secondary sources of data collected from District Census Hand Book, (2001 and 2011), District Statistical Handbooks, Primary Census Abstract of Haora, West Bengal. To achieve the objectives mentioned above the relevant method of quantitative analysis has been employed. To measure male- female literacy, the following three methods have taken.

1. The first one is in percentage terms. The formula is-

$$\text{Male-Female gap in Literacy (\%)} = \text{Male Literacy Rate (\%)} - \text{Female Literacy Rate (\%)}$$

2. The Second order analysis is based on an Index called Disparity Index as proposed by David V. Sopher in 1974. Here the modified Sopher's Index formula is used-

Disparity Index (DI) = $\log(x_2/\log x_1) + \log(200 - x_1/200 - x_2)$ where $x_2 > x_1$, (x_1 = Female Literacy Rate, x_2 = Male Literacy Rate)

2. The third one is Z-score, a statistical measurement of a score's relationship to find out the mean in a group of scores. A Z-score of 0 means the score is the same as the mean. A Z-score can also be positive or negative, indicating whether it is above or below the mean and by how many standard deviations.

$$Z \text{ Score} = (X - \bar{X}) / S$$

Where S = Standard Deviation of a sample (Standard Deviation of Male-Female literacy disparity gap)



\bar{X} = Mean of all values in the data set (Mean of Male-Female literacy disparity gap)

X = each value in the data set (Individual Male-Female literacy disparity gap)

RESULTS:

Table: III Comparison of % of Male-Female Literacy Gap of Haora Sadar, Haora District in 2001 and 2011

Table: III Comparison of % of Male-Female Literacy Gap of Haora Sadar, Haora District in 2001 and 2011

Name of Blocks/Municipalities	M-F GAP in %,2001	M-F GAP in %,2011
Jagatballavpur	15.7	8.29
Domjur	11.1	5.15
Bally Jagachha	14.5	6.35
Sankrail,	11.9	6.22
Panchla	15.7	7.09
Bally (M)	8.4	5.57
Haora (M Corp)	7.8	4.59

Computed by author

Table :III reflect that the male female literacy gap reduces in all the 5 blocks and 2 towns from 2001 to 2011. On the basis of Sophers Index calculation Table IV is given which reflects the male female literacy disparity in the various blocks and towns of the area of study concerned.



Table: IV Male -female Disparity Index by Sopher's Index, Haora Sadar Sub-division, 2011

SL. NO.	Level	Name of Blocks/Municipalities	SOPHER'S INDEX
1	<i>SUB-DISTRICT</i>	Jagatballavpur	<i>0.07925</i>
2	<i>SUB-DISTRICT</i>	Domjur	<i>0.04853</i>
3	<i>SUB-DISTRICT</i>	Bally Jagachha,	0.05773
4	<i>SUB-DISTRICT</i>	Sankrail	0.05798
5	<i>SUB-DISTRICT</i>	Panchla	0.06826
6	<i>TOWN</i>	Bally (M)	0.05061
7	<i>TOWN</i>	Haora (M Corp)	0.04144

Computed by author

Table IV exhibits that male-female literacy inequality in the blocks and towns of the study region ranges between the value of 0.04 to 0.07. On the basis of calculated score the study region has been divided into 3 types of inequality zone (Table :V)- high, medium and low type of inequality.

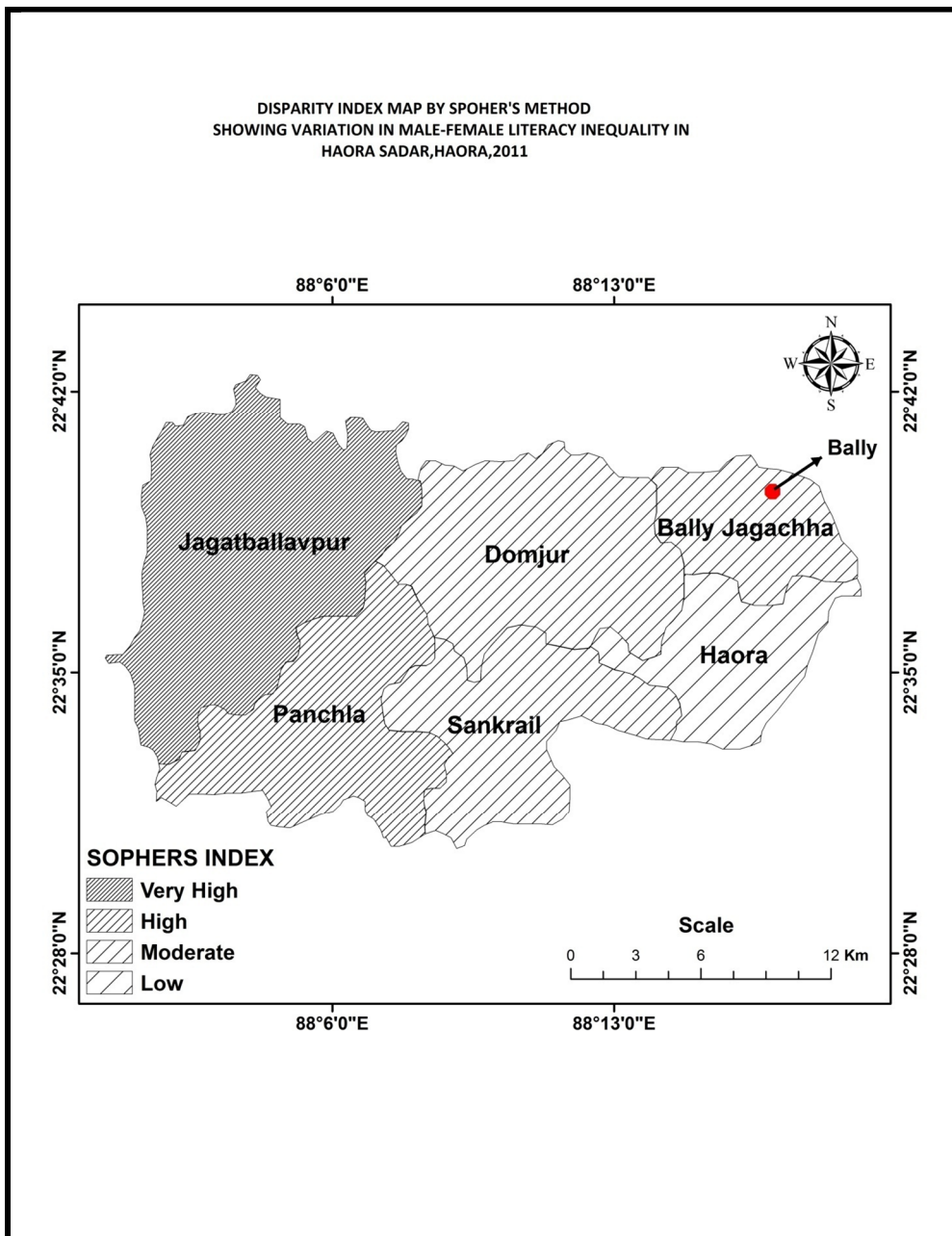


FIGURE:2 SOPHER'S INDEX MAP.HAORA SADAR,2011



Table:V: Range of Inequality on the basis of Sopher's Index

SL. NO.	Type of Inequality	Range of Inequality	Name of Blocks/Municipalities
1	High	>0.075	<i>Jagatballavpur</i>
2	moderate	0.045 to 0.060	<i>Domjur, bally Jagachha, Sankrail, Bally (M)</i>
3	low	<0.045	<i>Haora (M Corp)</i>

It is found that highest inequality is found in Jagatballavpur (0.07%) and lowest in Haora(M.C).

Table:VI BLOCK WISE MALE-FEMALE LITERACY INEQUALITY ON THE BASIS OF Z-SCORE ,2011

Level	Name	Male-Female Gap	Z SCORE
SUB-DISTRICT	Jagatballavpur	8.29236	1.83426
SUB-DISTRICT	Domjur	5.15512	-0.8973
SUB-DISTRICT	Bally Jagachha	6.35908	0.15094
SUB-DISTRICT	Sankrail,	6.22258	0.0321
SUB-DISTRICT	Panchla	7.09173	0.78887
TOWN	Bally (M)	5.57926	-0.528
TOWN	Haora(M.Corp)	4.59996	-1.3807

Computed by author

It has been found that a vast inequality in literacy exist in Haora Sadar. On the basis of the calculated Z-score ,to find out distribution of concentration of inequality Haora is divided into the six regions as follows-

FIGURE:3 MALE-FEMALE LITERACY DISPARITY MAP BASED ON Z SC

MALE-FEMALE LITERACY DISPARITY MAP BASED ON Z-SCORE SHOWING CONCENTRATION OF INEQUALITY, HAORA SADAR, 2011

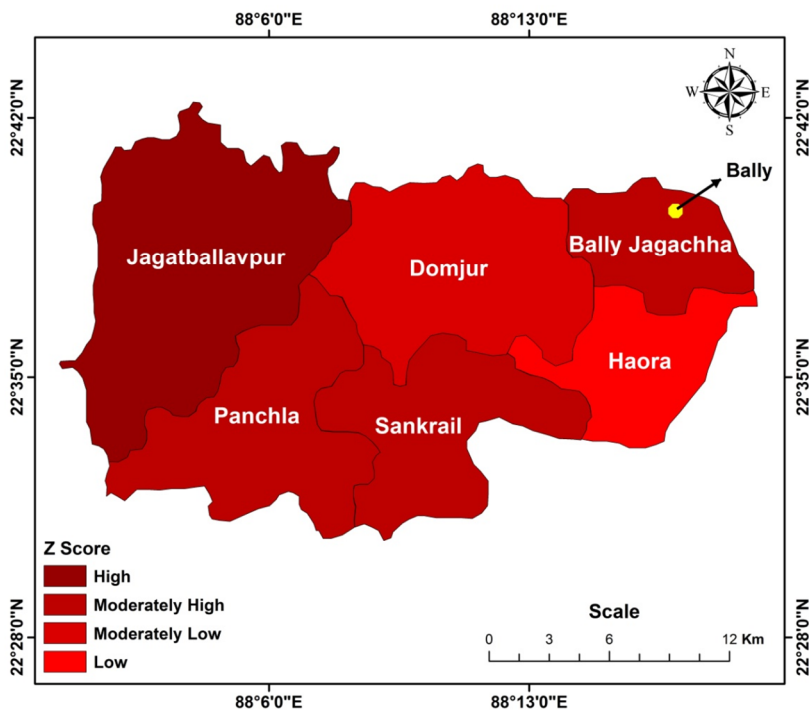




TABLE: 6 INEQUALITY REGIONS

Type	Z-score Value	Blocks of Inequality in Male Female Literacy Rate
		-
High	+2 to +1	Jagatballavpur
Moderately High	+1 to 0	Bally Jagachha, Sankrail, Panchla
Moderately Low	0 to -1	Domjur, Bally (M)
Low	-1 to -2	Haora (M Corp)

Table-VI shows that gender disparity in literacy rate is divided into classes of low, moderately low, moderately high and high. Jagatballavpur belongs to high inequality class as it also reflects highest gender gap (Table III). In Bally-Jagachha, Sankrail, Panchla the inequality is moderately high and in Domjur and Bally Municipality, gender disparity is moderately low. The lowest inequality occurs in Haora (M.C). The Haora (M.C) and Bally Municipality are urban area, thus having better education facility which ultimately resulted in higher literacy rate.

Discussion

Gender inequality in literacy is very high in JagatBallavpur block (98% rural population) and moderately high in Bally-Jagachha, Sankrail, Panchla. The gap between male and female literacy is a sensitive indicator of social discrimination. The gender gap in education occurs when there are systematic differences in schooling levels between men and women. In all the sub units of the study area, unemployment, disguise employment, poverty, lack of educational facilities, stubborn



social norms of caste and outlook of patriarchy, deep rooted conservative mind sets and social irrational prejudices makes low enrolment of girlchild . Early age of marriage, religious strictures, deep rooted conservative mind sets and social irrational prejudices, acute poverty abstain girl child to enroll from the formal education system. Sudden discontinuation and low retention in higher level of education of female are another cause of disparity. Whenever a family faces economical problem, to escape this the main thrust of the solution is given on the girl child ,either to marry her or to get rid her to engage any domestic or monetary work (as maids in towns, jari worker, etc)by stopping her education in order to sustain the easy solution of survival of the family. The most needed priority is to ensure access to global and national achievements and to improve the quality of learning of the women community. With increasing female literacy and education women understand the aim of a good life and become aware about the standard of living, literate women have the ability to engage themselves in productive works, they can supplement the family income, take part in decision making process and can strongly fight against the evils of the society.

In India, male literacy is higher than female literacy. The male-female gap in literacy rate continued to be unacceptably high. Despite progress in female education over the past four decades, the vast majority of women have remained illiterate. The National Policy of Education, 1986 has laid down that gender discrimination. In our society, a male child is always much more desired to the majority of the people as they will take forward the legacy where as the girl child is much more liabilities to the family .So this biased mindset is the main constraint in expansion of education among women. In West Bengal, the rate of infancy marriage is higher, 65% of the women less than 18 years have attained early marriage. Oppression on women, dowry system, early motherhood, ill health due to malnutrition still exists in the society.



Social and religious outlooks compel a girl child to discontinue their education for early marriage. Though the outlook are changing in very slow manner due to the administrative steps. Many girls of the villages disagree to get married in early age. According to Indian social tradition girl child has to perform several domestic chores. The mindset transformation of the parents particularly for first generation learner has become a tough task as the rigid confirmation of girls' accepted status is firmly embedded in an domestic system. Though after The Mid – Day Meals Scheme was launched in 1995, to boost the lower secondary and universalization of primary education by impacting upon attendance, retention and nutritional needs of children has improved the attendance of girlchild in primary level. Massive educational deprivation of the girl child is a reality.

There is an undoubtedly significant difference exists between male and female literacy rate in in Haora Sadar Sub-division. It has been seen that though gender disparity gap in literacy in Haora Sadar Sub-division has been reduced from 2001 to 2011 in the study area (Table:III) significantly but yet it exists in all the seven units of the study area. Highest gap is found to occur in Jagatballavpur (8.29%) and lowest in Haora Municipal Corporation.

In the urban units of the study region, where urban population is much higher namely Haora Municipal Corporation, Bally Municipality, Domjur , it has been found that gender gap in literacy is lesser. In urban areas perception and awareness of female towards education as well as education institution are much more than rural belt of the study area. But in Bally-Jagachha , though the urban population(92%) holds the majority of population, here the Z-Score value is moderately high ,which indicates moderately high concentration of inequality.

Gender inequality in literacy is very high in JagatBallavpur block(98% rural population) and moderately high in Bally-Jagachha, Sankarail,



Panchla. In all these blocks, unemployment, disguise employment, poverty, lack of educational facilities, stubborn social norms of caste and outlook of patriarchy, deep rooted conservative mind sets and social irrational prejudices makes low enrolment of girlchild . Early age of marriage, religious strictures, deep rooted conservative mind sets and social irrational prejudices, acute poverty abstain girl child to enroll from the formal education system. Sudden discontinuation and low retention in higher level of education of female are another cause of disparity. Whenever a family faces economical problem, to escape this the main thrust of the solution is given on the girl child ,either to marry her or to get rid her to engage any domestic or monetary work (as maids in towns, jari worker, etc)by stopping her education in order to sustain the easy solution of survival of the family.

In our society, a male child is always much more desired to the majority of the people as they will take forward the legacy where as the girl child is much more liabilities to the family .So this biased mindset is the main constraint in expansion of education among women. In West Bengal, the rate of infancy marriage is higher, 65% of the women less than 18 years have attained early marriage. Oppression on women, dowry system, early motherhood, ill health due to malnutrition still exist in the society. Social and religious outlooks compel a girl child to discontinue their education for early marriage. However, the outlooks are changing in very slow manner due to the administrative steps. For e.g,West Bengal Government introduced “Kanyasree Project” in 2013 in the intention to enhance the educational status amongst the girl children belonging to the age group of 13 years to 18 years and 18 years to 19 years. Many girls of the villages disagree to get married in early age. According to Indian social tradition girl child has to perform several domestic chores. The mindset transformation of the parents particularly for first generation learner has become a tough task as the rigid confirmation of girls’ accepted status is firmly embedded in an



domestic system. Though after The Mid – Day Meals Scheme was launched in 1995, to boost the lower secondary and universalisation of primary education by impacting upon attendance, retention and nutritional needs of children has improved the attendance of girlchild in primary level. Massive educational deprivation of the girl child is a reality.

Conclusion: The study reflects that inequality is highly pronounced in different blocks/Municipalities of Haora Sadar Sub-division. The gap between male and female literacy is a sensitive indicator of social discrimination. .To fulfills the existing gap in gender literacy in study region proper educational opportunities should be provide for women especially at the village level. Creation of an environment where women demand knowledge and information, empowering themselves to change their lives is the need of the day. Literacy alters perception, generates awareness and builds personality of an individual. Literacy particularly female literacy, play an important role in the social advancement and economic development a region. A time frame should be set to eliminate the existing gap between girls and boys, by firstly ensuring universal and equal access to and completion of primary education by all girls. It is needless to acknowledge that women's literacy and educational levels help secure social equality and human development, higher economic productivity and a tolerant democratic society. Proper planning of budgetary support from the Central and the State Government towards primary and secondary education, ensuring a synergistic partnership between formal and non-formal education, promoting public dialogue on the awareness of girls' education and women empowerment, providing equal educational opportunity to women and girls belonging to backward, ethnic and poorest section of the society are need of the hour. If women are not guaranteed and provided their right to education the milestone for women's development will be hampered. Therefore, women education should be



visualized as a prime goal of National Development, enabling women to respond to challenges to secure better lives for them and for their children. These realities cannot be isolated from the planning and implementation of educational policies. The success of all these aims requires universalisation of education promoting gender-sensitive rather than gender-blind policies and attitudes.

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OPTIMIZATION OF ANGULAR DISTORTION OF TIG WELDING JOINT OF MILD STEEL AND STAINLESS STEEL

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Introduction

Welding is used extensively in the fabrication of many structures, buildings, ships, pressure vessels etc., due to many advantages it has, over the other fabrication processes. However, distortion is a problem encountered during welding. The presence of distortion in weldments poses problems in further assembly and in aesthetics. Correcting unacceptable distortion is often costly and in some cases may induce cracking, when improper methods are followed. It is better to control the distortion during welding, through adoption of proper techniques and procedures.

The development of proper techniques for reducing and controlling distortion calls for fundamental knowledge on residual stresses, distortion and other factors, which influence them. While welding joins the components of a structure together, the complex thermal cycles from welding result in formation of residual stresses in the joint region and distortion of the welded structure. Both weld residual stress and distortion can significantly impair the performance and reliability of the welded structures. Distortion in a weld results from the expansion and contraction of the weld metal and adjacent base metal during the heating and cooling cycle of the welding process. During this heating and cooling cycle, many factors affect shrinkage of the metal and lead to distortion.

For example, as the temperature of the weld area increases, yield strength, elasticity, and thermal conductivity of the steel plate decreases, while thermal expansion and specific heat increases (Figure 1). These changes, in turn, affect heat flow and uniformity of heat distribution. To understand how and why distortion occurs during heating and cooling of a metal, consider the bar of steel shown in Figure 2. As the bar is uniformly heated, it expands in all directions. As the metal cools to room temperature it contracts uniformly to its original dimensions. It occurs only when there is no restriction on the bar i.e. it is free to expand and contract.

