CHAPTER II
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Review of related literature constitutes an important step of a research project. What has already been done, what remains to be explored and what needs to be researched in modern concepts can be determined through review of related literature. Not only this, procedural details, challenges and opportunities are also indicated by the previous studies. It may also give an innovative idea for the concerned project. The researcher went through various studies in the field which are discussed in the following pages.

2.1 Studies Related to Handwriting Analysis

Research in handwriting analysis dates back to the nineteenth century with Crepieux (1882) and continued by others. Everyone contributed to the field in their own way. Some of the ancient studies have been quoted below.

Crepieux (1882) examined forty-five handwritings of hysterical persons which revealed... in 24 instances... marked agitation and the abnormally large movements of the pen.

Preyer (1895) established that similar styles could be achieved when the pen was held by either right or left hand, foot or mouth, thereby establishing that handwriting was centrally organized by the brain and not the appendage.

Downey (1919) studied bipolar expressive characteristics such as fluent or jerky, impulsive or deliberate were examined in twelve individuals in their handwriting, carriage and expressive gestures, using 11 judges. Above chance correlations were achieved.

Saukek (1926) ascertained the objective criteria in handwriting, e.g. determining the relative speed of handwriting, developmental changes in the execution of the writing trait from childhood to adulthood, the role of the central nervous system etc.
Allport and Vernon (1933) in their treatise contains numerous controlled experiments which discovered congruence between expressive movements (e.g. handwriting, gestures, gait) and attitude, traits and values.

Roman (1936) studied the variability of handwriting: The development of writing speed and point pressure in 2200 schoolchildren.

Jacoby (1939) studied two hundred samples for one letter “I”. After careful analysis, no two strokes were found to be identical.

Lewinson and Zubin (1944) used objective criteria and were successfully able to differentiate between the handwriting of delinquents and non-delinquents.

Wolff (1948) explored a full range of experimental studies. The expressive movement in writing (especially the signature), is made chiefly in a state of unawareness, automatically and impulsively. These unconscious movements represent a reign of order, proportion and configuration, appearing in the same exact way as if they had been consciously calculated, measured and constructed. They originate neither in change nor in conscious intention, but (rather) they reflect unconscious principles of organization.

Several research studies have been conducted to reveal the status of handwriting in the educational systems of the world. Notable among them were (a) The UNESCO monographs on handwriting and (b) the Wisconsin study.

A significant contribution to the study of handwriting was the sponsorship by UNESCO (1948) on the teaching of handwriting. The chief findings prepared by Gray (1948) was designed to investigate the related functions of reading and writing so that effort might be made to improve literacy on an international scale, especially amongst the adults. Handwriting is widely thought of not only as a communication tool but also as a mean of individualized personal expression. The view, that activities, which provide for simple perceptual motor coordination can be encouraged before the child is formally, ought to write. The emphasis on writing of work – wholes rather than letters especially, during the phase of initial instruction. Evidence based upon the use of Roman type letters is cited to support the position that the
perception of work-wholes is both easier and more meaningful to the child during the stages of initial instructions in handwriting.

The second UNESCO (1948) report directs attention to increasing use of scales in evaluating handwriting and cites the development of two handwriting scales in Spain.

The Wisconsin study (1951), is an exhaustive study on handwriting practices was conducted on a sample of 232 school systems in the state of Wisconsin in U.S.A. The major findings were:-

a. Teachers rate legibility as the most important objective of handwriting specifically letter formation, slant and spacing. Speed is a factor, which is least, stressed.

b. Teachers are aware of individual problems in learning to write, difficulties encountered by the left-handed writers and corresponding adjustment of paper and handwriting instrument.

c. Teachers expect children to learn all the symbols of handwriting in order, numerals, lower case letters and capital letters.

d. Many types of handwriting instruments are used by the children in and out. The most frequent are pen, fountain pen, pencil, ballpoint pen, crayon, chalk, mechanical pencil and steel pen, holder etc.

Some major issues in the teaching of handwriting were:-

1. Manuscript versus cursive scripts
2. Slant in writing
3. Writing instruments
4. Speed versus quality
5. Race difference and handwriting
6. Sex differences and writing
7. Intelligence and handwriting
8. Tracing versus copying
9. Handwriting and fatigue
10. Bilateral transfer in handwriting
11. Role of drilling in handwriting instruction
12. Left handedness and handwriting
13. Incidence of left-handedness in schools.
Wolfgang (1953) used a new apparatus, Electroscriptograph (ESG), using electrical principles instead of mechanical-pneumatic principles for handwriting analysis. With this instrument, three simultaneous measurements can be taken: (1) point-pressure (pressure of the writing instrument against the writing surface), (2) grip-pressure, and (3) the difference between point and grip pressure. 1000 subjects have been tested under normal and stress conditions.44

Lapp (1970-1979) graphologist provided evaluations for juveniles for the purpose of determining placement penalties and treatment to the court and the probation department.

Briggs (1970) studied the influence of handwriting on assessment. Ten essays were chosen from a large number, written by 11-year-old children. A range of 10 contrasting handwriting styles was chosen from those of other children, and the 10 hand writers reproduced each of the 10 essays, thus giving 100 combinations of content and handwriting styles. Groups of ten teachers were asked to assess the essays. Findings were determined by using Analysis of variance. He concluded that the handwriting had a significant influence on the teachers’ marking (p=0.001), and secondly, that there may be a primary/secondary difference of attitude towards handwriting.

Stewart (1973) compared two approaches to handwriting instruction, and concluded that the task-analysis approach was significantly scoring higher on the measure of handwriting used as compared to diagnostic-remedial approach.

Hartford (1973) conducted three studies of beginning strokes – the degree of maturity of writer as compared with the retention or elimination of initial strokes. In all studies, students who retained the secondary beginning strokes were found to be passive and immature. A study of small g, d and f, the copybook form and variants of these letters were correlated with education, IQ and age. All variants were distinguished from eleven remaining variants by a high degree of motoric economy and radical and original departures from copybook model.

Jackson (1980) investigated a comparison of remedial treatments for cursive handwriting in 4th grade students. 143 4th grade boys and girls participated in a study. Groups were rated by two independent rates on slant, uniformity, and formation, spacing and general excellence as poor, average or excellent writers. Poor and average writers received one of four taped methods of relaxation – suggestion, traditional, a combined method and relaxation without suggestion. Two pre-tests 8 training tracts and one post test were administered. The k-sample binomial test of equal proportions and post hoc multiple comparisons in sample proportions for test of homogeneity were used to analyse the data. Significant difference was found among the methods on 4 of 5 characteristics among poor writers. For poor writers, the higher proportions of improvements were noted using anyone of three methods. Highest proportions were reported in the combined method group. Significant difference was found on two of the five characters for average writers on spacing. Average writers improved with three methods while on general excellence, improvements were noted on two methods.

Jamin (1982) examined forty-five handwritings of hysterical persons revealed in 24 instances marked agitation and the abnormally large movements of the pen.