But if the steel bar is restrained - as in a vise - while it is heated, as shown in Figure 2(b), lateral expansion cannot take place. But, since volume expansion must occur during the heating, the bar expands in a vertical direction (in thickness) and becomes thicker.

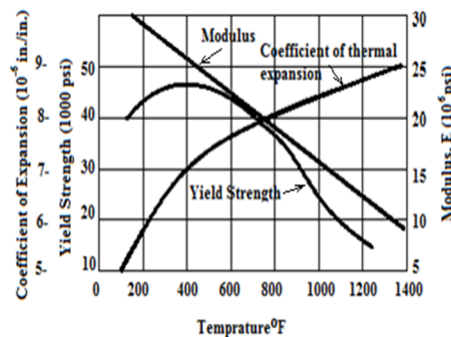


Figure 1: Effect on the properties of steel with increase in temperature.

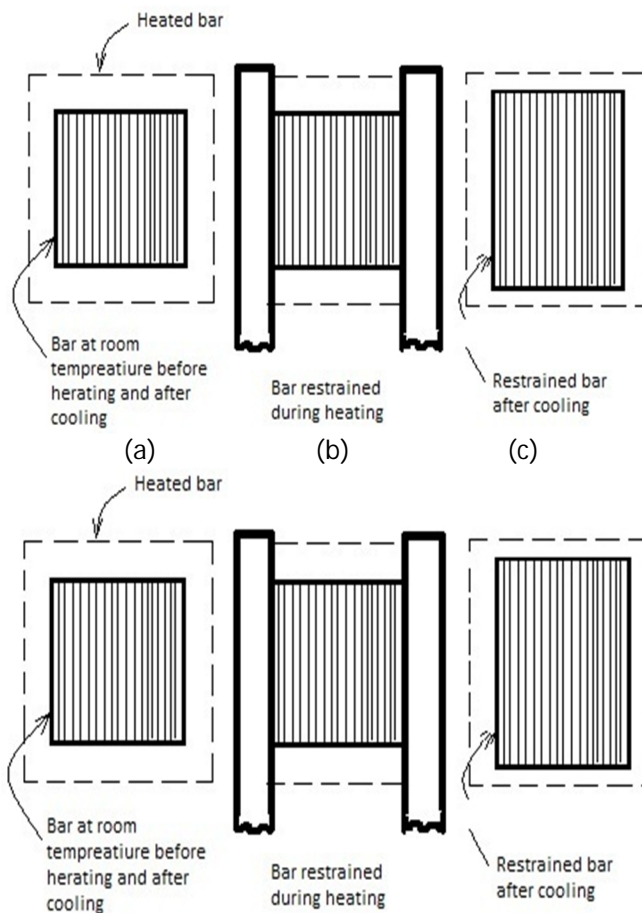


Figure 2: Reason for distortion.



As the deformed bar returns to room temperature, it will still tend to contract uniformly in all directions, as in Figure 2(c). The bar is now shorter, but thicker. It has been permanently deformed, or distorted. (For simplification, the sketches show this distortion occurring in thickness only. But in reality, length is similarly affected.)

Thermal distortion occurs when a process generates thermal gradients resulting in strains, due to non-uniform expansion or contraction that exceed the local yield point of the material. During the rapid heating cycle of a fusion welding process, material in the vicinity of the weld heats, expands in all directions and is compressed by the constraints of the much larger and cooler surrounding structure. The heated volume has a lower yield point than the cooler surrounding structure and is more readily upset to a smaller dimension, i.e. the heated volume yields in compression.

On cooling, the weld deposit & the heated volume of the adjacent parent material contracts in all directions, creating tensile strains that are constrained by the attached cool structures that did not reach a yield point strain during the entire heating and cooling process.

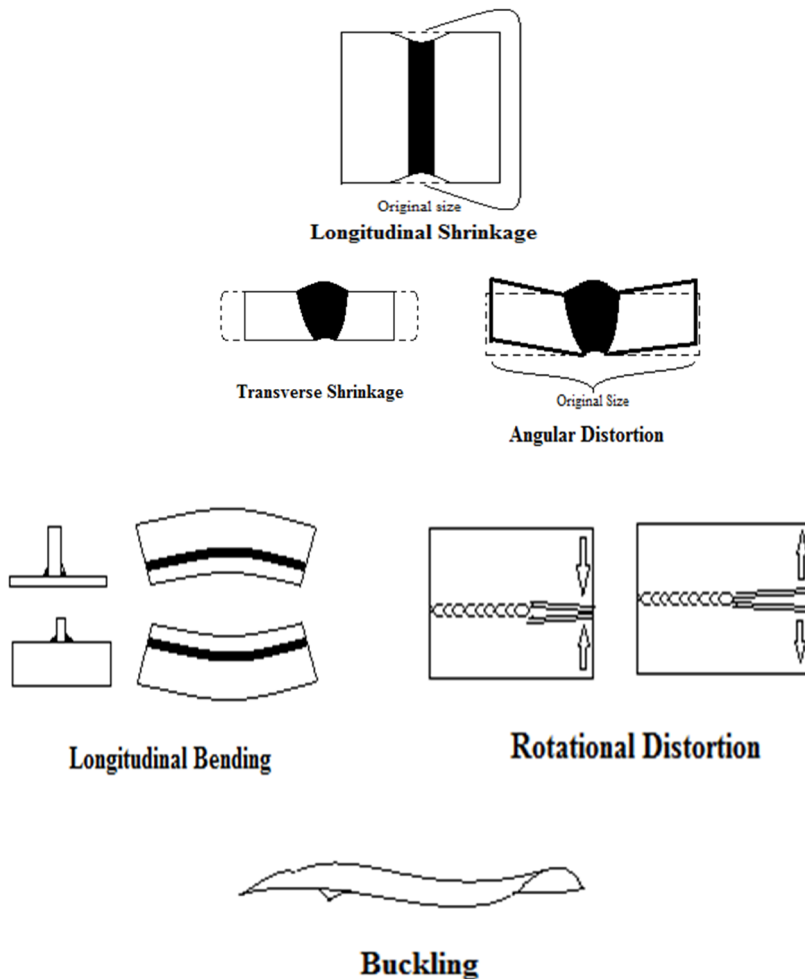
This localized contraction results in buckling, localized tensile yielding, or development of residual stress. On thinner members localized buckling will occur. On thicker members less localized distortion is evident; however residual stresses tend to be higher.

Distortion and residual stress are two undesirable after-effects associated with welding. Often these imperfections affect the desired performance of the component. Excessive distortion that manifests as deviation from design dimensions and shape of the component, problems in the alignment of subassemblies, machining and buckling strength of component besides the aesthetic appearances of the component. Residual stresses are complimentary to distortion, have adverse effects on the fatigue strength and dimensional stability etc.

Types of Distortion

Nature of the shrinkage force generated in the weld metal regions, governs the type of distortion experienced in by the component. The rapidly cooling weld metal creates shrinkage forces in all three directions viz. longitudinal, transverse and thickness direction and these shrinkage forces produce deformations in the longitudinal, transverse and thickness directions. The six types of distortions can be categorized as:

- Longitudinal shrinkage
- Transverse shrinkage
- Angular distortion
- Longitudinal bending or bowing
- Rotational distortion
- Buckling



Factors Affecting angular distortion

If a metal is uniformly heated and cooled, there would be almost no distortion. However, because the material is locally heated and restrained by the surrounding cold metal, stresses are generated higher than the material yield stress causing permanent distortion. The principal factors affecting the type and degree of distortion are:

- Parent material properties
- Amount of restraint
- Joint design
- Edge preparation and Part fit-up
- Welding procedure



1. Parent Material properties

Parent material properties which influence distortion are Coefficient of thermal expansion (α), thermal conductivity (k), Yield strength (σ_y), modulus of elasticity (E) and specific heat per unit volume. These properties of the material plays a significant role in determining the stresses generated during welding and hence, the degree of distortion.

Coefficient of thermal expansion

It is a measure of expansion and contraction. The higher the coefficient of thermal expansion of a material, the greater the distortion is likely to be, for example, as stainless steel has a higher coefficient of expansion than plain carbon steel, it is more likely to suffer from distortion.

Thermal conductivity

It indicates how readily the heat will spread through the material. Low thermal conductivity leads to high thermal gradients, and high thermal gradients lead to high distortion because distortion depends upon internal or external restraints. Thus the distortion increases with the increase in thermal gradient.

Yield Strength

The higher the yield strength of the material, the greater the residual stresses available for causing distortion. Thus a material with greater Yield strength is more prone to distortion.

Modulus of Elasticity

The modulus of elasticity is a measure of stiffness of a material so that higher the modulus the more it will resist distortion. Thus a material with greater modulus of elasticity is less prone to distortion.

2. Restraint

If a component is welded without any external restraint, it distorts to relieve the welding stresses. So, methods of restraint, such as 'strong-backs' in butt welds, can prevent movement and reduce distortion. As restraint produces higher levels of residual stress in the material, there is a greater risk of cracking in weld metal and HAZ especially in crack-sensitive materials.

3. Joint Design

Both butt and fillet joints are prone to distortion. It can be minimized in butt joints by adopting a joint type which balances the thermal stresses through the plate thickness. For example, a double-sided weld in preference to a single-sided weld has less distortion. Double-sided fillet welds should eliminate angular distortion of the upstanding member, especially if the two welds are deposited at the same time.

4. Edge preparation and Part fit-up

Edge preparation and Part Fit-up should be such as to require the minimum amount of weld metal and should be uniform to produce predictable and consistent shrinkage. Excessive joint gap can also increase the degree of



distortion by increasing the amount of weld metal needed to fill the joint. Close fit-up reduces the amount of weld metal and hence weld metal shrinkage. The joints should be adequately tacked to prevent relative movement between the parts during welding. Thus the welder should have adequate knowledge about them in order to control the distortion.

5. Welding Procedure

The factors determining the deformation of a structure during welding are partly of a technological and partly of a constructional nature. A suitable welding procedure is usually determined by productivity and quality requirements rather than the need to control distortion this influences the degree of distortion mainly through its effect on the heat input. As welding procedure is usually selected for reasons of quality and productivity, the welder has limited scope for reducing distortion. As a general rule, weld volume should be kept to a minimum. Also, the welding sequence and technique should aim to balance the thermally induced stresses around the neutral axis of the component.

Distortion Control

In general, three basic rules are followed to minimize distortion.

Rule 1 - Reduce the effective shrinking force:

Effective shrinkage force can be reduced by following methods:

Do not over weld

The use of excessive weld metal over and above that needed to meet the service requirements of the weld is not only wasteful but increases distortion. Ensure proper edge preparation and fit up. This will allow the minimum amount of weld metal to produce a strong joint and will result in saving of the electrode metal.

Use few passes

The use of many small passes increases lateral distortion. Use of fewer passes with a large diameter electrode minimizes lateral distortion. Large diameter electrode can fill the joint gap in less number of passes in comparison.

Place welds near the neutral axis of the device

This concept along with proper sequencing can significantly reduce unwanted distortion. The objective is to make the shrinkage forces exert their influence against each other in order to balance out. In most cases the forces created by shrinking weld metal will act thru the central axis as a fulcrum. The figure 3 shows this effect. The left side of the piece is welded which causes the shrinking force as shown by the arrows. The left side is placed under tension and stretches so that the un welded side becomes the long side and the welded side becomes the short side. In the example on the right the forces of the two welds balance out and the assembly remains straight. Keep in mind however that the overall length will be slightly reduced.

This minimizes the effective shrinkage force since the weld does not have sufficient leverage to pull the plates out of alignment.

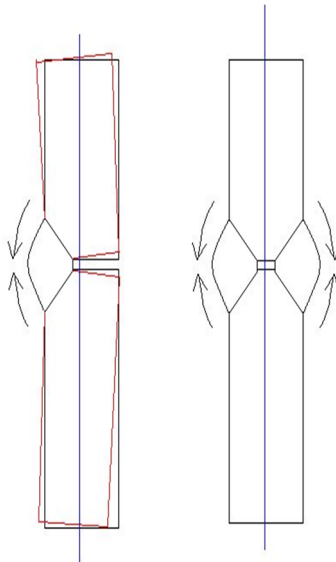


Figure 3: Welds near the neutral axis

Use intermittent welds

Intermittent welds showed better results when compared to the continuous welds. This also reduces the amount of weld metal and can result in significant cost savings as well as minimizing distortion.

Welding Sequence

The direction and sequence of welding is important in distortion control. Generally welds are made in the direction of free ends. For longer welds, back-step welding or skip welding is used.

Rule 2 - Make shrinkage forces work to minimize distortion:

Locate parts out of position.

Pre-setting the parts such that the contracting weld metal pulls them into proper alignment when the weld metal cools is a common way of using the shrinkage of the weld metal as an advantage. The metal pieces to be welded are placed out of their position, such that on cooling, the contraction of weld metal pulls them into their position. For this to be done, the welder must know the correct pre-setting angle and hence demands for a skilled welder and a method to find out the pre-setting angle.

Space the parts to allow for shrinkage.

Calculation backed up by experiments will indicate how much space needs to be left for parts to shrink into correct alignment when the weld cools. Pre-bending components may be appropriate so that the contracting weld metal straightens them as it cools.

Rule 3 - Balance shrinkage forces with other forces / with another:

This can often be achieved by adhering to a welding sequence, which places weld metal at different points around the structure so that the shrinkage of



one weld counteracts the distortion caused by a previous weld. Peening the weld bead as it cools stretches the weld, thus counteracting its tendency to contract and shrink as it cools. Use jigs and fixtures - the most common method of distortion control, it relies on clamping the work firmly so that the weld is forced to stretch as it cools.

Preventing Distortion by Fabrication Techniques

Workshop personnel have control over a number of activities as follows:

1. Precision in Marking out and Cutting

Modern shipyards are utilizing CAD/CAM in their laser and plasma cutting operations. The same equipment is now increasingly used for component identification and marking out. Marking out for subsequent assembly as part of the CAD/CAM cutting process minimizes subsequent requirements for marking out, greatly reduces errors in marking out and improves assembly times. This enables:

High accuracy in cutting leading to good fit up in the fabrication shop, leading to less minor corrections and accompanying distortion. Identification of parts and marking out of cut pieces using dot matrix, laser or plasma systems. This leads to greatly enhanced traceability of parts, enhanced precision of assembly, minimizing errors and rework.

2. Precision in Assembly

Precision in assembly is dependent on accuracy of design, accuracy of cut parts, accuracy of marked assembly lines and last but not least the skills of the assembler.

3. Tack welding

Tack welding plays a critical role in firstly holding the assembled structure together ready for welding and secondly in maintaining correct root gaps in butt welds and preventing movement in the structure as welding progresses.

The number of tack welds, the length tack welds and the distance between them will depend on the length and thickness of the weld, the degree of rigidity needed, the details of the weld preparation and the welding process being used. The tacking sequence can also have an effect and may need to be controlled to ensure correct root gaps are maintained along the length of a joint.

4.Pre-setting

Where a known amount of angular distortion will occur, presetting the joint by the amount of angular distortion expected ensures the alignment of the finished weld. This method can be very effective if consistent shrinkage rates are achieved through close control of welding procedures.

5. Jigs and Fixtures

Jigs and fixtures can be used for assembly and welding of subassemblies where the components are held rigidly until welded. This approach works well for production of multiple smaller sub-assemblies.



Mechanical Techniques

The following techniques rely on applying a force to change the shape of a component to correct the distortion produced by welding.

a) Hammering and Peening

This is a simple, cheap and sometimes effective method of correcting minor distortions. Hammering has limited application because it can lead to local surface damage and work hardening.

Peening of welds is an effective means of countering distortion due to weld metal shrinkage. Peening is carried out progressively as each weld or layer of weld is deposited in a multi-layer welds. The surface of the weld is spread out to reduce the tensile shrinkage stresses across and along the joint.

Peening must be done carefully to avoid introduction of undesirable features on the peened surface and is not allowed by some fabrication codes.

b) Pressing

Hydraulic presses can be used to correct distortion in the form of bowing and angular distortion. This approach is limited by the size of press available and the size and complexity of the component. Distortion can be corrected progressively, and with care there will be minimal damage to component surfaces.

Thermal Techniques

Thermal techniques are based on creating compressive yielding at locally heated sites, which then provide a tensile stress to "shorten" the heated zone. The part to be shortened is rapidly heated to generate a temperature gradient with thermal strain sufficient to cause compressive yielding as it expands against the surrounding cold, higher yield strength metal. When the heated area cools down, the part that underwent compressive yielding contracts to a smaller size than before it was heated.

Process Parameters affecting angular distortion

Various process parameters are to be controlled while performing welding. The angular distortion in welded parts is also affected by some of these process parameters. Many parameters have significant effect on a particular type of distortion. Hence, to control the angular distortion they need to be studied.

The process input parameters which affect the angular distortion in welding are:

- No of layers on the weld
- Welding speed
- Welding current
- Arc voltage
- Large size electrode
- Joint gap
- Electrode diameter
- Rate of cooling
- Time gap between successive passes.



- Quality of the parent material and electrode.
- Length of work piece

Literature Survey

A review of parameters optimization of TIG welding joint for dissimilar metals has been reported in the literature. The literature review has been taken from books, research papers and articles related to parameters optimization of TIG welding joint for dissimilar metals. The review is based upon extensive research in the academic literature. The proposed method specifically accommodate for parameters optimization of TIG welding joint for dissimilar metals.

Review of the Existing Literature

To identify the new field of research work, and to know the state-of-the-art, extensive literature is collected in all the diverse fields of parameters optimization of TIG welding joint of dissimilar materials. To understand and interpret the previous work on different aspects related to the formulation of the present research problem, the literature available in various sub areas of parameters optimization of TIG welding joint, selection of materials, no. of levels, quality characteristics and other specific literature are alone considered. An effort is made to review the literature based on definite broad objectives as well as identified literature features related to proposed work.

The literature has not been exhaustive owing to the non availability of all the journals and books related the research problem, and therefore, is only an indicative sample; nevertheless, it supports the development of the methodology for parameters optimization of TIG welding joint of dissimilar materials. The following few sections discuss only the major influential articles in various categories which are very important to the basic formulation of the problem selected for the present research work.

Search Methodology

The source used for our study consisted of scientific refereed journals (International and National), textbooks etc. Publications in language other than English and non-refereed professional publications were not included. Some of the search key used are TIG welding, TIG welding parameters, Taguchi Technique for design of experiment etc. The literature studied is presented as:

[1] Padal and Kumar (2014) developed a method for controlling welding distortion in Hatch Cover Girders due to fillet welds. They performed FAIRING (triangular heating and triangular cooling) after the weld process to reduces linear and angular distortion. It was consequently found that the opposite linear and angular distortion is produced due to the result of two main effects: triangular heating effect on one side and triangular cooling effect on other side.

[2] Rudzey (2014) investigated the effect of various defects of welded joints on the fatigue resistance of welded joints and concluded that weld defects of the



first category (pores, chains and clusters of pores, tungsten inclusions) in the range of $\sigma_{max} \frac{1}{4}$ 50–150 MPa had no significant effect on the fatigue strength of welded joints and the welded joints in the 6-mm sheets of the AMg6 and 1201T1 alloys, produced in one or two passes by automatic helium-shielded arc welding, showed similar values of fatigue endurance in the tests in the working stress range.

[3] Mallikarjuna et al. (2014) carried out experimental studies on welding distortion on commercial mild steel plates with varying electrode stick-out in controlled manner using standard Submerged Arc Welding equipment and recorded the results. From the results it was concluded that as electrode stickout increases, there will be a gradual decrease in distortion. It is also concluded that as electrode stick-out increases, the deposition rate is high and it was concluded that there will be a very less or negligible variation of longitudinal and transverse shrinkage during the process.

[4] Sorkhabi & Rafei (2013) worked on optimization of process parameters using genetic algorithm to reduce the transverse distortion in 304 L stainless steel butt welded plates. They investigated the effects of V shape angles and thickness of plates on the transverse distortion under temperature dependent of thermal coefficient condition. The results obtained from the finite element analysis in different models were used to produce the collection of data which were optimized using the genetic algorithm. Finite element results show that by increasing plate thickness, the transverse distortion has increased and by increasing V shape angle, this kind of distortion increased.

[5] Lidam et al. (2013) analyzed the capability of the multipass welding advisor (MWA) in analyzing the angular distortion induced by gas metal arc welding (GMAW) process used to join a combination of butt and T-joint. The MWA is applied to develop and compare 2D/3D finite element analysis (FEA) based on the thermal elastic-plastic approach with low manganese carbon steel as parent and weld material. They conducted experiments on low carbon steel and used both-sided clamping method to validate the simulation results. It was found that the results of 3D simulation and experiments showed acceptable accuracy, while 2D results offers a fast solution analysis time in estimating distortion trend.

[6] Tamrin et al. (2013) observed that the joint strength can also be influenced by factors such as bubbles morphology, material preparation/treatment, depth of molten pool and formation of chemical bonds, and intermetallic phases and their effects are also reviewed and discussed. It was found that two materials having approximately similar thermal expansion coefficients can be easily joined. To compensate for physical and chemical mismatch between dissimilar materials, employment of intermediate layers was found useful.

[7] Reddy & Swamy (2013) analyzed the transverse shrinkages which is an important factor in point of view of performance of welded joints. During the experimental analysis of transverse shrinkage in single and double V-groove



butt welded joints, groove angle was varied and heat input was kept constant in CO₂ Arc Welding process. It is observed that, the maximum transverse shrinkage increases with increase in the included angle.

[8] Bhanupratap et al. (2012) analyzed distortions in the welded joints due to the heat input by varying current for different butt joints keeping other parameters like arc voltage, welding speed and electrode extension constant using Submerged Arc Welding process. The different butt joints used in this process are Single V-groove butt joints, Bevel groove butt joints and double groove butt joints.

It is also seen that as heat input increases angular distortion increases in single V-groove, bevel groove and double V-groove butt welded joints. For same heat input angular distortion is maximum in bevel groove welded joints when compared to the single V-groove and double V-groove welded joints and minimum for double V-groove welded joint.

[9] Sasabe (2012), investigated the weld ability of Al-Cu series alloy 2219 with MIG process in comparison with that of Al-Cu-Mg series alloy 2024. It was found that 2219 is superior to 2024 in weld cracking sensitivity, and as for the combination with filler metal, the decrease in Mg content in weld metal causes crack resistance to increase. They observed that welded joints were fractured in weld metal even with reinforcement during tensile testing, so the intensification of weld metal is directly connected to the improvement in joint strength and fractured mode.

[10] Chenbin et al. (2012) investigated the effect of welding speed on microstructures and mechanical properties in high speed welding, low power laser-tungsten inert gas (laser-TIG) hybrid welding process is proposed on AZ61 magnesium alloy. Defect-free welds are produced. It is found that welding speed has a significant influence on microstructures and mechanical properties of the joints. Results indicate that with rapid increasing of welding speed, both the liner energy and average grain size decrease on the premise that fully-penetrated joints with no macroscopic porosities or cracks are obtained. The microhardness in the weld fusion zone increases with the welding speed.

[11] Ali et al. (2012) developed a numerical elasto-plastic thermo mechanical model for predicting the thermal history and resulting angular distortions of manual metal arc welding in one sided fillet joints. They concluded that as the thickness of the plate increases the distortion decreases and with the increase of power input the distortion also increases. Also The temperature profile obtained from the finite element modeling compared fairly with the experimental ones. It is observed from experimental results in Tables 3 and 4, as well as from finite element modeling that the distortion in vertical plates is more than the horizontal plates.

[12] Budkin (2011) studied the welding joints in dissimilar metals and concluded that to develop the technology for welding joints in dissimilar



metals, it is necessary to examine in detail the processes of interaction between the solid refractory metal and the liquid steel, determine the mechanism of dissolution and the diffusion of the refractory metal in the steel and of the components of the steel in the refractory metal, and also examine the temperature-time conditions of the formation of the interlayer of intermetallic compounds at the interaction boundary.

[13] Budkin (2011) concluded that to develop the technology for welding joints in dissimilar metals, it is necessary to examine in detail the processes of interaction between the solid refractory metal and the liquid steel, determine the mechanism of dissolution and the diffusion of the refractory metal in the steel and of the components of the steel in the refractory metal, and also examine the temperature-time conditions of the formation of the interlayer of intermetallic compounds at the interaction boundary.

[14] Tseng And Hsu (2011) Five kinds of oxide fluxes, MnO_2 , TiO_2 , MoO_3 , SiO_2 , and Al_2O_3 , were used to investigate the effect of activated tungsten inert gas (activated TIG) process on weld morphology, angular distortion, delta-ferrite content, and hardness of Type 316L stainless steels. They concluded that to obtain high quality welds and stable weld arc, the activated TIG process requires large diameter electrodes to support a given level of the weld current.

[15] Raju et al. (2009) analyzed Angular Deformation in a Full Penetration Un-Symmetrical Tee Joint. They carried out a study to analyze the influence of weld sequence on angular distortion, during welding of such unsymmetrical groove configuration in T-joints. They established a technique and brought down the distortion level from 5° (34 mm) to 0.11° (0.80 mm) through a series of weld sequencing.

[16] Do-Hyun et al. (2009) carried out an analysis to investigate whether the welding imperfection simulated by the thermal elastic-plastic analysis with high accuracy could be reproduced in the elastic-plastic finite displacement analysis with fidelity and concluded that the angular distortion appeared as V shaped and the absolute value becomes larger as the width of plate becomes larger.

[17] Vural et al. (2007), examined the effect of welding fixture used to prevent the distortions during cooling process utilizing a robot controlled gas metal arc welding method on cooling rate and distortions of welded structures. They designed fixture is reduced amount of distortions. The preheating effect of previous weld on the next weld has increased distortions on the other side of part. Increase in distortions is directly proportional to the increase in welding speed which affects the weld heat input.

[18] Cheng et al. (2006) utilized the laser forming (LF) technology for the post correction of welding-induced distortion. The LF correction paths were based on the magnitude and direction of bending angle, and the longitudinal residual stresses. The heating conditions were determined through the use of a heating

database established by FEM simulations. It was seen that laser forming can reduce not only the welding induced distortion, but also the tensile longitudinal residual stresses on the welded surface.

[19] Murgan And Gunaraj (2005) developed mathematical models to predict angular distortion for a particular set of parameters. Using the mathematical equations, they presented the trends of direct and indirect effects of the process variables on the angular distortion in the graphical form and analyze using the mathematical equations.

This sensitively analysis helps in optimizing the welding process to improve the quality and life of the welded parts. Prediction of angular distortion may help in reducing the distortion by providing initial angular distortion in the negative direction. Design of experiments (DOE) is a scientific approach of planning and conducting experiments to generate, analyze and interpretation of the data.

[20] Tseng and Chou (2003) investigated the effect of nitrogen added in argon shielding gas on the angular distortion of austenitic stainless steels. An autogenous gas tungsten arc welding was conducted on austenitic stainless steels 304 and 310 to produce a bead-on-plate weld. The delta-ferrite content of welds was measured by using Ferrite scope. The angular distortion of weldments was determined. Results indicated that the retained ferrite content in Type 304 stainless steel weld metals was rapidly reduced as the nitrogen addition in argon shielding gas was increased. The welding angular distortion was raised with the increase of the amount of nitrogen added in the shielding gas.

[21] Maruyama (2003) presented the basic principles and noteworthy features of dissimilar welding of stainless steel to carbon and low-alloy steels. During dissimilar welding of stainless steel to carbon and low-alloy steels, it is of the utmost importance to predict the nature of the mixed-composition weld metal and to understand the weld metal properties. Key aspects to be considered in this context are appropriate selection of welding additives and setting of welding conditions.

[22] VANLI and MICHALERIS (2001) presented a welding distortion analysis approach for T-stiffeners with a particular emphasis on welding-induced buckling instabilities. 2-D thermo-mechanical welding process simulations are performed to determine the residual stress and angular distortion. They computed the critical buckling stress along with the buckling mode and bowing distortion in 3-D Eigen value and linear stress analyses.

They investigated the effects of the stiffener geometry, weld sequence, weld heat input and mechanical fixturing on the occurrence of buckling and the distortion pattern. For the small section geometry, bowing is large in magnitude (28.8 to 46.2mm). It is considerably reduced in the large stiffener (2.0 to 5.2 mm), and can be ignored in the scope of many applications.



[23] Rajkumar And Varma (2001) carried a discussion on in controlling the angular distortion by selecting proper angle in the shielded metal arc welded joints and by varying the same factor the impact strength of the joint was also evaluated. They concluded that distortion has been increased with the increase in the groove angle till 60 degrees and Groove angles like 45 degrees and 60 degrees requires multi passes and The strength is increased with groove angle due to the increase in the amount of weld metal deposition.

[24] Cui & Mansour (1998) adopted a combination of the elastic large deflection theory and the rigid-plastic analysis to study the impact of various factors including the initial deflection shape on the ultimate compressive strength of unstiffened plates. They concluded that for a perfect plate, the effect of the aspect ratio a on ultimate strength is negligible. However, it will quite significantly affect the final total deflection shape at collapse and studied the effect of the maximum initial deflection amplitude on the ultimate strength.

Inference from the literature survey

In order to improve the performance of welding process, mathematical modelling is important tool in present context, it offers cost effective way (as experiments are more expensive than computational studies) with shorter time in predicting the results as compared to experiments. Computational techniques can compute the theoretical data, which may not be possible through measurements. Thus, the development of mathematical model can be attempted for the present work to predict the deformation in welding process.

From the above literature we found that various researchers have tried to solve the problem of distortion in welding process and much more work has to be done. The problem of minimizing the angular distortion still persists. However, Works have already been done on minimizing the distortion, but a vast area is still available for study. So we decided to work on the metal combination of SS 202 and Mild steel, with length of work piece, diameter of electrode, time between passes and welding current as process parameters.

Objectives of present work

- To study various welding methods used for joining dissimilar metals.
- To study various welding parameters and to analyze the effects of TIG welding parameters on angular distortion while welding of dissimilar materials using TIG.
- Development of mathematical model for TIG welding parameters effecting angular distortion of TIG welded joint.
- Optimization of TIG welding parameters effecting angular distortion in TIG welding of dissimilar materials.

Design of Experiment

Introduction

A scientific approach to plan the experiments is a necessity for efficient conduct of experiments. The experiments are carried out by using the



statistical design of experiments, so that appropriate data have been collected and analyzed by statistical methods resulting in valid and objective conclusions. When the problem involves data that are subjected to experimental error, statistical methodology is the only objective approach to analysis. Thus, there are two aspects of an experimental problem: the design of the experiments and the statistical analysis of data.

The design of experiment is the procedure of selecting the number of trials conditions for running them, essential and sufficient for solving the problem that has been set with the required precision.

The purpose of the theory of design experiment is to ensure that the experimenter obtains data relevant to his hypothesis in as economical a way as possible following a sequential way of analysis. Fisher has summed up the advantage of factorial experiments in that they result in:

- Greater efficiency
- Greater comprehensiveness in that:
- Effects of factors are estimated

Taguchi Experimental Design and Analysis

Experimental Design Strategy

The experimental design proposed by Taguchi involves using orthogonal arrays to organize the parameters affecting the process and the levels at which they should be varied. Instead of having to test all possible combinations like the factorial design, the Taguchi method tests pairs of combinations. This allows for the collection of the necessary data to determine which factors most affect product quality with a minimum amount of experimentation, thus saving time and resources. The Taguchi method is best used when there is an intermediate number of variables (3 to 50) and when only a few variables contribute significantly.

The Taguchi arrays can be derived or looked up. Small arrays can be drawn out manually; large arrays can be derived from deterministic algorithms. The arrays are selected by the number of parameters (variables) and the number of levels (states). Analysis of variance on the collected data from the Taguchi design of experiments can be used to select new parameter values to optimize the performance characteristic. The data from the arrays can be analyzed by plotting the data and performing a visual analysis, ANOVA, bin yield and Fisher's exact test, or Chi-squared test to test significance. The second approach which Taguchi strongly recommends for multiple runs is to use signal-to-noise ratio (S/N) for the same steps in the analysis. The S/N ratio is a concurrent quality metric linked to the loss function. By maximizing the S/N ratio, the loss associated can be minimized. The S/N ratio determines the most robust set of operating conditions from variations within the results. The S/N ratio is treated as a response (transform of raw data) of the experiment. Processes are often times subjected to many noise factors that in combination, strongly influence the variation of the response. For extremely noisy systems,



it is not generally necessary to identify specific noise factors and to deliberately control them during experimentation. It is sufficient to generate repetitions at each experimental condition of the controllable parameters and analyze them using an appropriate S/N ratio.

Loss Function

Definition:

A parabolic representation that estimates the quality loss, expressed monetarily, that results when quality characteristics deviate from the target values. The cost of this deviation increases quadratically as the characteristic moves farther from the target value. - Duncan, William

Taguchi defines quality loss via his "loss function". He unites the financial loss with the functional specification through a quadratic relationship that comes from a Taylor series expansion. The quadratic function takes the form of parabola. Taguchi defines the loss function a quantity proportional to the deviation from the nominal quality characteristics. He has found the following quadratic form to be a useful workable function:

$$L(y) = k(y - m)^2$$

Where,

L = Loss in monetary units

m = value at which the characteristic should be set

y = actual value of the characteristic

k = constant depending on the magnitude of the characteristic and the monetary unit involved. The loss function represented in above equation is graphically shown in fig. 4.

The farther the products characteristic varies from the target value, the greater is the loss. The loss must be zero when the quality characteristic of a product needs its target value. The loss is a continuous function and not a sudden step as in the case of traditional (goal post) approach (fig. 5). This consequence of the continuous loss function illustrates the point that merely making a product within the specification limits does not necessarily mean that the product is of good quality.

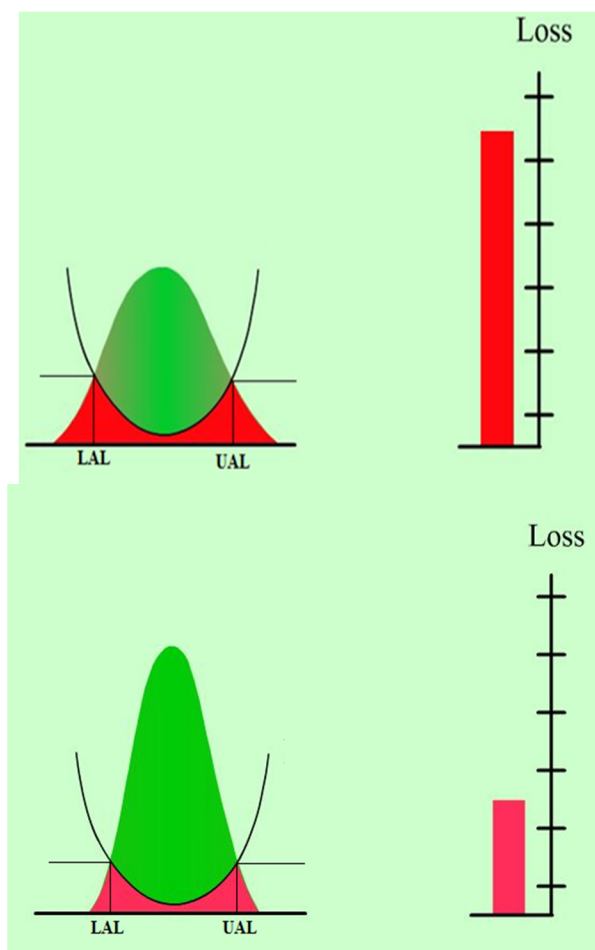


Fig.4. Taguchi's Loss Function

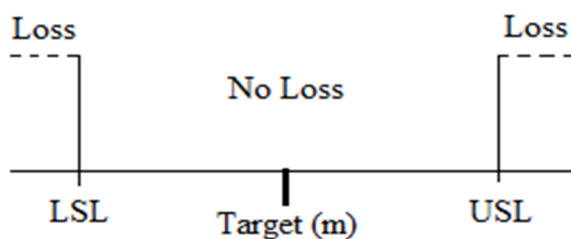


Fig. 5 Traditional (Goal Post) Approach

Average loss-function for product population

In a mass production process, the average loss per unit is expressed as:

$$L(y) = \frac{1}{n} \{k(y_1 - m)^2 + k(y_2 - m)^2 + \dots + k(y_n - m)^2\}$$



Where,

y_1, y_2, \dots, y_n = Actual value of characteristic for unit 1, 2, ..., n respectively

n = Number of units in a given sample

k = Constant depending on the magnitude of the characteristic and the monetary unit involved

m = Target value at which the characteristic should be set

The Equation can be simplified as:

$$L(y) = k(MSD_{LB})$$

Where,

MSD_{LB} = Mean squared deviation or the average of squares of all deviations from the target or nominal value

LB = "lower is better"

The loss-function can also be applied to product characteristics other than the situation smaller is better.

Signal to Noise Ratio

The loss-function discussed above is an effective figure of merit for making engineering design decisions. However, to establish an appropriate loss function with its k value to use as a figure of merit is not always cost effective and easy. Recognizing the dilemma, Taguchi created a transform function for the loss-function which is named as Signal-to-Noise (S/N) ratio.

The S/N ratio, as stated earlier, is a concurrent statistic. A concurrent statistic is able to look at two characteristics of a distribution and roll these characteristics into a single number or figure of merit. The S/N ratio combines both the parameters (the mean level of the quality characteristic and variance around the mean) into a single metric.

A high value of S/N ratio implies that signal is much higher than the random effects of noise factors. Process operation consistent with highest S/N ratio always yields optimum quality with minimum variation.

The equation for calculating S/N ratios for "smaller is better" (LB), "larger is better" (HB) and "nominal is best" (NB) types of characteristics are as follows:
 Larger is better:

$$(S/N)_{HB} = -10 \log(MSD_{HB})$$

Where,

$$MSD_{HB} = \frac{1}{R} [\sum_{i=1}^R \frac{1}{y_i^2}]$$

Smaller is better:

$$(S/N)_{LB} = -10 \log(MSD_{LB})$$

Where,

$$MSD_{LB} = \frac{1}{R} [\sum_{i=1}^R (y_i^2)]$$

Nominal is better:

$$(S/N)_{NB} = -10 \log(MSD_{NB})$$

Where,

$$MSD_{NB} = \frac{1}{R} [\sum_{i=1}^R (y_i - y_0)^2]$$

R = Number of repetitions

The Mean Squared Deviation (MSD) is a statistical quantity that reflects the deviation from the target value. The expressions for MSD are different for different quality characteristics. For the "smaller is better", the unstated target value is zero. For "nominal is best", the standard deviation of MSD is used. For "larger is better", the inverse of each large value becomes a small value and again, the unstated target value is zero.

Selection of Mathematical Model

To predict the distortion response, a mathematical model is to be developed after conducting the experiments. The no of independent variables in the design matrix are four and dependent variable is angular distortion that is also called response function or response factor.

The response function of interest, (Angular distortion), can be expressed as:

$$D = f(l, d, t, c)$$

Assuming linear relation, response factor can be expressed as

$$D = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4$$

Where b_0, b_1, b_2, b_3 and b_4 are coefficients.