Ostuni (1983) studied violence suffered at the hands of others suspected and identified by using handwriting. This study is based on handwriting that handwriting psychology can help in identification and specification of those traumatic experiences suffered by individuals that have remained in their unconscious minds and thus have influence on their behaviour. A case study was presented of a woman who was a victim of an attempted rape when she was 2 years old. The attack was first suspected after an analysis of her handwriting and was confirmed at the age of 20 years by the automatic writing she displayed under hypnosis.

Stanley, Coren and Searleman (1983) studied inverted versus straight handwriting posture on a sample of 450 families. They concluded that there was significant increase in the percentage of inverted writers among offspring in families where at least one parent was an inverted writer.

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\[^{45}\text{Image retrieved on 12.01.2013 from}\]
Ziviani and Elkins (1984) investigated an evaluation of handwriting performance in 575 children in grades 3 to 7 in terms of the legibility components (letter formation, spacing, alignment and size) and speed. The findings of inter-rater reliabilities were high (0.69 to 0.97) and test-retest reliability over one week was lower for legibility (0.44 to 0.84) than for speed (0.93). Secondly, reliabilities were higher for the older children. Thirdly, correlations among legibility components ranged from 0.46 to 0.76, though a principal correlations of legibility component scores with teacher ratings ranged between 0.52 and 0.76. They concluded that girls wrote significantly faster and smaller than boys. Girls also made fewer errors in letter formation than boys in grades 3, 4 and 5.

Graham (1986) investigated the reliability, validity and utility of three handwriting measurement procedures. The methods used were a holistic rated system in which examiners rated letters on a 5 point scale, a holistic research with modal letters and a correct – incorrect procedure of handwriting. Handwriting samples of 22 third graders and 22 fifth graders were rated. Intra-raters and Inter-raters reliability coefficients revealed that the two holistic scoring procedures were unreliable, whereas scores obtained by examiners who used the correct- incorrect procedures were considered overtime and across examiners. Although all three of the target measures were sensitive to difference between individual testees, only the scores from the two holistic procedures were associated with other indices of handwriting performance.

Peters (1986) studied the incidence of left handed writers and the inverted position in a sample of 2194 German elementary school children. In a sample of 2194 German 1st-5th Grades 6-9 % of the female and 9-5% of the male wrote with the left hand. The proposition of left hander writing with the inverted writing position was much higher than in comparable Canadian samples, particular in the early grades, because of the earlier introduction of cursive style writing in the German samples. He found that there was a significant effect of writing position on the directional consistency of the letter shafts in the writing samples. Non inverted writers were non inconsistent in their letter shaft orientation within and between words than inverted writers. Result emphasizes adaptation to the technical demands of left handed writing in the genesis of the inverted writing position.
Ziviani and Elkins (1986) examined the effect of pencil grip on handwriting speed and legibility of 282 children aged between 8 and 14 years. The findings showed no significant difference either for speed or legibility. Secondly, no significant difference was found between standard versus non-standard grips and fast, legible versus slow, illegible writers.

Blandford and Lloyd (1987) studied the effect of a self instructional procedure on handwriting with the help of seven self instructional questions designed to prompt students to think about important aspects of handwriting which were provided to two learning disabled elementary school boys (aged 10 years 6 months and 11 years 4 months). Assessment of the subjects handwriting performance, including letter formation, letter proximity to the line, letter height and word spacing were made daily in their resource room. Subject’s handwriting was found to be improved markedly when the cards were introduced.

Babcock and Freyd (1988) studied perception of dynamic information in static handwritten forms. 75 volunteers (mainly undergraduates) participated in 2 experiments. In an implicit detection task, the subject’s ability to detect stroke direction in a series of handwriting characters was found to be influenced by the particular drawing method used to generate the stimuli and similar results were obtained in an explicit detection task in which the subjects speculated on the drawing method. Findings suggested that perceivers were able to extract information relating to production from the static trace. It is proposed that they can then use this information in conjunction with their knowledge of a common production process, shared by both producers and perceivers, to aid character recognition.

Sara (1988) used handwriting as a tool in the diagnosis of hyperactive child. A blind study of the handwritings of 24 children comparing one hyperactive group of 8 and two control groups of 8, one group normal and other slightly retarded. They were analysed for 17 personality characteristics measured for four degree of intensity. The profiles obtained by graphological analysis matched the appropriate clinical profiles.

Hass (1989) compared the efficiency and quality of 15 experienced writers aged (24-42 yrs) persuasive letters written with (1) pen and paper (2) standard personal computer (3) advanced workstation. When compared with advanced workstation
subjects wrote for longer periods of time and composed longer letters than when composing with pen and paper. Rate of composition (words per min) was similar in all the three conditions. Letters composed with personnel computer were poorer in content and total quality. Results showed that eight of the subjects revised 2 of their letters in the medium with which they were composed. Subjects exhibited more total planning and more initial planning in pen and paper conditions, although there was more re-reading of text and attending to medium in the computer conditions.

Neter and Shakhar (1989) examined the validity of graphological inferences in personnel by means of Meta analysis. 17 studies dealing with the validity of graphology as a personnel selection device were tracked down. 63 graphologists and 51 non-graphologists evaluated 1,223 scripts. Results showed that future performance on the basis of handwritten scripts. Psychologists outperformed graphologists on all dimensions. It is suggested that source of limited validity of handwriting analysis may lie in script’s content.

Stanley et. al (1991) studied the effects of different training conditions in the acquisition of a handwriting task. This study reported a handwriting experiment on the learning of four Arabic letters. One group of subjects, called copiers, copied the experimental graphemes from a visual presentation. The other group, called planners, was forced into a mental planning stage. The experiment was subdivided in three consecutive stages: pre-test, training stage and post-test. They concluded that first writing segment was significantly less than in subsequent segments. In the training stage, analysis revealed a differential effect of practice on this trade for the two training groups. The results defended that the learning process can be characterized by the advanced preparation of increasingly larger and more abstract chunks, during the reaction time phase of a task. Simultaneously, the amount of on-line processing of more detailed motor instructions, during real-time execution, increased as a result of practice.

Halder and Wegener (1992) investigated controllability of the slant in simple and multiple strategies for disguising handwriting. 36 undergraduates were asked to disguise their normal handwriting slant and up to two other characteristics of their handwriting simultaneously. The results showed that as the disguising task became...
more difficult, voluntary control the slant was reduced, the slant tended towards uprightness.

Reisman (1993) studied the development and reliability of revised version of the Minnesota handwriting test. This Handwriting test was developed to meet the needs of occupational therapist for an educationally relevant, norm reference test that can identify students with handwriting difficulties as well as document treatment effectiveness. The instrument, its scoring quality, its scoring rate and other technical consideration were discussed. Studies of inter-rater, intra-rater and test-retest reliability were reviewed. The findings showed that the Inter and intra reliability correlation coefficients for the sample as a whole were high among students which confirmed the reliability of Minnesota handwriting test.