'D' is the angular distortion parameter. Assuming a linear relationship in the first instance it could be written as:

$$D = b_0 + b_1l + b_2d + b_3t + b_4c$$

Data analysis

A number of methods have been suggested for analyzing the data: Observation method, ranking method, column effect method, ANOVA, S/N ANOVA, plot of average response curves, interaction graphs, Regression analysis etc. However, in the present investigation plot of average response curves, ANOVA and S/N response graphs have been used.

Experimental Procedure

The experiments were conducted on mild steel and stainless steel plates of size 100 x 75 x 8 mm and 125 x 75 x 8 mm plates as per the design matrix (Table 3.2). A 30° V-groove was made on each plate so as to make butt joint. Each one of the cleaned plate was welded employing an electrode positive polarity. Weld beads were deposited in the V-groove using Stainless steel wire. The plates were cleaned mechanically to remove oxide layer and any other source of hydrogen, before welding. Weld bead were deposited using a Tungsten inert gas (TIG) machine to ensure the reproducibility of the data.

The complete sets of eight trials were performed to determine the variance of optimization parameters for the model. The experiments were performed in a random order to avoid any systematic error. The work limits of the parameters are selected as:

Parameters	Symbols	Units	Limits	
			Low(-1)	High(+1)
Length	l	mm	100	125
Dia.	d	mm	1.5	2
Time between passes	t	min.	0	5
Welding Current	c	Amp	70	90

Table 1: Limits of the process parameters

As per Taguchi experimental design philosophy a set of two levels assigned to each process parameter has two degree of freedom (DOF). This gives a total of 4 degree of freedom for the process parameters selected in this work. The nearest two level orthogonal array available satisfying the criterion of selecting OA is L8. For each trial in the L8 array, the levels of process parameters are indicated in below table .

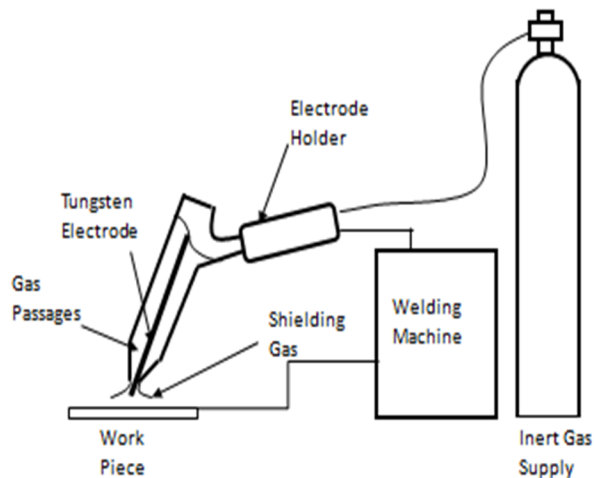


Fig 6 Tungsten arc welding Set Up

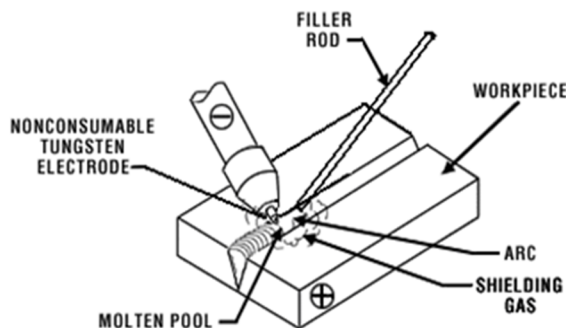


Fig 7 Tungsten arc welding process

Results and Discussions

The TIG experiments were conducted by using the parametric approach of the Taguchi method. The effects of individual TIG process parameters, on the selected quality characteristic – angular distortion have been discussed in this section. The average value and S/N ratio of the response characteristics for each variable at different levels were calculated from experimental data. The response curves (main effects) are used for examining the parametric effects on the response characteristics. The Analysis of Variance and S/N data is carried out to identify the significant variables and to quantify their effects on the response characteristics. The most favourable values (optimal settings) of process variables in terms of mean response characteristics are established by analyzing the response curves and ANOVA tables.

Design array with experimental values of distortion

S.no	I	D	t	c	Distortion	S/N Ratio
1	100	1.5	0	90	7.235 ⁰	-17.1888
2	100	1.5	5	70	3.624 ⁰	-11.1838
3	100	2.0	0	70	5.671 ⁰	-15.0732
4	100	2.0	5	90	6.913 ⁰	-16.7933
5	125	1.5	0	70	4.169 ⁰	-12.4006
6	125	1.5	5	90	4.621 ⁰	-13.2947
7	125	2.0	0	90	6.331 ⁰	-16.0294
8	125	2.0	5	70	3.845 ⁰	-11.6979

Table 2: Design Matrix with Distortion Values

Mathematical model

Assuming a linear relation between distortion and various parameters, the mathematical relation between them can be assumed of the form:

$$D = b_0 + b_1 I + b_2 d + b_3 t + b_4 c \dots\dots\dots(a)$$

The above equation is a general linear equation with four variables. From the regression analysis, we got the values for the above coefficients as:



Table 3: Calculated values of Coefficients

Serial No.	Coefficient	Values of Coefficient
1		0.37
2	b_1	-0.0448
3	b_2	1.56
4	b_3	-0.220
5	b_4	0.0974

Thus our regression equation becomes:

$$D = 0.37 - 0.0448l + 1.56d - 0.220t + 0.0974c$$

By putting the values of various parameters, we found the theoretical values of the distortion for various set of design parameters.

Conclusions

The following conclusions were arrived at from the above investigation:

The Taguchi's design of orthogonal arrays can be employed easily for developing mathematical model for optimizing the distortion within the workable region of the control parameters like length of work piece, diameter of electrode, time gap between successive passes and welding current in Tungsten arc welding.

Angular distortion decreases with the increase in length within the design range of parameters.

With the increase in electrode diameter, the angular distortion increases within the design range of parameters.

Angular distortion decreases with the increase in time gap between successive passes within the design range of parameters.

With the increase in current, the angular distortion increases within the design range of parameters.

The process parameter current has the highest effect on angular distortion.

Within the design range of parameters, the least effect on angular distortion is found of diameter of electrode.

The angular distortion is minimum when the length of plate is 135, electrode diameter is 1.5 mm, time between successive passes is 7, and welding current is 80 amp.

The optimum value of angular distortion is 2.828^0 .

Figure 8: Scatter diagram for Angular distortion between observed and calculated values

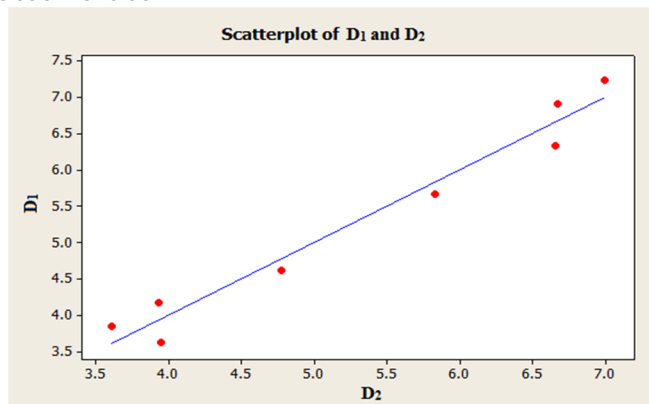


Figure 9: Effect of change in length (l) on Angular distortion

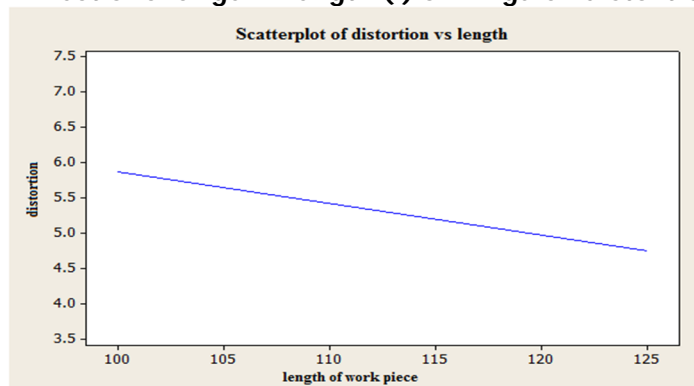


Figure 10: Effect of electrode diameter (d) on Angular distortion

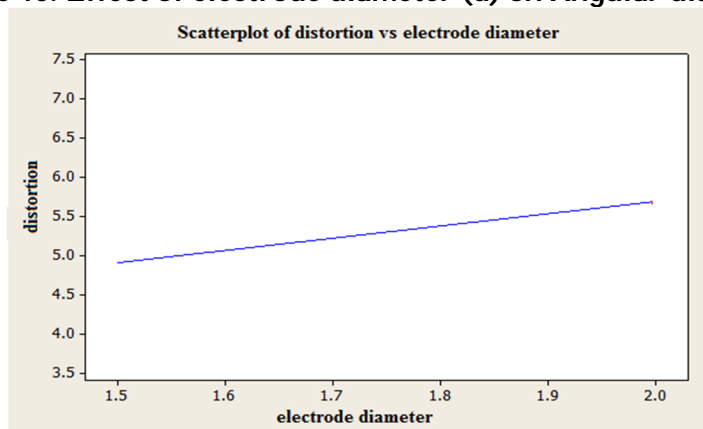


Figure 11: Effect of time b/w passes (t) on Angular distortion

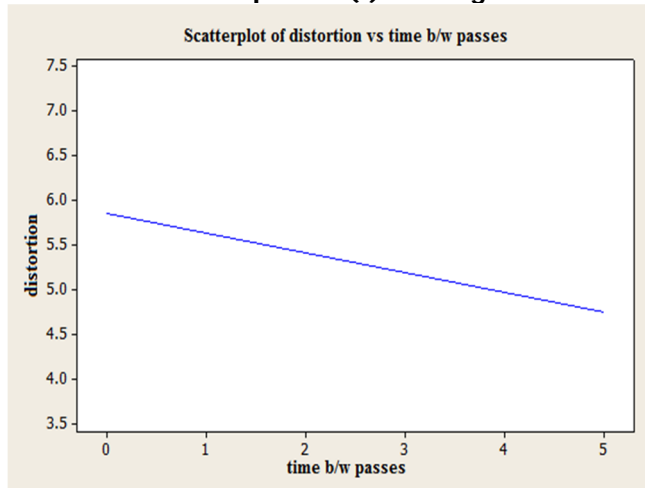
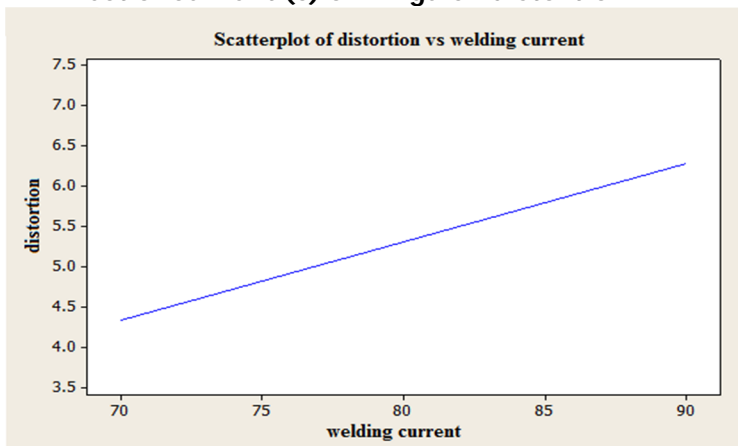


Figure 12: Effect of current (c) on Angular distortion



Scope for future Work

When it comes to the scope for future work, it is mandatory to talk the following points:

Only four parameters were considered here assuming all other factors constant. The other parameters can also be considered for optimization of distortion in welding like wire feed rate, welding speed, welding voltage etc.

The experiment can also be done on different materials like Aluminum and Stainless steel etc., to analyze their effects and to optimize distortion.

Distortion can also be optimized in other processes like MIG, Submerged arc welding, electric arc and Electro slag welding etc



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SELF-CONCEPT AND MARITAL ADJUSTMENT AMONG WOMEN

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INTRODUCTION

MARRIAGE: Marriage ,also called matrimony or wedlock,is socially or ritually recognized union or legal contract between spouses that establishes rights and obligations between them and their children and between them and their in-laws.the definition of marriage varies according to different cultures, but it is principally an institution in which interpersonal relationship are acknowledged. When defined broadly marriage is considered cultural universal.

Marriage is designed for purity, we under assault by temptation nearly every minute and from many directions. The bond of marriage gives us the support to defeat the temptation by engaging in deep love.

ADJUSTMENT IN MARRIAGE: "Shortly after tying the knot" the new couple will enter in a new phase called marriage, where adjustment is required in each and every phase married life. Both the spouses also adapt a change to their new roles complementing each other and acting as a team opposed to two separate units. It is also important to unify the following interest and values, maintaining open lines of communication and encouraging the expression of each other.

The adjustment period of marriage is the crucial litmus test of a relationship. Many marriages breakup due to lack of adjustment. This is because most young people do not understand the value of adjustment in marriage. Every phase of marriage has to be dealt with in a different way. The adjustment period by far is the most difficult



stage of marriage but once you get pass in it, life after that unfold as beautiful symphony.

For successful adjustment in marriage the first thing is to consider that your spouse is going through the same thing as you are but sometimes it may also differ, but patience is required in every aspect of marital adjustment whether it is same or different. Spouses should also soften their hearts their hearts for each other. In a marriage an entity called "EGO" has to be kept aside. There are ups and downs in every marriage. Every couple fight for some reason or the other. So the spouses should not have the ego otherwise in such some cases marriage becomes a complicated issue. A lot of care and understanding is required for a successful marriage. The good understanding in marriage will go a long way in consolidating your realationship. Adjustment is not only very important for smoothly running of couple's married life but also for the smoothly running of family and for the better upbringing of children. It is the responsibility of both the spouses to adjust so that it should not effect the psychology of their children. Couples feel that divorce is the only solution to their problems but they forget that children are the only sufferers in the whole issue.

Therefore it is equally important not only for women but also for the men to learn to adjust for the sake of their own children who have the whole life in front of them to spend.

SELF-CONCEPT: self-concept is not only a person's perception of self but impacts expectations of the partner and the tenor of the relationship.

In marital cases it was found that those with high self-concept actually compensated for the self threat implied in their transgressions by embracing their partner's continued positive regard and acceptance.



Self-forgiveness and embracing the positive aspects helps the person for adjusting him/herself in marital relationship. For many reasons most of which are not chosen, people walk into adult life wounded by reality. One of the scars is low self-concept. We know that we can't change our past but we can take charge of our present.

Consider looking at one positive quality of your's and one positive quality of your partner's each day matter what else happens. Every one should lay the foundation for a different sense of self and a different sense of trust in your relationship. High self-concept is very much important in marriage especially for women because in our culture especially women are considered the best home maker. It is because she plays so many roles in her regular way of life. She plays a role of a mother, a house-wife, daughter-in-law, sister-in-law etc. so therefore it is very much important for a women to make an high level of self-concept in better adjustment of marriage. It is not necessary that a women who is married more than 10 years have better adjustment. If her concept of self is low than it becomes for a women to have a happy married life. In some case the women in early marriage adjust within in a year or two because of having a good level of high self-concept. That is why high level of self-concept plays an important role for women to lead happy and successful married life.

Objectives:

1. To asses the Self-Concept of women who are married for less than 5 years.
2. To asses the Self-Concept of women who are married for more than 10 years.
3. To see how well the women who are married for less than 5 years are adjusted in their marriage.



4. To see how well the women who are married for more than 10 years are adjusted in their marriage.

Hypotheses:

1. There exists no significant difference in the self concept of women who are married for less than 5 years when compared to women who are married for more than 10 years.
2. There exists no significant difference in the marital adjustment of women married for less than 5 years and for more than 10 years.
3. There is significant difference between Self-Concept and Marital Adjustment.

METHOD

SAMPLING TECHNIQUE: The present study consists of 100 women out of which 50 women were married for less than 5 years and 50 women were married for more than 10 years. The sampling technique used is simple random sampling. The investigators personally administered the tests on the participants and the purpose and instructions were clearly stated to them. Time was given to answer the questions and then the questionnaires were collected back.

Inferential statistical analysis leads to judgement about the whole population, to which the sample at hand is presumed to be related. For statistical analysis, mean, standard deviation was calculated to do T test and correlation test was done.

Tools Used:

- Marital Adjustment Inventory
- Self-Concept Scale

ANALYSIS OF DATA:

- 1) Correlation test is used for a) all 100 women



- b) For 50 women who are married less than 5 years.
- c) For 50 women who are married more than 10 years.
- 2) T-test is used among women married for less than 5 years compared to women married for more than 10 years for Self-concept.
- 3) T-test is used among women married for less than 5 years compared to women married for 10 years for Marital Adjustment.

Tables:

TABLE-1: Shows Mean, S.D and T-score ratio of self-concept of women who are married for less than 5 years and more than 10 years.

Group of	No. of	Mean	Standard	t - value	
Women married for		women		Deviation	
Less than 5 years	50	32	10.77	3.04	
More than 10 years	50	37	4.37		

t value is significant at 0.01 level of signifacnce.

TABLE-2: Shows Mean, S.D and T-score ratio of Marital Adjustment of women who are married for less than 5 years and more than 10 years.

Group of	No. of	Mean	Standard	t - value	
Women married for		women		Deviation	
Less than 5 years	50	67.8	2.56	9.9	
More than 10 years	50	68.5	2.52		

t value is significant at 0.01 level of signifacnce.

Table 3 :

- a) shows the correlation between self-concept and marital adjustment among women married for less than 5 years



$$r = 0.6$$

b) shows the correlation between self-concept and marital adjustment of women more than 10 years

$$r = 0.4$$

FINDINGS:

The findings of current study shows that t value (3.04) is more than 2.58 S.E(1% level of significance), the null hypothesis I which states that There exists no significant difference in the self concept of women who are married for less than 5 years when compared to women who are married for more than 10 years is rejected.

It also shows that there is significant difference in the marital adjustment of women married for less than 5 years and for more than 10 years having t value as 9.9 which is more than S.E at 1% level of significance. Hence the null hypothesis II is rejected.

There is a positive correlation between self concept and marital adjustment of women married for less than 5 years($r = 0.6$) and more than 10 years($r = 0.4$).

CONCLUSION:

It is found that having good self-concept is the only key for successful marriage. Both the spouses when they enter in a phase called marriage should encourage each other for a successful marriage institution especially husbands are expected to boost the confidence in their wives on both professional as well as house hold level so that women can have a greater level of self-concept for better marital adjustment

It is also very important for both the spouses to not let the past of any one of them effect the marriage system because for the sake of past the present and whole future of the marital relationship turns into



a pathetic disaster where no one gets benefit from it. And now days also because the women has almost the power of making a successful marriage she should understand that good beliefs about one self (i-e) developing a good thinking about the concept of self will not only be helpful for the marital adjustment but also makes life very beautiful.

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SOME REFLECTIONS ON TAGORE'S EDUCATIONAL IDEALS

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In a strictly academic sense Tagore cannot be regarded as educationist. He did not possess any formal academic qualifications. A rebel against the pattern of the prevailing educational system, Tagore could tolerate being tortured at the hands of those who killed the very incentive of learning in the child. This education is according to him, unnatural as it takes the away from nature. He feels that a child divorced from nature cannot grow into full manhood. The fragmentary nature of his development is, therefore, a source of social disequilibrium. Thus the first duty of an educationist is to restore the child to nature for nourishment and sympathy. Education should always be imparted in a child's mind through love and sympathy. Tagore believes that education is the only means of freeing our minds from deep set of ignorance and prejudices. He believes that without education human mind would remain in the dark. Rabindranath conceives education as the all round growth and development of individuals in harmony with the universe. According to him, "The highest education is that which does not give merely information but makes our life in harmony with all existence."¹ Rabindranath has developed his philosophy of education from the memories of his school days, when the school resembles as education factory, lifeless, colourless, dissociated from the context of the universe. He had been a victim of unhappy training in his childhood. Education in those days was very much stereotype and there was no scope for unfolding one's own personality through education. As Tagore himself suffered in his childhood, he later came to realize that a child's mind should have a healthy growth. If a child's mind is subjected to compulsion and strict rules it cannot bloom



properly. Some scholars believe that the establishment of the Ashrama School at Santiniketan had its origin in Tagore's own painful experience about education in his childhood and it was this personal experience which persuaded him to give shape to a different model of education. He was very much critical about the mechanical kind of education prevalent in those days and his attitude was expressed in his satirical poem of "Totakahini".

The crux of Tagore's educational philosophy was learning from nature and life. He condemned bookishness vehemently. Sheer academic education had created a great gulf between the educated and the uneducated. In a way education took people away from their society, whereas it should be one of its primary aims to socialize them. He sought to work out a system of education that would pay due consideration to the interest of the child, grow out of the tradition and history of the land and recognize the need of close and constant contact with nature. Hence Tagore felt that our attention should be focused on the problem of creating a harmony between our education and our life. Tagore regards both nature and society as potent means of education.

Education is supposed to develop the individuality of man and it must be such as to make man more useful to society. Thus it may be said the education that takes man away from society is purposeless. Societies vary in their structure and complex. Hence, there cannot be uniform pattern of education. It is, therefore, essential that for devising an educational pattern for a society, its structure, complex, different patterns of life, aspirations, and cultural values should be taken into account. Tagore believed that education of any country should be rooted in its own soil. One misfortune of Indian education was that the system was borrowed from the West. It had all the aspirations and cultural background of a society that was alien to us. This created a conflict of ideology in the educated. Rabindranath had been insisting upon this point in his writing 'Siksha Herpher'. Gandhiji also expressed



his dissatisfaction over the prevalent educational system in his writing. In 'Young India', he wrote, "Almost from the commencement the text books deal not with things the boys and girls have always to deal with in their homes, but things to which are perfect strangers.....The higher he goes, the farther removed he is from home, so that at the end of his education he becomes estranged from his surroundings. His education is calculated to wean him from his traditional culture".²

Tagore argued that our education should be linked with our complete life—intellectual, aesthetic, social and spiritual. Our educational institutions should be in the very heart of our society, concerned with it by the living bonds of diverse co-operation. True education is that which helps us to realize how our training and knowledge have organic connection with our surroundings. Tagore wants to establish harmony of relationship through the element of humanism in education. According to him, only fullness of expression would signify full life and therefore he observe, "our childhood should be given its full measure of life's draught, for which it has an endless thirst. The young mind should be saturated with the idea that it has been born in a human world which is in harmony with world around it."³ He wanted to develop a system of education in which the children might be brought up in an atmosphere of a higher life. He deeply feels that "for some time past education has lacked idealism in its mere exercise of an intellect which has no depth of sentiment. The one desires produced in the heart of the students has been an ambition to wind wealth and power not to obtain self-emancipation".⁴ His ideal was the spiritual perfection and not the mere enjoyment of material objects.

Rabindranath wanted that his educational ideals should match the ideal of the age. The ideal of the age according to him, was racial unity which was to be brought about by living relationship of the people. In this connection he opined, "Our education must enable every child to grasp and to fulfill this purpose of age, not to defeat it, by acquiring the



habit of creating division and of cherishing national prejudices...the mission of our education should be to realize our unity....”⁵ He gave effect to his ideals in his Visva-Bharati. He included this ideal of unity in the activities of his institution educational, aesthetic and social service activities. This in turn aroused in the students love of humanity, freedom from all kinds of racial and national prejudice. Thus, the freedom of mind became the greatest ideal of education for Tagore.

He believes that civilization can become healthy and strong if it contains in its centre some creative ideal that binds its members in a rhythm of relationship. He opines that if society is not to become instinct, it must for its central force, great spiritual ideal and not merely an impetus to progress. Tagore’s ideal in education is to bring about reconciliation among the conflicting forces of society, by the perfection of human relationship, by controlling the egoistic instincts of man by giving him a philosophy of his fundamental unity.

In his ideal education Tagore seeks to establish the spiritual relationship between people. He believes in the bringing of the different human races close together in bonds of love and co-operation. But in his attempt to bring about a spiritual unity of man, he did not ignore man’s moral wealth of wisdom, which in which in his view was far greater value than a system that produced endless material and physical power. He sought his strength in union, in an unwavering faith in righteousness and never in the egoistic spirit of separateness. In his opinion that could be achieved, not through the mechanical method of organization but through a spirit of true sympathy.

Tagore seeks to make his educational system the vehicle of philosophy of life. He makes ‘life’ the centre, not the life of this child or that, nor even a particular aspects of human life in preference to some other, but life as a whole and at its richest and best, jointly lived by teachers and



students which will enable the students to plan and live their day-to-day life with maximum profit and enjoyment. Thus, environment receives greater importance than anything else in his system and the educational system become more or less an arena of life, not merely of certain types of activities but life-centric education.

Today, we observe that the present system of education is characterized by lack of freedom, lack of scope for close contact with teachers and with nature. This has resulted in hampering the development of creativity which is no doubt a permanent national loss. But Tagore's ideal of education is conducive to unfolding of creative potentiality of an individual because the freedom which is essential ingredient for development of creativity is the guiding principle of his ideal of education. However, it must be borne in our mind that Tagore's model of education is not the remedy for all present day social evils prevailing in India such poverty, dishonesty, corruption, illiteracy and unemployment. The present system of education responsible for degeneration of the value system of society where peace and joy of mind have been evicted from their throne to be occupied by corruption and dishonesty. But Tagore's model of education if properly implemented has the potential to minimize some of the evils of the present society.

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POLITICAL PARTICIPATION AND WOMEN: GRASS ROOT REALITY

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"Every country deserves to have the best possible leader and that means that women have to be given a chance to compete. If they're never allowed to compete in the electoral process then the countries are really robbing themselves of a great deal of talent."

– Madeleine K. Albright, National Democratic Institute, Chairman

Democracy implies equality for all human persons, men and women. Nature, success and effectiveness of democracy largely depend on the extent to which equal, effective and actual participation is provided by the system to all its citizens. It is considered as one of the best form of governments because it ensures liberty of thought, expression, belief, faith and worship, equality of status and opportunity, fraternity as well as the right to participate in political decision-making. No country can call itself democratic if half of the population is excluded from the decision-making process. The participation of women and their engagement in electoral process is an important marker of the maturity and efficacy of democracy in any country. Equitable participation of women in politics and government is essential to building and sustaining democracy. The level and extent of political participation of people may be restricted by the very existence of both natural and man-made inequalities. While it is impossible to overcome natural factors of inequalities, it is possible to overcome man-made inequalities simply by adopting and following of democratic principles and values. The pillars of democracy like liberty, equality, fraternity, justice etc. are strong enough to support and protect the people from the challenges posed by



man-made inequalities.

Empowerment means giving voice to voiceless. It is the process by which the disempowered or powerless people can change their circumstances and begin to have control over their lives. Women empowerment may mean equal status to women, opportunity and freedom to develop herself. Empowerment involves the building up of a society wherein in women can breathe without the fear of oppression, exploitation, apprehension, discrimination and the general feeling of persecution which goes with being a woman in a traditionally male dominated structure. Despite the constitutional safeguards, rapid expansion of educational facilities and higher degree of self-awareness among modern women, the fact is that, women across the globe is not treated properly in a dignified manner by the dominating gender. Promoting women's participation in politics is one of the core areas of women empowerment. Political participation is the hallmark of a democratic setup. The presence of women in the decision-making levels not only enhances their social, political and economic status, but also strengthens democratic institutions by making them more inclusive and meaningful. Increasing women's political participation and representation in Indian politics requires electoral and parliamentary reforms. The focus of Empowerment of Women is equipping women's decision making roles, their self-reliance, and their legal rights to equal treatment, inheritance discrimination. Empowering Women aims to inspire women with the courage to break free from social and cultural evils of the society. When and where women are given power they can perform their role effectively. According to the Jakarta Declaration, *"Empowerment of women is not only an equity consideration; it is also a necessary precondition for sustainable economic and social development. Involvement of women in the political arena and in decision-making roles is an important tool for empowerment as well as monitoring standards of political performance."* The social, cultural and economic



conditions of women impede their participation in politics. Discrimination, economic dependency, gender-based violence, and other abuses prevent women from enjoying their rights and entering politics or succeeding when they start a political career.

Women's role in decision making is one of the most important questions for consideration in the movement for their empowerment. The 73rd and 74th Amendments (1992) to the Indian Constitution have served as a major breakthrough towards ensuring women's equal access and increased participation in political power structures. Such an approach provides the women with a constitutional platform to stand up to men, to raise their voice on issues concerning women oppression, subjugation and related issues, providing them with an identity in an orthodox male dominated socio-political set up. The political participation of women in any society needs to be examined on the basis of the position and status they enjoy in that society or the level of their empowerment. The National Commission for Women was set up by an Act of Parliament in 1990 to safeguard the rights and legal entitlements of women. The 73rd and 74th Amendments (1993) to the Constitution of India have provided for reservation of seats in the local bodies of Panchayats and Municipalities for women, laying a strong foundation for their participation in decision making at the local levels. At the grassroots level 50 per cent reservation given to women in local self-government institutions has improved political participation of women in India yet political participation of women in Legislative Assemblies and Parliament is still quite low in India. Whether reservation for women in Parliament is the right tool for empowerment may be debatable, but it is certainly true that women of this country have a long way to go before they can achieve their potential. They are hampered by low levels of education, lack of access to health care, lack of employment, and low social status which manifests in crimes such as female foeticide, dowry deaths and domestic violence. The reservation



of women in a male-dominated political system, is so far refused to provide women a space, the representation of women in politics and administration is found low. We have a long way to go in improving the status of women as a whole and their share in leadership positions. In India, the problem is more serious, While in many other countries women are inching forward, in India the participation of women in politics has actually declined since the days of freedom movement, both in quantity and quality. The countries like Sweden (40.4%), Norway (39.4 percent), Finland (33.5 percent), Denmark(33.0 percent), Holland (31.3 percent), New Zealand (26.2 percent) Germany (26.2percent), Spain (24.6 percent),China(21.0 percent), Switzerland (21.0 percent), Canada (18.0 percent), Australia (15.5 percent), Mexico (14.2 percent), USA (11.7 percent), Russia (10.2 percent), Britain (9.5 percent), Bangladesh (9.1 percent), etc. have better representation of women in their legislatures than India. The Women's Reservation Bill, or The Constitution 108th Amendment Bill, proposes 33% reservation for women in the Lok Sabha and state assemblies for 15 years. The Bill was introduced in the Parliament in 1996, and subsequently in 1999, 2003, 2005, 2008 and 2010. It was finally passed by the Rajya Sabha in 2010, but is still pending in the Lok Sabha. With the dissolution of the current Lok Sabha, the Bill will lapse and will have to be re-introduced. The introduction of the Bill will increase women's participation and lead to women's empowerment. However, the Bill has still not been passed.

Women face several obstacles to participating in political life. Structural barriers through discriminatory laws and institutions still limit women's options to run for office. 2011 UN General Assembly resolution on women's political participation notes, "Women in every part of the world continue to be largely marginalized from the political sphere, often as a result of discriminatory laws, practices, attitudes and gender stereotypes, low levels of education, lack of access to health care



and the disproportionate effect of poverty on women." - Predominant socio-religious and cultural practices and restricted professional advancement further add to women's predicament. A "Times of India" report corroborates that "domestic responsibilities, lack of financial clout, rising criminalization of politics and the threat of character assassination" are making it increasingly difficult for women to be part of the political framework. Moreover, women politicians point out that even within the political parties, women are rarely found in leadership positions. In fact, "women candidates are usually fielded from 'losing' constituencies where the party does not want to 'waste' a male candidate.' Moreover they can get a political position by reservation but may work merely as proxies for their husbands or other family members. Women leaders and professionals are still faced with traditional roles and also have to meet work/professional expectations. Due to our cultural setting, the women are still preoccupied with domestic and family obligations that take up a large portion of their time. Women continue to play the triple role of producers, maintainers and reproducers. To be able to cope with all these responsibilities, women are expected to have and operate on an elastic concept of time. The goal of more women in politics is not fewer men in politics, but a more equitable society for everyone. Women are often dynamic leaders of change, galvanizing women and men to get involved, claim their rights, strengthen their communities and protect their planet. The Women's reservation policy bill is however a very sad story as it is repeatedly being scuttled in parliament.

The world over women are struggling to break the shackles that bind them and challenging the unequal distribution of power in society. Women in our country are still struggling hard for equal participation in every sphere including the politics. There still is an urgent need for focused planning with affirmative action for their inclusion in the growth and development with a greater share for them in decisions-



making processes. India got its first woman Prime Minister, Indira Gandhi about four decades back in 1966 and its first President, Pratibha Devi Singh Patil in 2007. In this respect, we are at least ahead of America, where till date, there has been no woman President or Prime Minister in its long history of political democracy.

One cannot expect a remarkable change in the society by having mere reservation of seats for women in local bodies. No doubt it is a first step in the right direction but it has to be accomplished by series of actions at different levels to harness the full potentials of the reservation of seats for women. There is a need to build new pathways into politics and to foster political learning and to create new forms of articulation across and beyond existing democratic spaces to enhance the potential of women's political participation. Political empowerment of women has now been attached utmost priority and their participation in other spheres such as governmental bodies, public administration, Judiciary and corporate and technical bodies has been recognized as equally important. Today, the global community has accepted the need to empower women and give them their due status in economic, social and political development so that they can thrive harmoniously and live with equality and justice. When women have a real voice in all governance institutions, from the political to those in the civil service, the private sector, and civil society, they will be able to participate equally with men in public dialogue, and influence the decisions which determine their own future and that of their families, communities, and nations.

As Atal Bihari Vajpayee, *"We have closed the doors of opportunity to many of them (women) in many areas of our economic, social, political and cultural life; we have not enabled our sisters and daughters to develop to their full potential....The empowerment of women is India's empowerment."* Thus road map for women empowerment is there but still we have miles to go on this path of empowerment. We hope that in



coming years ahead women empowerment will prove its worth.

Recommendations

- Government shall set up a system of monitoring and evaluation for women's participation in politics, decision-making and administration.
- Governmental, non-governmental and corporate initiatives should come up in devising and instituting social and other measures to eliminate structural constraints on the way of women coming up in responsible positions.
- We provide training for women political candidates to help build their capacities, and offer voter and civic education and sensitization campaigns on gender equality.
- Through innovative programs that strengthen women's political skills, emphasize how women are impacted by public policy, and improve the perception of women in political life.

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भारतीयज्ञानपरम्परायाः दृष्टौआधुनिकशिक्षणपद्धत्याः समस्याः समाधानं च

"Challenges and Solutions of the Modern Education System from the Perspective
of the Indian Knowledge Tradition."

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प्रस्तावना (Introduction)

वर्तमाने शिक्षणपद्धतौ यान्त्रिकीकरणम्, रटने आधारितः अभ्यासः, मानवीयमूल्यविहीनता च दृश्यन्ते। विद्यार्थिनः ज्ञानस्य केवलं प्रमाणपत्ररूपेण उपयोगं कुर्वन्ति, न तु तस्य व्यवहाररूपेण जीवनोपयोगितां पश्यन्ति। एवंरूपे वर्तमानशिक्षणपद्धतिः नैतिकता, आत्मविकासः, समग्रव्यक्तित्वनिर्माणं च उपेक्षते।

एतेषां समस्यानां समाधानाय भारतीयज्ञानपरम्परा (Indian Knowledge Systems) अतीवोपयोगिनी अस्ति। अत्र गुरुकुलपद्धतिः, चातुर्वर्ण्यविकासः, जीवनोपयोगिनी विद्या, योगः, आयुर्वेदः, न्यायदर्शनम्, व्याकरणशास्त्रं च उल्लेखनीयानि।

उदाहरणार्थम्, तैत्तिरीयोपनिषदि शिक्षाया उद्देश्यः “सा विद्या या विमुक्तये” इति प्रतिपादितः। (Taittirīyopaniṣad, II.9.1) — अर्थात् या विद्या मोक्षदायिनी, मुक्तिप्रदा सैव शिक्षा। आधुनिकशिक्षायां तु एषा दृष्टिः लुप्ता।

महर्षिः श्रीअरविन्दः अपि अवदत् — “The ancient system of education in India aimed at the growth of the soul and character rather than the acquisition of information.” (Sri Aurobindo, The Renaissance in India, 1918)



भारतीयदर्शनानि शिक्षा इत्यस्य माध्यमेन आत्मानं, समाजं, राष्ट्रं च परिष्कर्तुं समर्थानि। अतः अस्मिन् लेखे आधुनिकशिक्षायाः समस्याः विविच्य, भारतीयज्ञानपरम्परायाः माध्यमेन समाधानरूपाणि उपायान् च प्रस्तौतुकामाऽस्मि।

१. आधुनिकशिक्षायाः समस्याः (Problems in Modern Education)

- **परीक्षामुखी अध्ययनम् (Exam-oriented learning):-** छात्राः केवलं उत्तीर्णतायै पठन्ति, न तु ज्ञानप्राप्तये। बुद्धिकौशलं, विचारशक्तिः, सृजनात्मकता च उपेक्ष्यन्ते।
 - अन्वेषणाधारितशिक्षा — ज्ञानस्यप्रयोगात्मकदृष्ट्या अभ्यासः प्रेरणीयः।
 - आध्यात्मिकशिक्षायाः समावेशः -
विद्यार्थिनां भावनात्मकबौद्धिकसंतुलनाय आत्मचिन्तनं,
ध्यानं च समावेशनीयम्।
 - गुरुकुलपद्धतिः (The Gurukula System):
विद्यार्थीः स्वगुरोः समीपे निवसन्नैतिकम्, व्यावहारिकम्, तत्त्वज्ञानं च प्राप्नोति।
“आचार्यात् पादमादत्ते पादं शिष्यः स्वमेधया।
पादं स ब्रह्मचारिभ्यः पादं कालक्रमेण च॥” मनुस्मृतिः 2.140
 - नैतिकप्रश्नोत्तरीपद्धतिः —
पाठ्यवस्तुषु नैतिकदृष्ट्या प्रश्नोत्तरमाध्यमेन चिन्तनप्रवर्तनम्। एवमेव आचार्यैः,
सन्तैः च संवादस्य आयोजनं मानवीयमूल्यवृद्धये। एतादृशी शिक्षां यदि वयं
पाठ्यप्रणाल्यां प्रावेशयितुं प्रयत्नं कुर्मः तर्हि अवश्यम् आधुनिकाः
मानवीयमूल्यानां विवेचनं कुर्वन्ति।
 - अनुभवाधारित-शिक्षा (Experiential Learning):
वस्तुनिष्ठदृष्ट्या शिक्षायाः हेतुना प्रयोगात्मककार्यशालाः,
स्वयंसंशोधनपरियोजनाः च सम्मिलनीयाः। उदाहरणार्थम् -
संस्कृताध्ययनेन सह गणितस्य अभ्यासः दैनिकजीवनेन सम्बद्धः कार्येण
अनुभवाधारित शिक्षां प्राप्नु शक्यन्ते विद्यार्थीः।