Robert and Samuels (1993) compared the effectiveness of computer based handwriting exercises with traditional instruction in the remediation of handwriting difficulty. 36 students in grades 4-6 with poor handwriting received one of three instruction methods. In method 1 subjects performed computer based handwriting exercises to track visible and invisible letters. In method 2, conventional instruction was provided using pencil, paper, and plastic overlays and felt pens to copy and trace letter forms. In method 3, conventional instruction using tracing and copying was provided through the computer. Results indicated that traditional group using pen and paper demonstrated significant improvement from Pre-test to post-test on five measures, and the computer groups in 2 measures. Findings suggest that traditional instruction using pen and paper was the more effective treatment method.

Eliot (1994) in his study on classroom management style and teacher personality traits, found four personality traits, aggression, dominance, nurturance and change were investigated as predictors of positive and negative classroom style.

Cornhill and Smith (1996) investigated the relationships between the specific performance components, eye-hand coordination, visual motor integration, in hand manipulation and handwriting skill. A sample of 48 typical first grade students was identified as good and poor handwriters by their teachers. Each child completed the Motor Accuracy Test; the Developmental Test of Visual-Motor Integration (VMI); two tests of in-hand manipulation, including a rotation and a translation task; and the
Minnesota Handwriting Test (MHT). All test scores for the subjects with good handwriting were significantly higher than those of the subjects with poor handwriting. Each performance component test was significantly correlated to MHT scores. Translation, VMI, and rotation scores were significant predictors of MHT scores, accounting for almost 73% of variance. A discriminant analysis using the performance components correctly classified 98% of the students as good or poor handwriters. In-hand manipulation has significant association to handwriting skill.

Graham and Weintraub (1996) criticized a review of handwriting research in progress and prospects from 1980 to 1994. They concluded that considerable progress was made during this time period in understanding the processes involved in handwriting control and development as well as in teaching students with handwriting difficulties. In addition, advances in theory, experimental procedures, on-line recording devices, and computerized instructional programs resulted in an increased level of sophistication. Thus, the prospects for future research in this area are promising.

Cohen (1997) studied individual and sex differences in speed of handwriting among 153 high school students in cursive handwriting task, which required them to copy sentences as quickly as possible. The 78 girls performed significantly better than 75 boys did and a substantial range of speed for each sex was found. Handwriting speed has the potential to act as a limiting factor under some circumstance.

Poluha, Teulings & Brookshire (1998) evaluated levodopa-related changes in temporal and spatial measures that are assumed to correspond to changes in rigidity and bradykinesia. The handwriting and speech performance of 10 right-handed 47-85 year old males with Parkinson's disease was tracked at 30-minutes intervals across one levodopa drug cycle. The handwriting measures included upstroke duration and size for the letters l and e. The speech measures included duration of certain vowels and the quadrilateral area produced by these vowels, and the slope of the diphthong. Levodopa significantly improved handwriting upstroke duration but not upstroke size. Speech measures did not show a significant trend across the levodopa cycle. The results suggest that upstroke duration is sensitive to the presumed effects of levodopa and that handwriting analysis may hold promise in helping to estimate an optimum levodopa regimen for Parkinson's disease patients.
Mergl et al. (1999) studied digitized analysis of handwriting and drawing movements in healthy subjects as methods, results and perspectives. Simple writing and drawing tests were administered, using a digitizing tablet, transmitting signals to a computer for processing. They concluded that younger subjects write faster and with a higher degree of automation than older subjects. Secondly, verbal intelligence and customary motor activity in everyday life could be identified, whereas personality and gender were found to have little influence. There were no significant differences between left-handers and right-handers in hand movements. The movement parameters had high test-retest stability.

Mergl, Tigges, Schroter and Moller (1999) found that the diagnosis of movement disorders and the distinction between their possible generation by drug-treatment or illness can be done more objectively by using digitized analyses of hand movements. The aim of this study was to define this method that is to identify its reliability and the influence of several co-variables upon measurements, in healthy subjects. Simple writing and drawing tests were administered, using a digitizing tablet, transmitting signals to a computer for processing. The kinematic parameters identified in this way provided objective, reliable and valid measures for the dynamics and the degree of automation of hand movements. Analysis of the data showed that younger subjects write faster and with a higher degree of automation than older subjects. Other moderating variables, such as verbal intelligence and customary motor activity in everyday life (motoric practice) could be identified, whereas personality and gender were found to have little influence. There were no significant differences between left-handers and right-handers in hand movements. The movement parameters had high test retest stability. The results of this study in healthy subjects indicate that age, verbal intelligence and motor practice should be considered when evaluating the effects of drug-treatment or psychiatric illness upon hand-movement in patients.

Wallen and Mackay (1999) studied test-retest, inter-rater, and intra-rater reliability, and construct validity of the handwriting speed test (HST) in year 3 and year 6 students. Two hundred and twelve students from randomly selected schools in Sydney, Australia completed the Handwriting Speed Test (HST) twice at 4-week intervals. The findings showed that intra-class correlation coefficients for the sample as a whole were high for inter-rater and intra-rater reliability and good for test-retest
reliability. Scores of students rated as fast or slow by their teachers were compared to examine the test's construct validity. Secondly, this study indicated that the Handwriting Speed Test (HST) is a reliable test for year 3 and year 6 students but weaknesses in examining the validity of the test.

Greasley (2000) examined the rationale and modus operandi of graphology. When the authors take a closer look at the academic literature, they note that there is no discussion of the actual rules, by which graphologists make their assessments of personality from handwriting samples. Examination of these rules reveals a practice funded upon analogy, symbolism, and metaphor in the absence of empirical studies that have established the associations between particular features of handwriting and personality traits proposed by graphologists. These rules guide both popular graphology and that practiced by professional graphologists in personnel selection.

Engelsman, Niemeijer and Galen (2001) studied a sample of 125 children from grades 4 and 5 of two normal Dutch primary schools were investigated regarding the incidence of handwriting problems and other fine motor disabilities. Handwriting quality was assessed with a concise assessment method for children’s handwriting (BHK) and the school questionnaire for teachers (SQT). Two groups of 12 Children each were formed, one group of good writers and a group of poor writers selected from the lower performance range. The results revealed that 34% of the group of 125 children displayed handwriting problems. The analysis confirmed that serious handwriting problems are accompanied by fine motor deficits. In the children who received physiotherapy their quality of handwriting improved.

Mavrogiorgou, et al., (2001) examined Basal ganglia dysfunction is supposed to play a part in the pathophysiology of obsessive-compulsive disorder (OCD). A new computer aided technique for the analysis of hand movements, allowing the detection of subtle motor performance abnormalities, was applied in this study of patients with OCD and healthy controls. Using a digitising graphic tablet, hand motor performance was studied in 22 unmedicated patients with OCD and compared with 22 healthy controls. All subjects drew superimposed concentric circles with both the right and the left hand, in addition to writing a given sentence, their personal signature, and letter sequences in four different sizes. Kinematic parameters were calculated to quantify hand motion. Patients with OCD had significant impairments of handwriting
performance, reflected by lower peak velocity (sentence $t=3.6$; $p=0.001$; signature $t=2.8$; $p=0.01$) and micrographia (sentence $t=3.4$; $p=0.002$; signature $t=2.5$; $p=0.02$), compared with controls and shortened acceleration phases per stroke (sentence $t=2.4$; $p=0.02$; signature $t=4.1$; $p=0.000$). By contrast, in repetitive drawing, patients with OCD had higher peak velocity than healthy controls (group task interaction $p<0.01$). There were no significant differences in left and right hand performance between groups. Patients with early versus late age of onset differed in handwriting parameters, such as handwriting consistency. Greater severity of obsessions and compulsions correlated with increasingly poor handwriting performance in patients with OCD. A subtle motor dysfunction in OCD can be detected with a digitizing tablet. The findings showed handwriting impairments in patients with OCD, in line with the assumption that basal ganglia dysfunction is part of OCD pathophysiology. Repetitive motor pattern performance was not impaired, but rather tended to be even better in patients with OCD than in controls. The findings also support the concept that patients with OCD with early versus late age of onset differ in pathophysiological mechanisms and basal ganglia dysfunction.

Guthke, Beckmann and Schmidt (2002) reported that handwriting analysis suffers from a lack of acceptance among psychometrically oriented psycho-diagnosticians. Methodological problems of validating studies so far imply that no decision is possible about the validity of judgements based on handwriting analysis. Five graphologists gave judgements about social and cognitive inhibition, achievement motivation, conscientiousness, frustration tolerance, and calmness on the basis of standardized handwriting samples taken from 60 undergraduates. These judgements show no relation of scores in corresponding questionnaires. But controlling for social desirability as a moderator variable, the relations between graphological judgements and psychological questionnaires (e.g. for introversion) increased.

Prakash and Lahiri (2002) examined whether emotional maturity can be scientifically measured through psychographology, or handwriting analysis. The sample consisted of 30 emotionally stable and unstable adolescent boys and girls (aged 15-17 yrs). Ss were asked to choose one card out of the 14 cards of the T.A.T. (Thematic Apperception Test), and write an original short story on it. The analysis of the graphic movements through the universal, standard and scientific norms of graphology reveals
that there are significant differences in the patterns of handwriting of emotionally stable and unstable adolescents.

Kavallieratou, Fakotakis and Kokkinakis (2002) found in their study an unconstrained handwriting recognition system (UHRS). The proposed system consists of seven main modules: skew angle estimation and correction, printed-handwritten text discrimination, line segmentation, slant removing, word segmentation, and character segmentation and recognition, stemming from the implementation of already existing algorithms as well as novel algorithms. This system has been tested on the National Institute of Standard and Technology (NIST), Institute of Computer Science and Applied Mathematics (IAM –DB), and modern Greek unconstrained handwriting (GRUHD) databases and has achieved accuracy that varied from 65.6% to 100%.

Knoblich et.al (2002) studied the authorship effects in the prediction of handwriting strokes as an evidence for action simulation during action perception test. Three experiments were conducted in which participants observed parts of earlier self- and other-produced trajectories and judged whether another stroke would follow or not. When the trajectories were produced without constraints, participants accomplished this task only for self-produced trajectories. When the trajectories were produced under narrow constraints, the predictions were equally accurate for self- and for other-generated trajectories. These results supported the action simulation assumption. The more the actions that one observes more the resemblance, the way one would carry them out with oneself, the more accurate was the simulation.

Simner and Goffin, (2003) found among the various tests employed in personnel selection; handwriting analysis or graphology has enjoyed long-standing international popularity despite being highly contentious. This report contains not only an evaluation of the current published scientific reviews on the use of graphology in personnel selection, but also an evaluation of several additional studies graphologists provided that seemed to have been overlooked. The latter were obtained by contacting nine of the foremost institutes offering graphological training, consulting services, or both to ensure that the graphologists themselves would be fairly represented. Even with this additional information, one found no reason to counter conclusions the scientific community had reached, namely that (a) the continued use of graphology in personnel selection could prove harmful to many individuals and firms, and (b) it fails
to approach the level of criterion validity of other widely available and less expensive screening devices used for personnel selection.

Dehkordi, Sherkat & Allen (2003) studied handwriting style classification. The technique consisted of two phases namely the extraction phase and the classification phase. Two nonparametric classification techniques were applied to the extracted features in order to compare their effectiveness in classifying words into legible, illegible, and middle classes. Data was analysed by using a multiple discriminant analysis (MDA) probabilistic neural network (PNN). The experimental results showed that the probabilistic neural network method gives superior classification results when compared with the multiple discriminant analysis (MDA) method. Secondly, the legible, illegible, and middle handwriting the method provides 86.5% (legible/illegible), 65.5% (legible/middle), and 90.5% (middle/illegible) correct classification for two classes. For the three-class legibility classification the rate of correct classification is 67.33% using a probabilistic neural network (PNN) classifier.

Hoskyn and Swanson (2003) investigated the relationship between working-memory (WM) span and writing performance in three age groups (mean of ages of 15, 30, 77 years). The findings showed that older adults’ performance was inferior to younger adults on measures of verbal and visual-spatial working-memory (WM) and structural complexity in writing. There was significant difference between working-memory (WM) span moderated structural complexity in writing across age and short-term memory, reading comprehension, word knowledge, spelling and handwriting speed.

Poizner (2004) investigated the perceptions of clients and their therapists when graphology was introduced into their sessions. Eight clients submitted a sample of their handwriting for assessment. After therapists provided their clients with feedback on their assessments, both therapists and clients participated separately in semi-structured interviews with the researcher to share their perceptions of the clinical use of this technique. Analysis of the interview transcripts revealed five emergent themes: clients’ positive perceptions and discordant reactions; therapists’ positive perceptions and concerns; and therapists’ views on the therapeutic use of graphology. Highlights of the findings included clients’ positive perceptions of the accuracy of their profiles and the value of an external perspective. Negative reactions, mostly minor, included skepticism about the credibility of the process and intolerance for difficult material.
Therapists found that the graphological analysis confirmed therapeutic directions, provided meaningful feedback, and triggered more intensity during sessions. However, there was a need to be sensitive when giving clients personal feedback.

Beech and Isla (2004) studied the differences in sex hormones and its effect on handwriting style. The findings showed that handwriting gender correlated significantly with digit ratio and the femininity scale of the Bem sex role inventory (BSRI, Bem, 1974). Secondly, the women’s right hand digit ratio correlated with relative sexuality of handwriting, but there was no corresponding relationship for the males. These findings suggest that prenatal hormonal influences can affect later female handwriting performance and might even affect developmental inter-hemispheric differences, but did not appear to have impact on males.

Tripathy and Pal (2006) studied handwriting segmentation of unconstrained Oriya text. They segmented handwritten text into lines, words and characters. They propose a water reservoir concept-based scheme for segmentation of handwritten text into individual characters. For line segmentation, the document is divided into vertical stripes. Analysing the heights of the water reservoirs obtained from different components of the document, the width of a stripe is calculated. Stripe-wise horizontal histograms were then computed and the relationship of the peak-valley points of the histograms was used for line segmentation. Based on vertical projection profiles and structural features of Oriya characters, text lines were segmented into words. For character segmentation, at first, the isolated and connected (touching) characters in a word were detected. Using structural, topological and water reservoir concept-based features, characters of the words that touch were then segmented. From experiments they concluded that the proposed “touching character” segmentation module has 96.7% accuracy for two-character touching strings.