➤ **मानवीयमूल्यानां अभावः (Lack of human values):**

शिक्षायां नैतिकता, आत्मानुशासनम्, सहिष्णुता, कर्तव्यनिष्ठा च लुप्तानि दृश्यन्ते।

- योगः एवं ध्यानम् (Yoga and Meditation): चित्तशुद्धये, एकाग्रतावृद्धये च योगाभ्यासः अत्यावश्यकः।

“उद्धरेदात्मनाऽत्मानं नात्मानमवसादयेत्।” भगवद्गीता 6.5

- ग्राम्यजीवनानुभवः —

ग्रामेषु शिक्षायाः अभ्याससत्रेण सामाजिकदृष्टिः समृद्धया स्यात्। तदनु पाठ्यक्रमे समाजसेवायोजनाः अनिवार्याः भूयुः।

- सांस्कृतिककार्यक्रमानां आयोजनम् (Cultural Immersion):

विद्यालयेषु भारतीयसंस्कृतेः विषयकं नाट्यं, कथा-कथनम्, भजनम् इत्यादीनि आयोजनीयानि, येन छात्रेषु संस्कारः समाविशतु। उदाहरणार्थम् - ‘गीताजयंती’, ‘गुरुपूर्णिमा’ इत्यादीनाम् उत्सवानां शिक्षायां एकीकरणम्। अनेन अवश्यं ज्ञानवर्धनं भवति।

➤ **आत्मविस्मरणं च परानुकरणम् (Loss of identity and blind imitation):**

पश्चात्त्यदेशीयशिक्षायाः अनुकरणं कुर्वन्तः वयं स्वस्य सांस्कृतिकं वैभवं विस्मरामः।

- नैतिकशिक्षा (Ethical Education): हितोपदेशः, पञ्चतन्त्रं, रामायणं, महाभारतम् इत्यादिषु विद्यमानानि नैतिकमूल्यानि पाठ्यांशः रूपेण समावेशनीयानि।

- स्थानीयज्ञानविज्ञानस्य समावेशः (Integration of Indigenous Knowledge): देशीयकृषिपद्धतयः, आयुर्वेदः, परम्परागतवास्तुशास्त्रं च पाठ्यविषयेषु स्थापनीयम्। उदाहरणार्थम् - एकं पाठ्यक्रमं “भारतीयप्रज्ञा” नाम्ना आरभ्य, सर्वस्तरेषु शिक्षायाः अङ्गं कर्तव्यम्।

➤ **सामाजिकविमुखता (Alienation from society):**

शिक्षा समाजसेवाया आधारः न भूत्वा केवलं व्यवसायमूल्या जातम्।



- विद्यायाः चतुर्विधलक्षणानि (Four-fold purpose of learning):विद्या धर्मेण सहिताऽस्तु, आत्मविकासाय भवतु, समाजोपयोगिनी च भवतु, राष्ट्रनिर्माणे सहायकत्वं कुर्यात्।
- सेवापरकशिक्षणम् (Service Learning):विद्यार्थिनः स्वग्रामे, समाजे वा किञ्चन परियोजनां क्रियासिद्ध्यै निष्पादयेयुः।उदाहरणार्थम् - “एकं मासं ग्रामे”—अन्तर्गतं ग्रामसेवायै शिक्षायाः एकैकः पाठ्यांशः भवेत्।

एते दृष्टिप्रकाशः श्रीमद्भगवद्गीता, उपनिषदः, श्रीअरविन्दस्य च लेखेषु दृश्यते।योगव्यासप्रशिक्षणं, नीतिशास्त्रपाठनं च शिक्षकप्रशिक्षणपाठ्येसमावेशनीयम्।आधुनिकशिक्षकाःभारतीयज्ञानपरम्परायाःमूल्यानि, दर्शनानि च आत्मसात्कुर्युः।

शिक्षायाम् अरविन्ददर्शनम् (Sri Aurobindo's Philosophy in Education)

श्रीअरविन्दस्य शिक्षासम्बद्धं दृष्टिकोणं समग्रजीवनदृष्टिम् आधारीकृत्य स्थितमस्ति। तेन शिक्षा केवलं ज्ञानप्राप्तिः न, अपि तु व्यक्तित्वविकासस्य साधनं मन्यते।

श्रीअरविन्देन त्रिविधशिक्षणप्रणाली प्रस्ताविता—

1. शारीरिकविकासः (Physical Education):
स्वस्थं शरीरं जीवनस्य आधारः। अतः प्रारम्भे एव शारीरिकक्षमता, आहारनियमः, स्वच्छता च शिक्षायाम् आवश्यकानि।
2. मानसिकविकासः (Mental Development):
चिन्तनशक्ति, मननकौशलं, तार्किकता, सृजनात्मकता च शिक्षया वर्धनीया। शिक्षयाः उद्देशः न केवलं ज्ञानार्जनं, अपि तु विवेकसम्पन्नता।
3. आध्यात्मिकविकासः (Spiritual Development):
आत्मस्वरूपज्ञानं, साधनायाः प्रेरणा, लोकसेवाया भावना च आध्यात्मिकशिक्षायाः अङ्गानि। अयमंशः शिक्षायाम् भारतस्य वैशिष्ट्यम् अस्ति।



श्रीअरविन्देन उक्तम्— “Education to be true must not be confined to the teaching of some subjects, but must go to the root of man’s growth and bring out the full potential of the soul.” (The National Value of Art, 1910)

तस्य शिक्षादर्शनं जीवनस्य सर्वाङ्गीणविकासाय समर्पितम्। एषः दृष्टिकोणः आधुनिकशिक्षायाः यन्त्रात्मकतां परिहार्यं, मानवीयतया समृद्धां शिक्षापद्धतिं स्थापयितुं समर्थः।

उपसंहारः (Conclusion)

अस्मिन् लेखे वयं द्रष्टुं शक्नुमः यत्, आधुनिकशिक्षणपद्धतिः केवलं प्रमाणपत्रदायिनी भूत्वा आत्मविकासाय असमर्था जाता अस्ति। एषा शिक्षापद्धतिः समाजस्य, राष्ट्रस्य च दीर्घकालीनविकासाय अनुपयुक्ता।

एतस्मिन्नपेक्षायाम् भारतीयज्ञानपरम्परा – गुरुकुलपद्धतिः, योगः, नैतिकशिक्षा, धर्माधारितदृष्टिकोणः च आधुनिकशिक्षायाः परिष्काराय सार्थकं समाधानं प्रददाति। तस्मात् आवश्यकं यत्, शिक्षायां भारतीयदृष्टिकोणं पुनः समावेशयेम। गुरुणा सह सम्बन्धः, धर्मविज्ञानम्, जीवनोपयोगिनी विद्या, समाजाभिमुखदृष्टिः च शिक्षायाः मूलाधारत्वेन स्थापनीया। एवं कृत्वा एव भारतदेशः पुनरपि विश्वगुरुः इति स्थानं प्राप्तुं शक्नोति। एते उपायाः केवलं शिक्षायाः समस्यानां समाधानं न, अपि तु नवभारतस्य निर्माणाय आधाररूपेण स्थातव्याः। भारतीयदृष्ट्या शिक्षायाः नवचिन्तनम् एव आधुनिकविश्वे भारतस्य वैशिष्ट्यं प्रतिपादयतु। अयं पद्धतिः, न केवलं व्यावसायिकतां प्रति, अपि तु लोकहितं, आध्यात्मिकबोधं, चिरस्थायिसंस्कृतेः विकासं च लक्ष्यीकुर्वति।

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AN ANALYSIS OF FEMINIST READINGS OF ABHIJNANASAKUNTALAM

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Kalidasa and his magnum opus **Abhijnanasakuntalam** need no introduction not only to the Sanskrit Fraternity but also to the world at large. Introduced to the western world through the translation of Sir William Jones, **Abhijnanasakuntalam** made a deep impact on the 18th and 19th century Europe so much so that Goethe the German writer has this couplet in praise of it:

If in one word of blooms early and fruits of riper years,
Of excitement and enchantment I should tell,
Of fulfilment and content, of Heaven and Earth;
Then will I but say 'Sakuntala' and have said all. [Indian Review]

The praise, as it is very obvious from the quotation above, is for the magical world of Kalidasa's imagination where he has been able to blend mythology, nature and human emotions in such a manner that they would encompass both Heaven and Earth.

But in recent times, because of theories like feminist literary criticism and gender theory which are ruling the roost in interpreting literature, **Abhijnanasakuntalam** has been looked at and critiqued under different type of lenses than were seen previously. This article is an attempt to critically analyse the feminist approaches to **Abhijnanasakuntalam** which have been quite popular lately.

Feminist literary criticism seeks to analyse the representations of women in literature and exposes gender stereotypes and power dynamics within a literary work which represent women in a marginalised position in a patriarchal society. It aims to show that



women have been historically objectified and are treated as property or object of male sexual gratification. So, themes like gender bias for male child and against female child, sexual objectification of women, women pushed to a secondary role and seen only in relation to men are frequently explored as part of feminist approaches to literary works.

For these feminist literary critics, the society that the play **Abhijnanasakuntalam** depicts is an out and out patriarchal society where male children are not only preferred but the absence of them is seen as tragedy affecting Dushyanta individually and also the entire kingdom as he is a king and needs an heir. The hermits wishing him to have a male heir is like "...suggesting Dushyanta's worth as a king ... will be determined by his ability to father a male child who will be able to carry on his legacy." [Sidgel, 10]. Kanva's parting message to Sakuntala when she is being sent to her husband's place is seen as patriarchy at work where women are positioned as objects to be protected by the father/ husband, where a woman's position is determined only with reference to her husband; her role in her household is to be pleasing the man of the house and not offending him in any way, reinforcing a woman's marginalized status in patriarchal society. It is Maricha's 'lecturing' to the wives of other rishis that stands out to them as another instance of patriarchal preaching on women's status, when Dushyanta's and Sakuntala's reunion takes place.

The feminist critics also censure the comparison of Sakuntala to the delicate flowers like Jasmine and blue lotus both by Priyamvada and Dushyanta [25] as "objectifying and reducing women to passive objects of beauty" while Dushyanta's description is seen as "objectifying and infantilizing" women, Priyamvada's comparison amounts to "women ...internalising the harmful gender stereotypes" [Sigdel,11] of the prevailing patriarchal society. Sakuntala being described in terms of sexual imagery by Dushyanta while watching her [without her consent] hiding behind a tree is seen as not only an act of voyeurism but also an act of sexually objectifying her and



seeing her for only her body and not the feeling thinking human being behind it. [Sigdel, 10] The very fact that Sakuntala is rejected for not producing the evidence of her Gandharva Vivaha is declared as a proof for the secondary status of women in Kalidasa's time not withstanding that there is curse by Durvasa because of which Dushyanta forgets his past with Sakuntala.

The ecofeminists who believe " ... in patriarchy women and nature are treated as feminine and are dominated and exploited"[Khanal,230] go a step further and declare that Dushyanta description of Sakuntala as a flower yet to be smelt, a delicate shoot yet to be torn apart by a nail, an unpolished diamond, fresh honey yet to be tasted[76] not only associates Sakuntala with Nature's "bewitching freshness and sanctity"[233] but also Dushyanta's greedy desire of "colonizing and consuming" Sakuntala. [233] They go to the extent of calling Gandharva Vivaha that Sakuntala has of her own volition as "a male created contractual policy to keep women as a private property." [Khanal, 233]

Attempts are also made to juxtapose the subdued femininity of Sakuntala and the dangerous and deviant femininity of her mother Menaka to show that Kalidasa is at pains to show that Sakuntala may have the 'apsara like' beauty of her mother but very unlike her mother in her behaviour. They point out that Menaka is a dangerous and deviant femininity who does not fit into the Patriarchal structure because she not only leaves her child but also Viswamitra and never to return into his life. To overturn 'the stigma of promiscuity and assertive individuality of apsaras'[Yangzom, 39] like Menaka, Sakuntala, the feminist critics, claim is projected as a pativrata *stree* by Kalidasa who does not fall out of love with her husband even after her public and very humiliating rejection but waits for him to take her back as a wife. Sakuntala is made to be the 'domesticated femininity' that fits into a patriarchal society. [Yangzom,39] She thus is invested with the qualities of a typical *nayaki* of a Sanskrit nataka.



Dushyanta himself is not seen as a noble king but one who is given to philandering, maintaining a harem full of queens yet trying his luck when he comes across Sakuntala. Madhavya mocks at the king saying that just as one who is satiated by sweets would love to taste tamarind, he is running after a hermit girl when he has a harem full of voluptuous women at his disposal.[71] Harem is seen as an extreme form of sexual objectification of women. [Sigdel,11] The feminists further point out that the callousness with which Dushyanta treats his other queens only show that he is an agent of patriarchy. He is seen as product of patriarchal Brahminical order who follows rules prescribed by that order at the cost of hurting others which includes animals he hunts and wives he ignores. [Yangzom,39] The curse and the ring are also considered just ploys introduced by Kalidasa to gloss over the blatant unpleasant nature of Dushyanta's personality.

Having mentioned the points to show how the feminist critics perceive **Abhijnanasakuntalam**, it is essential that a detailed analysis is made of the play to enquire whether the perceptions are valid or not. Kalidasa breaks new ground in dramatization of **Abhijnanasakuntalam**. Let us begin with the title of the play – **Abhijnanasakuntalam** – Recognition of Sakuntala. With the title itself Kalidasa makes sure that his audience know that Sakuntala is the centre of his drama even though according to the tenets of Sanskrit Nataka which Kalidasa follows, Dushyanta the *dhirodatta* type of hero should be the centre. Sakuntala remains the focus of attention from the time she is introduced whether she is on the stage or not. Her presence and even more her absence matters.

The way Sakuntala's character is presented and developed also shows that Kalidasa was going against the grain of the tenets of Sanskrit drama. Unlike a traditional *nayika* of a nataka, Sakuntala is not presented only in terms of the actions of the hero. Nor Kalidasa does present her only as a second fiddle to the hero. Sakuntala as envisaged by Kalidasa is not a demure innocent girl who couldn't fend for herself. It has to be remembered that she, not the elderly



Gouthami or even other hermits like Sarnggrava are made in charge of the hermitage in the absence of Kanva which emphasises her capabilities. When she falls in love with Dushyanta, she is the first one to confess. Even though she keeps it a secret within her. Her friends' encouragement makes her courageously confess her love to him through a letter even though she may face rejection. "I know not your mind, O cruel one but day and night, Cupid causes acute pain to the limbs of me whose affection is centred in you" [107] The letter reflects her 'agency' – her ability to decide for herself her life, fate and future. Not even once she has misgivings or fears that she may be doing something wrong. Nor she waits for approval of anyone – not even of her father. It is one of her friends Priyamvada who worries but not her. "I do not know what Father [Kaashyapa] will do on hearing this affair." [121] Sakuntala is sure of herself. She shows awareness of the world when she comments on Dushyanta's harem full of queens. She tells Priyamvada "Why do you detain the royal sage, who is pining on account of his separation from the ladies of his harem" [109] It is her intelligent way to elicit a promise from him that he wouldn't neglect her which makes Dushyanta promise that only two women are going to be in his life one Sakuntala and other – Rajyalakshmi his kingdom. "Notwithstanding the multitude of wives (only) two (will be) the glory (or mainstay) of my line, the sea-girt earth, and this friend of yours." [111] Independent of thought, she is aware of the circumstances of her life and is not blindly lead or controlled by Dushyanta. When he tries to kiss her before the Gandharva Vivaha, she softly but surely stops him from taking advantage of her even though she is head over heels in love with him. "King of Puru race, keep to decorum." [113]

When she is repudiated by Dushyanta who under a curse does not remember her and mocks her, she faces him with dignity and stands for her honour trying to clear her name of deception. "What good, indeed will a reminder do, when that sort of love has undergone such a change? ... Still, this must be done as my own self has to be cleared by me." [141] Kalidasa's Sakuntala is often compared to the Sakuntala of the **Mahabharata** in this aspect. As it well known,



Kalidasa seems to have derived the idea of the story from the **Mahabharata**. It is often projected that the **Mahabharata's** Sakuntala shows feisty nature argues and demands recognition due to her and her son. In comparison, it is often said that in trying to ennoble Dushyanta, Kalidasa has made Sakuntala a pale and insignificant one as against very independent Sakuntala of the Mahabharata. It has to be remembered that Sakuntala's cries in the court of Dushyanta in Kalidasa's play are not cries of mere helplessness as it is often interpreted but of shock which shatters her like a bolt from the blue. It has to be remembered that she calling Dushyanta 'anarya' is of great significance. It is not just a word of blame but a word to remind him that he is safekeeper of honoured tradition of Aryans which he is flouting by rejecting her. It is a warning to him not to cross the line. It is an admonition that he is breaking the dhrama. For, Sakuntala the harsher punishment comes from her own people Sarnggrava and Saradvata who in their self-righteous pomposity leave her to fend for herself. It cannot be generalised to say that she is treated that way because she chose to marry without the consent. Kalidasa, through the use of irony makes sure that Sakuntala's repudiation by her own people is seen not in a generalised sense but as an instance of lacking of qualities empathy and humility of asceticism in Sarnggrava and Saradvata. The way both of them talk and comment on everything in a very condescending manner prepares the spectators to the highhanded sanctimonious behaviour that is seen in their interaction with Dushyanta and then their repudiation of Sakuntala. Sakuntala allows her sorrow to overwhelm her only when she goes out of the court. In her cry for the earth to pave and take her in, as in the case of Sita in the **Ramayana**, it is her dignity that stands out not her helplessness. She is rescued by Menaka her mother who comes back do her motherly duties and takes her to safe haven of Maricha hermitage. She even sends Sanumati to gather information on Dushyanta. It is to be remembered that 'motherly' Menaka is designated a symbol of 'dangerous femininity' and a contrast to Sakuntala by some feminist critics.



The reunion of Sakuntala and Dushyanta also comes under the critical lenses of the feminist critics. Though not her vivacious self any longer, Sakuntala is still in love with Dushyanta because through Sanumati her mother's friend she is aware of Dushyanta's remorse at repudiating her. Yet, it has to be reiterated that when Dushyanta meets her in the Maricha ashrama and her son Sarvadaman asks her about the identity of Dushyanta, she does not acknowledge Dushyanta as her husband. She waits for Dushyanta to admit and accept before the hermits that she and Sarvadaman are his wife and son. It is only after Dushyanta *kneels* before her that Kalidasa makes her accept Dushyanta and greet him as a husband is greeted by a wife. Imagine the dramatic impact of Dushyanta kneeling before her seeking pardon and reconciliation with her. Sakuntala makes sure that if she is repudiated publicly, her reconciliation with her husband can happen only after apology and reconciliation in public by him. Her happiness gets accentuated when she comes to know from Maricha that Dushyanta did not forget her on his own but because of the curse.