Martens and Claesen (2006) studied an evaluation of different handwriting observation techniques from a signature. They discussed the relative importance of different signal types from the viewpoint of on-line signature verification. The results of the experiments that have been carried out were not just interesting for this peculiar identity verification system, since they allowed evaluating the implications of potential simplifications of the Smart PenTM-concept, but they were undoubtedly useful to future developers of on-line signature verification systems.
Peverly (2006) studied the importance of handwriting speed in adult essay writing and lecture note taking. The findings showed that in children and adults, greater transcription speed increases automaticity of word production, which in turn lessens the burden on working memory (WM) and enables writers to use the limited capacity of working memory (WM) for the metacognitive processes needed to create good reader-friendly prose. They concluded that models of writing, which emphasize the metacognitive components of writing primarily, should be expanded to include transcription (handwriting automaticity and spelling).

Perron (2007), in his study on identification and diagnosis of epilepsy, by means of handwriting analysis studied samples of handwriting obtained from 37 epileptics and 63 psycho-neurotics, with 6 psychologists scoring the writing on a 12-item blank, giving the 12 features most characteristic of epileptic handwriting. The differential diagnosis of epilepsy was right 75% of instances, and agreement among judges correlated.

Tucha and Klaus (2008) examined graphonomics, automaticity and handwriting assessment and concluded that current curricula of handwriting education focus too much on writing style and neatness and neglect the aspect of handwriting automaticity. These findings indicate that attentional control to any characteristic of the writing process (e.g. direction, lexical status, movement, style) results in an impairment of handwriting automaticity. These findings support and add a new dimension to previous conclusions.

Roston, Hinojosa and Kaplan (2008) investigated using the Minnesota Handwriting assessment (MHA) and handwriting checklist in screening first and second graders’ for assessing handwriting difficulties in children. The Minnesota handwriting assessment examined the ranges of legibility of handwriting. Also, it evaluated whether the handwriting checklist that documents students’ posture, tool use, grasps, and other components during the writing task which accurately predicts legibility. The results showed through Regression analyses found that the four Handwriting Checklist variables accounted for 23% of the variance in the legibility variable on the Minnesota handwriting assessment test.
Berninger (2009) investigated the highlights of programmatic, interdisciplinary research on writing studied an overview of research topics and findings from an interdisciplinary, programmatic line of research on writing over the past 25 years are presented. Her findings showed that the cross-sectional assessment studies (grades 1 to 9) measures uniquely and explained variance in handwriting, spelling, and composing and thus validated their use in assessment. Secondly, the longitudinal studies (grades 1 to 5 and 3 to 7) contributed to knowledge of the cognitive processes of writing, within a working memory architecture that orchestrates multiple component processes in time to achieve specific writing goals, especially the translation of ideas into words, syntax, and text, and transcription (handwriting and spelling) by pen and by keyboard. Thirdly, combined brain imaging and behavioural studies of writing have provided converging evidence for brain-behaviour relationships for handwriting, spelling, and composing and for the role of temporally coordinated working memory, including an orthographic loop with a graphic-motor envelope for word production.

Jasper (2009) studied circadian variations in the kinematics of handwriting and grip strength. Ten healthy young male subjects underwent a 40 hour sleep-deprivation protocol under constant routine conditions. Starting at 09:00 hours, subjects performed three handwriting tasks of increasing perceptual-motor complexity (writing a sentence, writing one’s signature, and copying a text for 3 minutes) and assessed grip strength of both hands every 3 hours. Handwriting performance was analysed by writing speed, writing fluency, script size, break times, and pen pressure. The important findings showed significant relationship between handwriting and circadian rhythm for the frequency of handwriting as a measure of movement speed. A weak effect of task complexity was evident for the non-writing episodes: while copying a text, break times were influenced by a circadian rhythm, whereas during sentence writing, the non-writing episodes remained constant. Secondly, neither grip strength nor the kinematics of handwriting was influenced by sleep deprivation; only the level of the force rate was decreased the second day. Lastly, there was significant relation between circadian rhythm in the speed of handwriting and grip strength.

Kaiser, Albaret and Doudin (2009) investigated the relationship between visual-motor integration, eye-hand coordination, and quality of handwriting. The concise
Luria and Rosenblum (2009) compared the handwriting behaviours of true and false writing with computerized handwriting measures. Thirty-four participants wrote true and false sentences on a digitizer, called the computerized penmanship evaluation tool (ComPET). The computerized penmanship evaluation tool (ComPET) evaluates brain-hand performance, as manifested through handwriting behaviour, and was found to be a valid measure for detecting the dis-automaticity. Their results showed the significant differences in mean pressure, spatial measures (mean stroke length and mean stroke height), but no significant differences were found in temporal measures and in the number of peak velocities.

Shimel, Candler and Smith (2009) compared the effects of cursive handwriting programs in improving letter legibility and form in third-grade students without identified handwriting problems. Sample of convenience of 50 third-grade students received instruction for 10-15 minutes daily for 6 weeks using either handwriting without tears, loops and other groups programs, or, as a control condition, continued instruction in the Zaner-Bloser program. The findings showed that student handwriting for all programs improved from pre-test to post-test. Post-test comparisons indicated no significant differences between programs. They concluded that the method of handwriting instruction has a limited short-term impact on cursive letter legibility and form for children without handwriting problems.

Concluding, from the above review of literature related to handwriting, the investigator found that in past many studies have been done exclusively on handwriting only. Only few to name studied with other variables as comparison of delinquents and non-delinquents (Lewinson-Zubin, 1944), criminal studies (Lapp, 1970) hyperactivity (Sara, 1988), classroom style (Eliot, 1994), motor abilities/disabilities (Engelsman, Niemeijer and Galen, 2001; Cornhill and Smith, 1996), sex differences (Mergl, Tigges, Schrotre and Moller, 1999), have been done.
The act of handwriting reveals an individual’s state of mind. It is more than a succession of words put together to create a means of communication irrespective of medium used to trace letters (Robert and Samuels, 1993). The findings of researches confirmed handwriting as a map of an individual attitude towards life, an indicator of physical health, a labyrinthine pathway to long – forgotten hidden places inside (Ostuni, 1983) and diagram of our unconscious mind (Kaiser, Albaret and Doudin, 2009).

2.2 Review of Literature Related to Handwriting and Personality

Personality is the variable which the psychologist are trying to define and still waiting to arrive at a common definition. Different researchers have studied personality on its various dimensions and investigated its relationship with other psychological attributes using different samples and tools at various places. A brief review of literature relevant to the present study has been discussed in this section.

Thatcher and Wiederholt (1970) investigated an electroencephalographic analysis of personality-dependent performance under psilocybin in 11 volunteers under 160 g/kg psilocybin-induced ergo tropic arousal. There was significant psilocybin-induced changes in mean energy content of Electroencephalographic (EEG), reaction time, and latency and duration of alpha attenuation to photic stimuli were noted in all subjects, as well as significant correlations between Electroencephalographic (EEG) parameters, personality types and psychomotor (handwriting) test results. Secondly, a clustering of certain Electroencephalographic (EEG), personality, and handwriting characteristics in specific subjects seemed to justify their classification into two general groups.

Vestewig, Santee & Moss (1976) studied the validity and student acceptance of a graphoanalytic approach to personality. Forty-eight handwriting specimens were rated by 6 handwriting analysts on 16 personality variables. The important findings showed that correlations of analysts’ ratings and personality inventory scores were non significant. Secondly, the Analysis of variance showed that there were significant differences between the analysts on their judgments of 10 of the 15 traits. Subjects were also given the reports prepared for them and a bogus report and asked to rate the analysts' assessments for accuracy. Subjects were able to choose 2 of the 15 traits with significant accuracy on the real report when considering individual traits. Hence, there
were no significant differences between the accuracy ratings on the real and bogus reports on overall rating. It was concluded that the analysts could not accurately predict personality from handwriting.

Crumbaugh (1977) examined a reply to 'Validity and student acceptance of a graphoanalytic approach to personality' by Vestewing, Santee, and Moss. The data reveals that some findings actually support the validity of graphoanalysis in spite of the fact that their methodology stacked the cards against the handwriting experts.

Williams, Cross and Cross (1977) examined the Handwriting characteristics and their relationship to Eysenck's extraversion-introversion and Kagan's impulsivity-reflectivity dimensions. Using 46 female subjects, scores on the Eysenck personality inventory and matching familiar figures test were compared by factor analysis to the handwriting characteristics of: middle zone height; middle zone breadth; upper zone height; lower zone height; space between words; right margin breadth; left margin breadth; a general size measure; handwriting time; paragraph indentation; slant. The factor analysis revealed three distinct writing styles: one related to extraversion; another related to introversion; and a final one related to reflectivity. There findings showed the significant relationship between trait-sign and factor analysis in comparison with other methods of graphoanalysis.

Rosenthal and Lines (1978) studied handwriting as a correlate of extraversion. Three handwriting measures, line slope, letter slant, and letter width were chosen, and the relationship between these measures and extraversion as measured by the Eysenck personality inventory. The subjects were 58 tertiary students. No significant correlations between the handwriting measures and extraversion were found, nor were there significant inter correlations between the three handwriting measures. Thus the results did not support the claim that the three handwriting measures were valid indices of extraversion.

Eysenck and Gudjonsson (1986) studied the validity of handwriting analysis. They administered The Eysenck Personality Questionnaire (EPO) to 99 Subjects, and a handwriting sample provided by each. Significant correlations were only obtained for the psychoticism (P) category; neither extraversion (E), nor neuroticism (N), nor the
lie scores (L) scale showed significant correlations between subjects and the graphologists.

Warner and Sugarman (1986) examined attributions of personality based on physical appearance, speech, and handwriting. The data were analysed by using 3x6 multivariate analysis of variance (MANOVA) design. The results predicted that the source consistency hypothesis receive consistent attributions across all three types of information. The differential information hypothesis predicted that different personality dimensions are used to differentiate each type of information. In a, each judge rated a single actor/information combination on scales of social evaluation, intellectual evaluation, activity, potency, emotionality, and sociability. Photographs of actors were differentiated primarily in terms of positive social and intellectual evaluation; the speech of actors was differentiated primarily along an activity dimension; and the writing of the actors was differentiated primarily along a potency dimension. This study supported the differential information hypothesis and suggested that these three types of information about an actor may lead judges to use different personality dimensions.

Furnham & Gunter (1987) studied graphology and personality as another failure to validate graphological analysis. A group of 64 adults completed the Eysenck personality questionnaire (EPQ) and copied out a set text in their own handwriting. Independent coders (reliability 0.89) rated each sample of handwriting on 13 specific features which were correlated with the Eysenck personality questionnaire (EPQ). Results showed few significant differences, once again questioning the validity of handwriting analysis.

Peeples and Retzlaff (1992) studied personality traits and handwriting characters in male and female college students. They explored the practicability of using handwriting character to predict Personality traits. 15 highly reliable handwriting characters were measured in handwriting of 168 females and 76 males’ college students. The Personality Research Form – E, measuring 22 normal traits was administered to each student. Stepwise regression shows different patterns of association between personality traits and Handwriting characters within each sex. All 15 handwriting characters were predictive of 1 or more personality traits. Female’s
handwriting predicted play and desirability; male’s handwriting predicted 12 personality traits.

Bushnell (1996) examined a comparison of the validity of handwriting analysis with that of the Cattell 16PF. In this study, the personality of 120 subjects was assessed by the Cattell 16PF and by handwriting analysis. Each subject was presented with five handwriting analysis textual reports and five personality textual reports (one of each being their own). They were asked to rank order each set in terms of perceived accuracy. The same ranking process was undertaken by each respondent's social partner. The results demonstrated that handwriting reports were ranked at a chance level by self and by other and that personality reports were ranked at a well above chance level by self and by other. Self-rankings were more accurate than other-rankings.

Wong and Michael (1999) examined the relations among personality perceptions, self-disclosing behaviour, and friendship strength between Chinese roommates. One hundred and thirty-one university students rated their own and their roommate's personality, their self-disclosing behaviour, and the strength of their friendship six months after being assigned a room together. The important finding was self-ratings on the personality dimension of application for both to one's friendship ratings and one's self-disclosing behaviour. After controlling for self-rated application, it was found that both the respondent's and the roommate are self-disclosing behaviour contributed separately to increasing the respondent's friendship ratings. Secondly, respondent self-disclosure was unrelated to how respondents perceived their roommates. However, the perceived roommate qualities of helpfulness and intellect were associated with the respondent's friendship ratings, suggesting that other, unmeasured social behaviours are being exchanged between roommates to enhance their friendship.

Reevy and Maslach (2001) studied the use of social support in gender and personality differences. They concluded that gender, but not sex, was significantly correlated with patterns of social support. Femininity (in both sexes) was associated with seeking and receiving emotional support, and with seeking and receiving support from women. Masculinity (in both sexes) was linked only with receiving tangible support.
Ramsay and Silverman (2002) studied the dynamics of handwriting printed characters and claimed that through study of handwriting characters your personality from your handwriting can be predicted. It helps in identification of an individual and their personalities.

From the review of literature related to personality, the investigator found that in past many studies revealed that personality is a way a person behaves and thinks. Researches showed that graphologists link personality to graphology by examining handwriting traits i.e. line slope, letter slant, letter width (Rosenthal and lines, 1978) also zone height, space between words and lines, margins, size, slant, paragraph indention (William et.al, 1977). Further, conflicting findings exist regarding the relationships between handwriting and personality attributes (Vestewig, Santee and Moss, 1976 and Peeples and Retzlaff, 1992).