Just as Kalidasa breaks tradition in the conceiving Sakuntala, he breaks new path in designing the character of Dushyanta. Kalidasa presents Dushyanta, unlike the usual heroes of Sanskrit drama, "as human and fallible" [Rajan, 89] Kalidasa creates a much complex and interesting character of Dushyanta than one would expect in a *dhirodhata* character. He is no doubt presented as majestic and strong in person with graceful manner. Among his courtiers and the public there is a perception of he being a '*rajarshi*' but Kalidasa very cleverly puts him under his ironic scrutiny especially in the earlier part of the play so that we become aware of his weaknesses. The way Dushyanta falls in love with Sakuntala and observes her beauty in sexual terms eagerly waiting to enjoy certainly makes him look a 'philanderer'. Madhavaya's comments when Dushyanta praises Sakuntala as 'the jewel of womankind'[73] on him corroborate our perception of him. "If so all fair ladies are now thrown into the background." [73]



But it would be wrong to fix our opinion of Dushyanta only on the earlier part of the play especially on the repudiation scene where Dushyanta seems to repudiate Sakuntala rather cruelly. Because of the curse which is Kalidasa's invention Dushyanta forgets about his marriage to Sakuntala and when she reaches his palace, refuses to acknowledge her as his wife. Dushyanta's repudiation is not only called 'callous and cruel'[Rajan, 92] but has been termed 'sexist'[Yangzom,37] forgetting the fact that Dushyanta is pushed to speak harsh mostly because of, 'not partly because of' [Rajan, 93] the sanctimonious way Sarngrava and Saradvata behave with the king making unfounded accusations not only at him but dragging his ancestors into the conversation. When Sakuntala fails to provide the ring as an evidence, the enraged Dushyanta takes it on her and makes the comment that she is trying to palm off someone else's child as his and generalises about the deceit of women. The so called 'sexist remarks' have to be seen in the context of the heated debate that happens.

No doubt, as Rajan says, in the beginning Dushyanta knows Sakuntala only carnally [86] but on the discovery of the ring and his realisation of what happened, his remorse which makes him neglect his kingly duties, through his intense sense of guilt, through his fear of never be able to meet his wife or son again, Dushyanta changes for the better. So, when he sees Sakuntala in the Maricha's hermitage, it is not the 'roving eye for beauty' that sees her but for the first time he sees her as the 'person of intrinsic beauty not merely a beautiful object' [Rajan, 86] His grief and guilt making him not only a better person but also a better king. Losing his wife and child makes him empathetic towards all those who have lost their dear ones. He becomes respectful towards his queen Vasumati even as he grieves the loss of Sakuntala. It would be a great disservice to Kalidasa's impeccable dramatic sense if one forgets to acknowledge and appreciate this arc of transformation that he brings about in the characterisation of Dushyanta and thus in his (Kalidasa's) take on the repudiation of Sakuntala.



Sakuntala's repudiation in the absence of the ring also has made feminists complain that inanimate objects are given importance over and above what a woman says by Kalidasa reflecting gender bias. It has to be remembered that Kalidasa himself brings the ironic perspective whether true love requires an evidence by making Sanumati the friend of Menaka say "...how is it that love of such a type requires a token of recognition" [224] when she comes to see how Dushyanta is faring. Sakuntala being the child of Nature, doesn't care for the objects before repudiation. Nor she cares for it after the reconciliation because she refuses to take back the ring from the King. Thus, the recognition of Sakuntala that the title talks about, goes beyond recognition of Sakuntala with the help of a ring. The 'abhijanana' in the title, with a little more symbolic extension, could also be referring to Dushyanta recognising the true worth of Sakuntala.

No doubt, seen from the lens of feminist literary criticism certain parts of the play especially preference for male child, woman treated as a property of the man etc. would lend themselves to criticism. But it has to be noted and appreciated that Kalidasa stretches the boundaries of the art form which he inherited to imaginatively present Sakuntala as a woman who is independent, courageous and one who wouldn't bog down when faced with difficulties. Though critics like Sigdel talk in a passing manner about the presence of "of female agency" in the play, the emphasis given is to foreground "the subjugation women to male authority" "gender discrimination and sexual objectification of women" as the "primary drawback of the play". [Abstract] Such critics fail to see the enormity of achievement of Kalidasa - the way Kalidasa maps out Sakuntala's character as one with intelligence, courage, dignity and more than anything else 'agency' and the way he brings in the character development of Dushyanta as the play progresses. One can only marvel at how subtly but surely, he expands the boundaries of Sanskrit drama and the roles of *Nayaka* and *Nayaki* in it. In this matter, he seems to be akin to Shakespeare who created intelligent brave and beautiful heroines



in his romantic comedies while the society itself did not present any role models among women.

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वर्तमान परिपेक्षे संस्कृते शैक्षिकमनोविज्ञानम् । In Present Scenario Educational Psychology in Sanskrit.

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उपोद्घातः –

भाषा नाम का इति जिज्ञासायां - भाषा अन्यथाभावानाम्, विचाराणाम्, संप्रेषणस्य स्वरात्मकम् (अथवा) साधनम् अस्ति ।

Language is any means vocal (or) otherwise of expressing communicating feelings (or) thoughts.

शिक्षा तथा भाषायाः विकासः –

बालकानां भाषाविकासस्य तेषां शिक्षायाश्च निगूढ सम्बन्धः अस्ति । समुचितभाषाविकासाय समुचितशिक्षा अतीव महत्त्वपूर्णा अस्ति । शिक्षायाः मुख्यतया द्वौ प्रकारौ भवतः ।

- (1) अनौपचारिकशिक्षा
 - (2) औपचारिकशिक्षा
- (1) अनौपचारिक शिक्षा – बालानां विकासस्य प्रवर्धने बालकाः स्वपरिवारात् यां शिक्षां प्राप्नुवन्ति सा अनौपचारिकशिक्षा इति कथ्यते । परिवारे मातापितरः प्रत्यक्षतया शिक्षां ददति । अस्मिन् अर्थे मातापितरः अनौपचारिकाः शिक्षकाः इति उच्यन्ते ।
- (2) औपचारिकशिक्षा – बालकानां भाषाविकासे अपि औपचारिकशिक्षायाः महत्त्वपूर्ण स्थानम् अस्ति । अस्याः शिक्षायाः माध्यमेन शिक्षकाः बालभाषायाः सम्यक् विकासाय साहाय्यं कर्तुं शक्नुवन्ति । अस्मिन् सन्दर्भे निम्नलिखिताः अंशाः सन्ति ।
- अ) कक्षायां शिक्षकाः कस्यापि शब्दस्य उच्चारणं शुद्धतया स्पष्टतया च कुर्वन्तु । यतः बालकाः यथा उच्चारणं श्रुण्वन्ति । तथैव तस्य उच्चारणं कर्तुं शिक्षन्ते ।
- आ) कक्षायां, शिक्षकैः व्यक्तिगतभेदस्य सिद्धान्तः मनसि स्थापयितव्यः तैः स्मर्तव्यं यत् बालकेषु, बुद्धिः, रुचिः, आवश्यकता इत्यादयः परस्परं भिन्नाः सन्ति ।
- इ) शिक्षकाः बालकानां मध्ये शिक्षायां रुचिं सृज्यन्ति, यतोहि रुचिः अभावात् ते गुरुः प्रति अवधानं दातुं न समर्थाः भवन्ति । नूतनाः शब्दाः अपि न शिक्षितुं समर्थाः भवन्ति ।

संस्कृतशिक्षायाः प्रयोजनम् -

अत्र वयं अग्रे विचारयिष्यामः यत् वर्तमाने संस्कृतशिक्षायाः किं प्रयोजनम् ? कार्यान्तरूपं संस्कृतशिक्षायाः विकासे व के उपायाः सन्ति इति ।

सम्पूर्णदेशे संस्कृतशिक्षायाः वर्तमानस्थितेः सर्वेक्षणं कृत्वा अयं विषयं स्वीकृतः । शिक्षादर्शनम्, शिक्षेतिहासः, शिक्षामनोविज्ञानम्, शैक्षिकप्रविधिः, इत्यादिविषयान् संस्कृतमाध्यमेन बोधयन्ति । छात्राणां परीक्षालेखनमाध्यमपि संस्कृतमेव अस्ति ।

मनोविज्ञानम् -

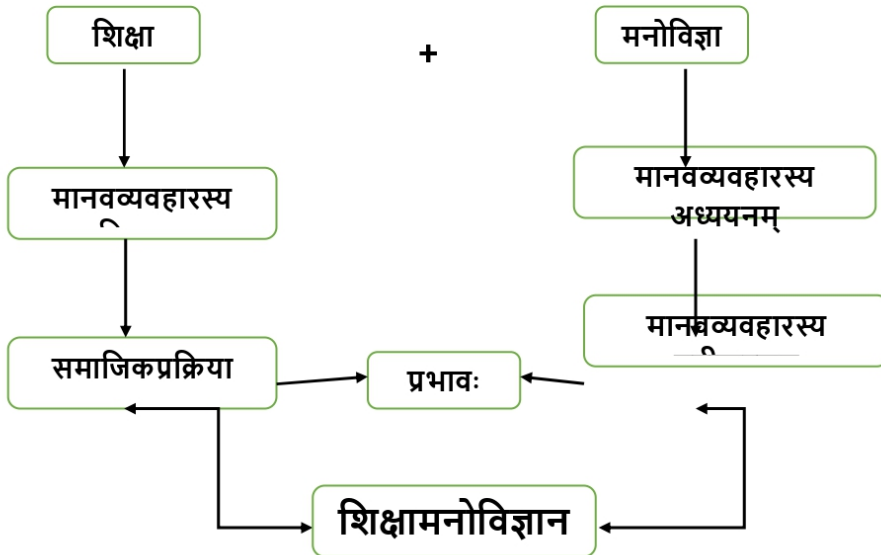
मनोविज्ञानम् इत्यस्य आङ्ग्लभाषायां Psychology इति समानार्थकशब्दः वर्तते । पदमेतत् Psyche तथा Logos इति ग्रीकपदाभ्यां निष्पन्नम् । तत्र Psyche इत्यस्य आत्मा इति Logos इत्यस्य विज्ञानम् इति च अर्थः वर्तते । **Psyche + logos = Psychology**

आत्मा + विज्ञानम् = आत्मनः विज्ञानम् ।

शिक्षा मनोविज्ञानयोः सम्बन्धः -

शिक्षामनोविज्ञानं मनोविज्ञानस्य अनुप्रयुक्तशाखा वर्तते । समासपदेऽस्मिन् शिक्षामनोविज्ञानम् इति द्वे पदे स्तः । तत्र मनोविज्ञानस्यार्थः ज्ञातपूर्वः । शिक्षायाः अर्थमिदानीं ज्ञास्यामः । बालकाः जन्मतः कानिचन शारीरिक-मानसिकसामर्थ्यानि प्राप्नोति । परन्तु केवलं वंशानुक्रमात् प्राप्तसामर्थ्यानि प्राप्नोति । परन्तु केवलं वंशानुक्रमात् प्राप्तसामर्थ्यानि लक्षणानि गुणाश्च 'सामाजिकजीवनं यापयितुं पर्याप्ताः न भवन्ति । एते गुणाः छात्रेषु भवेयुः तदा एव बालकस्य शिक्षाव्यवस्था सम्पूर्णा भवति ।

शिक्षामनोविज्ञानस्य सम्बन्धः -



शिक्षामनोविज्ञानस्य परिभाषा: -

(1) कोलेनिक महोदयः - शिक्षामनोविज्ञानं नाम मनोवैज्ञानिकसिद्धान्तानाम् अनुसन्धानस्य

च शिक्षाक्षेत्रे अनुप्रयोगः ।

(2) क्रेगप्रभृतयः - शैक्षिकवातावरणे सामान्यमनोवैज्ञानिकसिद्धान्तानाम् अनुप्रयोगः एवं शिक्षा मनोविज्ञानम् ।

(3) शि.ई.स्किनरमहोदयः- शिक्षामनोविज्ञानं विशेषतया मानवानुभवानां व्यवहारस्य सम्बद्धानुसन्धानफलितानि शैक्षिकपरिस्थितिषु प्रयुनक्ति ।

(4) N.L. Munn - Psychology is concerned with over all adjustment of the organism to the environments.

(5) Jhon.F.Travors - Educational Psychology is described as the systematic study of people (pupils), Learning and Teaching (1970).

वर्तमानसमाजे शैक्षिकमनोविज्ञानस्य उपयोगिता –

Utility of Educational Psychology:

अस्माकं मनसि अयं प्रश्नः उत्पद्यते यत् शिक्षामनोविज्ञानस्य अध्ययनस्य का उपयोगिता इति ।

एतस्य प्रश्नस्य समस्यायाः समाधानार्थं यदा वयं शिक्षामनोविज्ञानं तटस्थरूपेण पश्यामः तदा ज्ञायते ।

शिक्षामनोविज्ञानस्य अध्ययनं शिक्षायाः विभिन्नक्षेत्रेषु उपयोगि सिद्धं जातम् । अद्यत्वे च स्वसिद्धं भवति । पाठकानां सुविधायै वागमनम् शिक्षामनोविज्ञानस्य उपयोगिता निम्नलिखित रूपेण उक्तास्ति ।

1) बालकस्य स्वभावे (In Understanding the Child's Nature)-

शिक्षामनोविज्ञानस्य अध्ययनेन बालकस्य स्वरूपं अवगन्तुं बहु साहाय्यं भवति । शिक्षाजगति शिक्षामनोविज्ञानस्य अध्ययनात् ते ज्ञातवन्तः यत् बालशिक्षा तदा एव सफला भवितुम् अर्हति । तेषां शिक्षानुसारं भवति प्रकृतिः । बालकस्य स्वभावस्य अर्थः तेषां रुचिः मनोवृत्तिः, बुद्धिः, व्यक्तित्वगुणाः, आवश्यकता, इत्यादयः । अद्यत्वे बालकानां शिक्षा सफला भवति । अनेन तथ्येन सहजतया सिद्धं भवति ।

2) शैक्षिकप्रक्रियायाः अवगमने (In Understanding Educational Process)-

शिक्षायाः सफलतायै शैक्षिकप्रक्रियाणां अवगमनमपि आवश्यकम् अस्ति । आचार्यस्य शिक्षिकायाः च शैक्षणिकप्रक्रियायाः स्वरूपस्य विषये अवगमनम् आवश्यकम् ।



एतत् तदा एव सम्भवति यदा ते शिक्षामनोविज्ञानस्य अध्ययनं कुर्वन्ति। अन्येषु शब्देषु शिक्षामनोविज्ञानस्य अध्ययनेन शिक्षकाः छात्राः च शिक्षायाः विभिन्नपक्षेषु अवगताः भवितुम् अर्हन्ति। फलतः ते शिक्षकस्य, शिक्षिकायाः च भूमिकायां अधिकं सफलाः सिद्धाः भवन्ति। अस्य तथ्यस्य आधारेण अपि शिक्षामनोविज्ञानस्य महत्त्वं वा उपयोगिता वा सिद्धा भवति।

3) शिक्षकं प्रभावं कर्तुं (In Making the teacher effective) -

प्रभावशिक्षकस्य अर्थः अस्ति यत् सः शिक्षकः यः छात्रान् सम्यक् शिक्षयित्वा तेषां सर्वतोमुखविकासे सहायकः भवति। एतत् तदा एव सम्भवति यदा शिक्षकः शिक्षिकायाः आवश्यकता, बौद्धिकक्षमता, रुचिः इत्यादीनां विषये अवगतः भवति। एतत् ज्ञानं प्राप्तुं शिक्षामनोविज्ञानस्य अध्ययनम् आवश्यकम् अस्ति। अतः शिक्षामनोविज्ञानस्य अध्ययनात् आचार्यः अध्यापनस्य त्रयाणां पक्षाणाम् अर्थात् किम् (किम्), कथं (कथं) किमर्थं च (किमर्थम्) विषये सूचनां प्राप्नोति। तथा च ज्ञायते यत् किं किं पाठनीयम्, कथं कर्तव्यम् इति। अस्य आधारेण अपि शिक्षामनोविज्ञानस्य अध्ययनस्य आवश्यकता, उपयोगिता च सिद्धा भवति।

4) शिक्षणपद्धतिं प्रभावं कर्तुं (In making teaching methods effective)-

प्रभावशिक्षणपद्धतेः अर्थः सा पद्धतिः यया शिक्षा बालकानां अधिकतमं लाभं ददाति, तेषां सर्वतोमुखविकासे च सहायिका भवति। कस्य बालस्य कृते का पद्धतिः अधिकं प्रभावं भविष्यति इति ज्ञातुं शिक्षामनोविज्ञानस्य अध्ययनम् आवश्यकम्। शैक्षिकमनोवैज्ञानिकाः स्वस्य निरन्तरसंशोधनात् प्राप्तपरिणामानां आलोके विभिन्नवर्गस्य बालकानां कृते भिन्नाः शिक्षणपद्धतीः अनुशंसन्ति। शिक्षकाः शैक्षिकमनोवैज्ञानिकानां सूचनानुसारं प्रभावशिक्षणपद्धतिं उपयुज्यते, येन बालकाः अधिकतमं लाभं प्राप्नुवन्ति। अस्य वास्तविकतायाः आधारेण अपि शिक्षामनोविज्ञानस्य महत्त्वं सिद्धं भवति।

5) बालानां शिक्षणार्थं प्रेरयितुं (In Making children motivated to learn) -

शिक्षामनोविज्ञानस्य अध्ययनस्य एकः लाभः अस्ति यत् बालकानां स्वपाठं शिक्षितुं वा स्मर्तुं वा प्रेरयितुं साहाय्यं करोति। शिक्षामनोवैज्ञानिकाः स्वसंशोधनस्य आधारेण कथितवन्तः यत् बालकाः कथं शिक्षणं प्रति प्रेरिताः भवेयुः। थॉर्नडाइकः बालकानां अध्ययनं कृत्वा रुचिं जनयितुं तेषां शिक्षणं प्रति प्रेरयितुं शारीरिकपुरस्कारेषु मौखिकपुरस्कारेषु च बलं दत्तवान्, दण्डस्य महत्त्वं च गौणम् अकरोत्। स्किनर् बालकान् स्वपाठान् स्मर्तुं प्रेरयितुं सुदृढीकरणस्य महत्त्वं बोधितवान्। एतेषां मनोवैज्ञानिकानां योगदानस्य लाभं गृहीत्वा अद्यत्वे अपि शिक्षकाः मातापितरः च बालकान् स्वपाठं ज्ञातुं वा कण्ठस्थं कर्तुं वा प्रेरयन्ति। परन्तु ये शिक्षकाः मातापितरः वा एतस्मात् ज्ञानात् वञ्चिताः सन्ति ते अद्यापि बालकान् शिक्षणं प्रति प्रेरयितुं असफलाः भवन्ति। एषा वास्तविकता शिक्षामनोविज्ञानस्य उपयोगिता अपि सिद्धां करोति।