2.3 Review of Literature Related to Handwriting, Self-Concept and Mental Health

There have been numerous studies on self-concept in many universities of the world. It has been studied in relation to many psychological attributes and varied results were obtained. Mental health is not only studied in educational/psychological context rather it is also a matter of concern for health professionals. With the sphere of variable, wide range of studies were available with other variables while studies on handwriting analysis and mental health could be found from various print and non-print resources. Although the researcher could not get many studies on handwriting with self-concept and/or mental health, yet few studies related to self-concept and mental health relevant (may be slightly) to the investigation in hand were worth mentioning.

Sharma, (1979) found that differences in self-concept influence mental health. The high and low groups on various areas of self-concept differ significantly on mental health. Mental health was found to be positively correlated to self concept.

Benvenuto (1983) investigated the relationship between handwriting and self esteem. Findings indicate that the size of the small letters in the script body was the major determinant of subjects self esteem with the signature representing subjects’ public images and the script body revealing this private or actual ego status. Disproportion between the signature and the body indicated ambivalence between the private and the
public ego image. Results suggest that the combination of down strokes of small letters, upper looped/stemmed letters and capital letters determines the actual ego status.

Wellingham (1987) in their study on Evaluation of adolescents’ self-esteem through the Coopersmith Self-esteem inventory and graphometric analysis of students’ handwriting stated that Self-esteem has long been considered an essential component of a good mental health. Coopersmith’s Self-esteem Inventory and Wellingham-Jones Self-esteem Values List applied to handwritings were given to 15- to 19-yr-old students to explore the former’s usefulness in designing programs to enhance self-esteem. Students were from 4 high schools representing the socioeconomic range of a small rural California city. Handwritings of the 25 students scoring highest and the 25 scoring lowest on self-esteem were graphometrically evaluated. Chi square showed total agreement between the two tests in 62% of the cases, partial agreement in 30%, and complete disagreement in 8%. This suggests Coopersmith’s inventory may be a useful tool for school administrators, provided its limitations are understood. Similarities and differences between and within the high and low self-esteem groups were discussed.

Burwani (1991) studied that students who perceived themselves to be highly competent were relatively free from mental ill-health symptoms. High ideal self-concept was conducive to mental health and discrepancy between real and ideal self was found to be associated with mental ill health.

Biswas (1992) investigated that a person with poor self-concept and inferior mental health cannot perceive the frustrating situation objectively. He feels himself inadequate, lacks confidence and distorts reality thereby he may perceive frustrating situation as an ego threat and produce excessive extra-aggressive responses for his defence.

Krishnan (1993) found that sex had no influence on the self-concept of individuals.

Evans et.al. (1993) examined personality; marital and occupational factors associated with quality of life and concluded that hardiness and self-esteem were important components of overall quality of life. Secondly for overall quality of life the marital
communication skills of expressiveness and intimacy were essential. Thirdly, overall quality of life was related to satisfaction with various job characteristics.

Pigge and Marso (1994) studied the relationships of prospective teachers' personality type and locus of control orientation with changes in their attitude and anxiety about teaching. 150 prospective teachers completed attitude, anxiety, and personality measures. They findings showed that candidates progressed through teacher preparation, anxiety decreased and attitude remained high and positive. Secondly, introverted candidates expressed more anxiety and experienced a smaller decrease in anxiety than extroverts, whereas internally controlled candidates reported less anxiety than candidates with average or high externality.

Gupta and Paul (1998) studied that self concept of male students was better than that of female students before and after the teaching practice.

Batra (2005) found significant relationship between mental health and self-concept of secondary school teachers. The teachers with good mental health had positive and realistic self-concept than the teachers with poor mental health.

The perusal of the studies described above amply justify that the studies on mental health of secondary school teachers are equally important since they affect the classroom learning and development of a desirable behavior. To conclude, one can say that personality influences the self-concept in significant way and Self-concept although being rooted in personality traits is susceptible to all kinds of environmental influences which in turn affect the mental health also. The different kinds of influences are such as parenting, peer influence, the media, educational system and so on where as personality is not.

A few studies have attempted correlation of handwriting and personality and with other variables than the variables taken for the above study by the investigator. Only few studied handwriting with Cattel 16PF (Bushnell, 1996), Peeples and Retzlaff, (1992) with male and female personality traits, Rosenthal & Lines (1978) and Williams, Cross & Cross (1977) with extraversion and introversion.

The critical appraisal of the above studies revealed certain specific research trends in the area of handwriting analysis. Most of the studies concentrated on handwriting
only and others from clinical points of view. One notices the absence of any study on the handwriting analysis of prospective secondary school teachers in relation to personality, self-concept and mental health.

2.4 Emergence of Problem

The researcher belongs to the teaching community itself and while checking the notebooks of the students during teaching practice and in teaching and checking/evaluating the answer sheets of examination, the researcher found great difference in the writing of some of the students; while in others no significant changes were observed. Clearly, there was some difference in state of minds of the students on both the occasions. Handwriting acts as a picture of the current state of mind body and feelings-the complete person is symbolized in written script which is made up of more than 20 indices, such as degree of slant, size, rhythm and spaces between letters, words and lines. It provides answers to many questions about personality and also disclosed inside secrets in one’s life. It acts as a powerful tool for parents and teachers to know what is going on inside. Moreover the bent of mind towards science or arts or fine arts may affect one’s handwriting. For example, M.F. Hussain, an artist had very beautiful handwriting. Also signatures of no two people are same, just like no two individuals are same and that is why we study and observe the individual differences. Due to the fact that handwriting is one of the most neglected areas in educational research, even teachers are not trained in this field and that is why they are unable to help students to improve their handwriting skills resulting in lot of them are struggling with poor script. This also leads to the students, even B.Ed. teacher trainees losing in making a difference in their personality traits. Hence it affects their way of presenting themselves.

How and why all these differences are emerging was the pinching question. The investigator pondered over these issues and thus got interested in handwriting analysis. After reading books on handwriting analysis, visiting websites, discussion with the intellectuals and other online resources of handwriting analysis like dictionaries, encyclopaedias etc. etc. the investigator also did some online analysis of own handwriting. The online analysis of the handwriting created more curiosity to study and understand it in a better way. So, the investigator started looking for the
previous studies done on handwriting analysis and allied variables, but scanty researches were available relating to mental health, self-concept and personality.

Many studies related to handwriting analysis has been done outside India, but most of the studies were related to one or the other kind of illness, their diagnosis and their treatment namely, for epilepsy (Perron, 2007), for basal ganglia dysfunction (Mavrogiorgou, et al., 2001) for Parkinson’s disease (Poluha, Teulings & Brookshire, 1998) traumatic experiences (Ostuni, 1983), sex hormones (Beech and Isla, 2004) while other studies were related to comparison of delinquents and non-delinquents (Lewinson-Zubin, 1944), criminal studies (Lapp, 1970), hyperactivity (Sara, 1988), classroom problems (Eliot, 1994), motor abilities/disabilities (Engelman, Niemeijer and Galen, 2001; Cornhill and Smith, 1996), sex differences (Mergl, Tijges, Schrot and Moller, 1999), employment (Simner and Goffin, 2003), emotional maturity (Prakash and Lahiri, 2002), self-esteem (Benvenuto, 1983) and memory (Hoskyn and Swanson, 2003). Apart from the above variables the most researched variable in relation to handwriting analysis was personality.