- 6) **कक्षायाम् अध्यापनं प्रति अभिरुचेः वर्धनम् - (In increasing interest towards classroom teaching)** - शिक्षामनोविज्ञानस्य महत्त्वं तस्मात् अपि स्पष्टं भवति यत् तस्य अध्ययनेन शिक्षकाः स्वच्छात्रेषु वर्गशिक्षणविषये जागरूकतां रुचिं च निर्मातुं साहाय्यं कुर्वन्ति। आयान्ति तेषां सामाजिक-आर्थिक-स्थितिः च भिन्ना भवति। मनमाना पथिम इन् विश्वयमभेदांसि आस्था अच्छति। अध्यापकः एतान् भेदान् मनसि कृत्वा बालकान् पाठयन्त, प्रायः बालः स्वाक्षायं रुचिं लभन्ते, उपस्थितिः भवन्ति, तेषां शिक्षास्य लभनं च लभन्ते ।
- 7) **भूमिकावर्गस्य अवगमनम् (In Understanding role category)** - शिक्षामनोविज्ञानस्य एकं विशिष्टं महत्त्वं अस्ति यत् मातापितरः, शिक्षकाः तस्य अध्ययनं कर्तुं शक्नुवन्ति। एतत् शिक्षिकायाः अधिकारिणां च भूमिकावर्गान् अवगन्तुं साहाय्यं करोति । अन्येषु शब्देषु शिक्षामनोविज्ञानस्य अध्ययनेन ते स्वस्वकर्तव्यं अधिकारं च अवगच्छन्ति । अत्र कक्षायाः शिक्षणस्य सफलतायै विशेषतः शिक्षकस्य शिक्षिकायाः च भूमिकायाः ज्ञानम् अतीव महत्त्वपूर्णम् अस्ति। शैक्षिकमनोविज्ञानस्य अध्ययनात् ते ज्ञायते यत् तेषां कक्षायां विषयविशेषज्ञस्य, अनुशासनस्य, अभिभावकस्य च भूमिकां कथं भवति इति। अपरपक्षे शैक्षिकमनोविज्ञानस्य अध्ययनात् शिक्षिकैः ज्ञायते यत् आज्ञाकारिच्छात्रस्य भूमिकां कथं भवतीति। एतयोः परस्परसहकारेण वर्गशिक्षणं सफलं भवति । अनया दृष्ट्या अपि शिक्षामनोविज्ञानस्य महत्त्वं स्वतः एव दृश्यते।
- 8) **कक्षायां अनुशासनहीनतायाः समाधानम् (In solving classroom indiscipline)** - शिक्षामनोविज्ञानस्य अध्ययनं कक्षायां अनुशासितव्यवहारस्य नियन्त्रणे साहायकं भवति। शिक्षामनोविज्ञानस्य अध्ययनेन शिक्षकाः अधिकारिणश्च अनुशासनहीनतायाः कारणानि ज्ञात्वा, तानि कथं दूरीकर्तुं शक्नुवन्ते इति विषये सूचनां प्राप्नुवन्ति। एतस्याः सूचनायाः लाभं गृहीत्वा ते अनुशासनहीनतायाः समाधानं कर्तुं समर्थाः भवन्ति। अस्य आधारेण अपि शिक्षामनोविज्ञानस्य अध्ययनस्य उपयोगिता सिद्धा भवति।
- 9) **मानसिकस्वास्थ्यस्य उत्त्रयनार्थम् (In improving mental health)** - शिक्षामनोविज्ञानस्य अध्ययनस्य एकः लाभः अस्ति यत् एतत् शिक्षकस्य शिक्षिकायाः च मानसिकस्वास्थ्यस्य उत्त्रयनार्थं साहाय्यं करोति। मानसिकस्वास्थ्यं किम्, मानसिकस्वस्थस्य शिक्षकस्य छात्रस्य वा कः परिचयः, ते किमर्थं मानसिकरूपेण अस्वस्थाः भवन्ति, तस्य दुष्प्रभावाः के सन्ति, पुनः कथं मानसिकरूपेण स्वस्थाः भवेयुः इत्यादिज्ञानं मनोविज्ञानेन । अतः एतस्याः सूचनायाः लाभं गृहीत्वा ते स्वं मानसिकरूपेण स्वस्थं कृत्वा वर्गशिक्षणं सफलं कर्तुं शक्नुवन्ति।
- 10) **आत्मविश्लेषणं तथा आत्मावबोधनम् च (In self-analysis and self-understand)** — शिक्षामनोविज्ञानस्य महत्त्वं अनया दृष्ट्या अपि सिद्धं भवति। शिक्षायाः अध्ययनेन शिक्षकः छात्रश्च स्वस्य विश्लेषणं कर्तुं समर्थः भवति । तथा च शिक्षामनोविज्ञानस्य अध्ययनेन ज्ञायते यत् अन्येषां व्यवहारं शिक्षणस्थितीनां च सम्यक् अवगमनाय इदमपि आवश्यकं यत् व्यक्तिः प्रथमं



स्वस्य विश्लेषणं कृत्वा स्वयमेव अवगन्तुं प्रयतते इति, फलतः छात्रस्य, व्यवहारं वास्तविकरूपेण अवगन्तुं तस्य कृते सुविधा भवति । डैश (Dash, 1998) इत्यनेन लिखितं यत् शिक्षामनोविज्ञानस्य एतत् महत्त्वं न केवलं अद्वितीयं अपितु वर्तमानशिक्षणं सफलं कर्तुं आधारशिला अपि अस्ति।

एवं स्पष्टं भवति यत् शिक्षामनोविज्ञानस्य अध्ययनं वस्तुतः अतीव उपयोगि, सार्थकं महत्त्वपूर्णं वा अस्ति।

उपसंहारः –

मनोविज्ञानस्य ज्ञानं शिक्षकस्य सफलतायाः रहस्यम् अस्ति। अस्य ज्ञानस्य आश्रयं न गृहीत्वा अक्षमताम् असफलतां च गत्वा व्यावसायिकजीवनस्य यात्रां समाप्तुं अर्हति । शिक्षामनोविज्ञानेन न केवलं कक्षायाः शिक्षणार्थं शिक्षकस्य मार्गः प्रशस्तः, अपि तु तया शिक्षकाः, अभिभावकाः, छात्राः, समाजः च शैक्षिकसमस्यानां परिचयपुरस्सरं समाधानं कृत्वा जागरूकाः कृताः, समायोजनस्य क्षमता विकसिता, कार्यदक्षता विकसिता तथा नूतनवंशनिर्माणे शिक्षकस्य भूमिका सक्षमा अभवत्।

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THE CONCEPT OF RENUNCIATION OR SANYASA IN THE SELECTED NOVELS OF R.K. NARAYAN

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R. K. Narayan is one of the three important Indian novelists in English. Mulk Raj Anand and Raja Rao are the other two important novelists. He is the only writer who was included in The Writers and Their Workshop by The British Council. R.K. Narayan has Indianised the novel, which is essentially Western art form. According to William Walsh R.K. Narayan's "Writing is a distinctive blend of Western technique and Eastern material, and he has succeeded in a remarkable way in making an Indian sensibility at home in English art". (Walsh 54) Major part of his fiction is autobiographical and he gives his life experiences in his fiction. He writes about the middle class particularly South Indian middle class, his own class, because he is familiar with the ways, habits and aspirations of the middle class and so he limits himself to this middle class. In his fiction, Malgudi plays a major role and it is a live character. Millions of English readers have flocked to since 1935. Whether it is a novel or a short story, the setting is same Malgudi. As William Walsh says, "The Malgudi of his novelist's life, becomes an intense and brilliant image of India itself. Whatever happens in India happens in Malgudi, and whatever happens in Malgudi happens everywhere". (Walsh 56) It is the same pace of life, same locale and topography without monotony. This is the result of his great craftsmanship.

There are traces of Indian philosophy, thought and sentiment in his fiction. Narayan has high creative power. It is because of this creative and imaginative insight, that he described Indian life and the Indian people, culture and traditions with a rare detachment without ever trying to moralize, or give his personal views.

Varnasrama Dharma is one of the basic principles of Hinduism. It is a peculiar characteristic feature of Hinduism. The word *Varnasrama* is a combination of *Varnas* and *Asramas*. The word *Varnas* tells the meaning of social origin of the society that is the origin of four classes in a society. The word *Asramas* or Stages tells the meaning of



spiritual order of life in a *Vedic* society. The four Asramas or Stages are *Brahmacharya*, *Grihastha*, *Vanaprastha* and *Sanyasa*. The *Varnashrama Dharma* system is progressive detachment from material enjoyment. It gives discipline to a man in the society. The ultimate goal of the *Varnashrama Dharma* system is Bliss or Self-Realisation. According to *Varnashrama Dharmas* the human life is divided into four parts – the first part is *Brahmacharya* or Bachelorhood (Student Life), the second is *Grihastha* or Householder (Married Life), the third *Vanaprastha* or Detachment (Retired Life) and the fourth part is *Sanyasa* or Self- Realisation (renounced Life).

Sanyasa Ashram is the last and most important of *Varnashrama dharmas*. There are three novels on this concept written by R. K. Narayan i.e. *The Bachelor of Arts*, *The Guide* and *A Tiger for Malgudi*. The purpose of this paper is to examine in which of the novels the concept of *varnashrama dharma* is elaborated and strongly expressed.

The novel, *The Bachelor of Arts* intends to show the bachelor life of Chandran and his false love, attractions and reality. The theme of the novel is education of a young man. Chandran's education completes at college, at home and in the world at large. He perfects himself gradually after a series of incidents in his life and settles as a good natured young man in the society. His life as a college student is heroic and life out of college, falling in love is typical of any bachelor. He wants to get married to his beloved, Malathi, irrespective of the tradition. However, the horoscopes do not tally and the marriage does not take place. For this he is extremely frustrated and dejected and falls ill. He does not revolt against his elders because of the principles he learned from his respectable family. Out of grief he goes to Madras for a change to his uncle's house. But he goes to a hotel and stays a day without any particular intention in his mind. As a principled man he is free from bad habits. Even when provoked by a new friend to have a drink or visit a prostitute house, he very tactfully slips out and does not yield to temptation. That night he spent on the footpath, and by the morning he decides to become a *Sanyasi*, having donned the garb of *Sanyasi*, Chandran wanders aimlessly through the countryside.

Shelterless, foodless and strengthless is Chandran in the present condition. This is a perfect appearance for him now to play the role of a *Sanyasi*. Chandran spends eight months as a *sanyasi*, here he does some self-introspection and comes to a conclusion that



what he believes as renunciation is not renunciation at all. In other words, it may be another form of suicide for which he does not dare to commit. He avoids suicide because of the social stigma attached to it. Further, he lacks the barest physical courage for resorting to it. He was a sanyasi because it pleases him to mortify his flesh. So, Chandran realises that it is his infatuation for Malathi which brought him to this ignoble position. He does not to deceive any one additionally. The simplicity and innocence of the village folk touches his heart and makes him realise his self-deception. In other way he is deceiving and exploiting others too. He has become a cheat and now he hates his hypocrisy. All this is just because of Malathi and his love for her. After this retrospection he comes out of his love for Malathi. He realises that he stooped down to this stage due to his love towards Malathi. This thought in him makes him angrier. Out of a self-analysis and all foolish things he is doing, Chandran decides to leave the village and also the role of *Sanyasi*, and returns to Malgudi. Only then he realises how much his parents love and worry about him due to his disappearance. His illusions regarding love and marriage have been shattered. Thus step by step his eyes are opened to truth and from a raw romantic he matures into a realist. The remaining gap in his life is also filled when he finds to his pleasant surprise that there can be other girls as divine as Malathi, and the moment he sees Susila, whose horoscope has already matched his, he madly falls in love with her and all his sad memories of Malathi are wiped off in his new found joy. Here ends the story of Chandran, *The Bachelor of Arts*.

The important novel by R. K. Narayan on the same concept of Sanyasa is the Sahitya Academy Award winning novel, *The Guide*, which is published in 1958. The protagonist, Raju, is portrayed through the various roles he assumes throughout his life. His character continually adapts to shifting circumstances, taking on new identities as situations demand. Yet, a subtle but consistent thread runs through his journey—the instinct to guide others in their personal and social dilemmas. This underlying trait forms the core of the novel, which is why Narayan aptly titles it *The Guide*. Raju is, in every sense, the guide—both to others and, paradoxically, a failed guide to himself. The story begins with the introduction of the railways to Malgudi, which brings a steady flow of tourists to the region. Malgudi is described as a picturesque town, surrounded by verdant hills, dense forests, the flowing Saryu River, and ancient



ruins lost in time. In this evolving setting, Raju transforms from a modest shopkeeper into a successful tourist guide. His charm, intelligence, and sociable nature earn him both wealth and popularity.

Raju's life takes a pivotal turn when he encounters a young couple, Marco and Rosie, during one of his tours. Marco, a reserved scholar, disapproves of Rosie's love for classical dance, considering it beneath their social stature. In contrast, Raju encourages Rosie to pursue her passion and gradually becomes deeply involved in her life. "Rosie is a woman of strong emotion and passion. She has a passionate ambition of becoming a dancer of name and fame". (Singh 68) He not only supports her artistic ambition but also manipulates her relationship with Marco, deepening the rift between husband and wife.

Eventually, Marco leaves Rosie behind in Malgudi and returns to Madras. Rosie, seeking support, moves into Raju's home, and the two begin living together. Raju becomes her stage manager and uses his marketing skills to establish Rosie as a renowned dancer. However, with success comes arrogance. Raju becomes possessive and begins controlling Rosie, primarily driven by pride and financial greed. His downfall begins when he commits forgery by signing a legal document on Rosie's behalf. Despite her efforts to defend him, Raju is sentenced to two years in prison.

After completing his sentence, Raju avoids returning to Malgudi in disgrace. Instead, he takes shelter in an abandoned temple near the village of Mangal. There, villagers mistake him for a sadhu (holy man), and he gradually assumes the role. Initially playing along for convenience, Raju begins to deliver spiritual advice and help resolve local disputes. Over time, he becomes a respected figure in the community.

Caught in a web of social expectation and newfound faith placed upon him, Raju continues his act. But slowly, this role leads him toward genuine introspection and transformation. Through solitude, contemplation, and the villagers' unwavering faith, Raju attains a state of spiritual awakening. He learns to surrender his ego and desires for the greater good, embracing selflessness. To the villagers, he becomes a Mahatma-like figure. One villager remarks: "If he fasts, there will be rain. Out of his love for us, he is undertaking it. This will surely bring rain and help us." (Narayan, p. 102) When a situation arises that a severe drought hits the village,



Raju is asked to fast to bring rain, in which Raju is left with no choice but to undertake a fast for rain. He accepts the task, not as an act, but as a real sacrifice. Renouncing even basic necessities, he fasts for twelve days. On the final day, as his strength fades, he says to Velan: "It's raining in the hills. I can feel it coming up under my feet, up my legs." (Narayan, p. 247) The novel ends on an ambiguous note—whether it actually rains is left unknown. However, what is certain is Raju's profound internal transformation. From a man of deception and desire, he evolves into a figure of selfless devotion and quiet dignity.

Thus, in R.K. Narayan's *The Guide*, Raju's journey is a transformation from a materialistic, manipulative tourist guide to a figure of spiritual significance, potentially achieving sainthood. While he initially exploits the villagers' faith for personal gain, he ultimately experiences a genuine shift in character and purpose. His selflessness in fasting to bring rain to the drought-stricken village suggests a deep spiritual awakening and a move towards a selfless state, akin to a saint.

The most important concept of *Sanyasa* or Self-Realisation appears again in R. K. Narayan's famous novel *A Tiger for Malgudi*. In *A Tiger for Malgudi* R.K. Narayan has portrayed the fourth stage, that of *Sanyasa* and self-realization. In this novel, the hero is Raja, an aged tiger who lives a carefree jungle life until he is chained by the humans. Starting with its cub hood, wild days in the jungle, he becomes a puppet in the hands of the Circus Captain. Later he becomes a hero in a film and works slavishly. He enjoys freedom when he breaks through the film, shooting camp and wanders into the town. Raja subsequently is picked up by a holy man, the master to whom he becomes a true disciple. The Master or *Sanyasi* protects him from a terror – stricken mob and brings about a change in him. He applies powers to save the tiger and transforms it inwardly. R.K. Narayan skilfully projects the *Panchtantra* technique allegorically in the depiction of the fourth and the last stage *Sanyasa* of the *Varnasrama Dharma*. Unlike other novels this novel has a direct flow of philosophical discourse.

A totally transformed form of a human being appears in the role of the Master in *A Tiger for Malgudi*. His profound realism in spirituality is found all through since his appearance at the school.



This is the *Sanyasa* stage where the Master possesses some cosmic powers and uses them to transform a tiger. He practiced yoga and is now an enlightened soul because he left his home not out of wrath 'but out of an inner transformation.' He renounced his family and all material possessions one midnight just like '*Siddhartha*'. All the busy life he is leading seems senseless and abruptly leaves everything and everyone intolerably. He realised the ultimate reality of life, shed all his cravings and started living in isolation with meagre food and meditation. The essence of his teachings to the tiger is so practical that one has certainly to arrive at such realistic thoughts. He teaches that a sense of time is not required by a renounced person. Nobody bothers about the present but worries about the past and the future and loses what is existing. The Master is not tempted by his wife's invitation because he has to undergo a lot of hardship to reach this stage of *Sanyasa* and so rejects her. By this time, he has erased his name and identity from his mind completely. He says that one has to worship the Ultimate, i.e., God. He is reluctant to be called '*Swamiji*'. He has gained such a power of taming a wild animal.

In the Introduction of the novel Narayan "recalls the great event of Kumbha Mela which recurs every twelve years at the confluence of the three rivers, Ganga, Yamuna and Saraswati in Allahabad where he comes across a hermit with his companion tiger. He does not hold the animal on a leash since he claims they were brothers in previous life". (Ramtake 89) Giving philosophical touch to an animal, a new concept in Indian English Literature is used by Narayan in a convincing manner. It is a novel that shows the transformation of a Tiger and the Master who has already reached the stage of *Sanyasa*. Detachment of the self or ego plays a major role in *Sanyasa* or Self-Realisation. The suffering is equal to a man or a beast if led by the ego. Once it is shed off like the leaves of a tree, it is free from all bondage. This realisation occurs both in the Tiger and the Master. The Master is one who renounces everything and undergoes a complete change of personality. He has freed himself from all possessions and human ties. As M.K. Naik says "A Tiger for Malgudi begins as a simple and rather artless fable; it ends as a profound moral statement". (Naik 21) This stage is achieved first by the Master who leads the Tiger also into it by a beautiful comparison of old age to the extinguished lights before one goes to bed. By conquering his ego, the Tiger transcends the emotions of fear and



anger and becomes free from the limitations of the physical world. The Master achieved this spiritual knowledge by his own experience of self-realisation whereas the Tiger is led into it by the Master with his power owned in the stage of *Sanyasa*.

Conclusion

R.K. Narayan explores the philosophy of sannyasa—or renunciation—in three of his notable novels: *The Bachelor of Arts*, *The Guide*, and *A Tiger for Malgudi*. In the novel "Bachelor of Arts" the main character, Chandran, renounces the world to become a sanyasi after a romantic disappointment. This aspect is a significant part of his character development and the novel's exploration of societal norms and personal desires. Whenever his opinion about love changes, he immediately realizes his mistake. He immediately reaches his home like a normal man. That kind of ascetic phase is only for a very short time in his life, but it's not as same as in the case of Raju in *The Guide*. Raju's transformation is deeply rooted in performance and perception. He begins as a reluctant actor in the role of a holy man, delivering sermons and advice based on common sense or borrowed wisdom. However, over time, the act becomes real. The villagers' faith in him and his increasing sense of responsibility start to change him internally. Raju's transformation into a sadhu is not entirely spiritual, nor entirely fake—it is layered, ironic, and deeply human. Narayan explores the idea that redemption is possible even for the most flawed individuals. Raju, once a self-serving man, dies a selfless figure, embodying the very ideals he once pretended to represent. While *The Guide* has often been the most discussed in critical circles for its portrayal of transformation and self-realization, it is in *A Tiger for Malgudi* that the theme of *sanyasa* is presented most explicitly and philosophically.

In *A Tiger for Malgudi*, Narayan delves deeply into the concept of renunciation through the character of a tiger, Raja, and his relationship with a saintly yogi. The novel becomes an allegorical reflection on detachment, self-discipline, and spiritual awakening. The yogi, who represents the ideal of a true renunciate, guides the tiger from violence and instinct toward peace and enlightenment. This spiritual journey offers a more direct and profound representation of *sanyasa* than in his earlier works.



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