In all the above studies, very few were related to educational system, the behaviour patterns of students or the student teachers. Moreover, while studying the handwriting analysis and its systems, the investigator came to know about so many psychological aspects which one can assess using handwriting analysis viz., fears, defences, aptitudes, thinking patterns, intellectual and materialistic aspirations, sex drives etc. So the pertinent question arises, ‘Can the relationship of handwriting analysis and these variable be scientifically proven?’ Also, the investigator did not come across any study in handwriting analysis directly related to psychological or academic variables. The list of variables that graphology claims to be related was long and the target to study all of them was too gigantic to be achieved in the limited time frame for the present project.

Further, the pinching questions were ‘How can handwriting analysis be used in educational setup?’, ‘What are the direct benefits a teacher can draw from handwriting analysis?’, and ‘What will be the advantage of handwriting analysis to students?’ The decision to make choice of the variables for study was tough and the investigator after sessions of discussion with the supervisor arrived at the conclusion that self-concept and mental health played a vital role in the development of the
students’ personality, as effective members of society. A student who has good mental
health and self-concept is also expected to be good at academics and more successful
in general life.

Thus, investigator got interested in researching about the personality, self-concept and
mental health of the prospective secondary school teachers who are going to be the
future teachers, of the Nation builders the students, and the variations therein as
depicted by their handwriting. A Pilot study was also conducted by the researcher to
study the handwriting of the prospective secondary school teachers.

2.5 Significance of the Problem
Handwriting is a field not so much explored in India, though all teachers face the
problem of poor handwriting in classrooms at all stages. Right from nursery class we
teach our children to write neatly and legibly but mostly in vain, rarely realizing why
a particular student writes so badly and illegibly while other writes very beautifully,
though the teacher is same and teaches all students in the same way. Apart from these
many students fail in school and university examinations due to poor handwriting.
Nowadays school boards and universities have clearly mentioned in the instructions in
examination sheets that students should write legibly or else their answer sheets
would not be marked or will be given a zero. Illegible handwriting completely defeats
the purpose of written communication and leads to the problems of misinterpretation
and misleading words. A teacher has to write on the notebook as well as on
blackboard for the students. If a teacher cannot write legibly, students will not be able
to read and hence copy and understand wrong things. For this purpose the study in
hand is very significant to study the handwriting of the prospective secondary school
teachers, so that they become more effective teachers. This study is also important
from the point of view of identifying their problems, studying their personality, self-
concept and mental health by using handwriting analysis. It indicates handwriting
analysis as an important tool in the hands of teachers to understand the personality of
their students and know why some students write illegibly so that they can be treated
properly to fulfil the purpose of education.

2.6 Rationale of the Problem
The rationale behind the problem is attributed to the following considerations which
motivated the researcher to frame the topic of the research as stated above:
Firstly, handwriting is the clear index of mind as it is called brain-writing. The way our brain functions and the physiology of a person affects personality of a person – in terms of attitude, reaction to particular situations, outlook towards past, present and future, importance to mental, physical and emotional needs etc. These characteristics are depicted by handwriting of an individual. Thus, the rationale behind choosing handwriting and personality. Greasley’s (2000) study and Sara (1988) endorse the rationale presented here.

Formation of identity words and signatures of a person represent what a person thinks of oneself. This provides base to the present study.

Mental health of a person and handwriting are very much interrelated as depicted by variable slant, erratic baselines, suicidal baselines, leaving no margins, too much spacing between letters, words and lines, and undue importance is not given to any of the zones in the handwriting so is the personality and self-concept of a person is built up. All the four variables of handwriting, personality, self-concept and mental health are interlinked in one person only. In Poizner’s study of (2004), therapists found that the graphological analysis confirmed therapeutic directions, provided meaningful feedback, and triggered more intensity during sessions. However, there was a need to be sensitive about when giving clients personal feedback. This provides strength to the rationale of the study.

The study of handwriting analysis among females and males taken up here is due to the fact that females and males have certain inherent difference in terms of physiology and mental make up which is supported be Cohen (1997) as stated above in the literature review. (page 27)

The reason for studying science and arts students’ handwriting are firstly they differ in the aptitudes (for science and arts) and again they write differently in terms of their style and expression as well as amount of writing they do in general and during examinations. Their mental make up and personalities are different to observe.

Background of a person and the way they are taught and brought up sets their personality, attitudes and affects their mental health. Hence, the difference depicted by their handwriting also needs to be explored and hence the investigator thought of thorough study.
2.7 Title of the Problem
HANDWRITING ANALYSIS IN RELATION TO PERSONALITY SELF-CONCEPT AND MENTAL HEALTH OF THE PROSPECTIVE SECONDARY SCHOOL TEACHERS

2.8 Statement of the Problem
To study the English handwriting in relation to the personality – introversion/extraversion, neuroticism and psychoticism; self-concept and mental health of male-female prospective secondary school teachers of government and private colleges of education in Chandigarh and Punjab.

2.9 Objectives of the Study
Objectives of study give direction to the study and keep the investigator focussed in due course of time. The investigator worked on the study in hand keeping in view the following objectives.

1. To construct and standardize handwriting analysis scale.
2. To study the relationship of handwriting analysis with the personality of prospective secondary school teachers.
3. To study the relationship of handwriting analysis with the self-concept of prospective secondary school teachers.
4. To study the relationship of handwriting analysis with the mental health of prospective secondary school teachers.
5. To study the relationship of personality with self-concept of prospective secondary school teachers.
6. To study the relationship of personality with the mental health of prospective secondary school teachers.
7. To study the relationship of self-concept with mental health of prospective secondary school teachers.
   a. To study the relationship between dimensions of self-concept and dimensions of mental health of prospective secondary school teachers.
   b. To study the relationship of dimensions of handwriting analysis with dimensions of personality, dimensions of self-concept and dimensions of mental health of prospective secondary school teachers.
c. To study the relationship of dimensions of personality with dimensions of self-concept and dimensions of mental health of prospective secondary school teachers.

8. To compare the handwriting analysis of male and female prospective secondary school teachers.


10. To compare the handwriting analysis of prospective secondary school teachers of education colleges of Chandigarh and Punjab.

11. To compare the handwriting analysis of prospective secondary school teachers of all the four colleges individually.

12. To compare the mental health of male and female prospective secondary school teachers.

13. To compare the mental health of prospective secondary school teachers of government and private colleges of education.


15. To compare the personality of male and female prospective secondary school teachers.

16. To compare the personality of prospective secondary school teachers of government and private colleges of education.

17. To compare the personality of prospective secondary school teachers of education colleges of Chandigarh and Punjab.

18. To compare the self-concept of male and female prospective secondary school teachers.


21. To ascertain the conjoint contribution of personality, self-concept and mental health to the total variance in the handwriting analysis of prospective secondary school teachers.
2.10 Hypotheses

After reviewing the related literature following hypothesis were framed for the present investigation which were verified by using various statistical techniques:

1. There exists a significant relationship between handwriting and personality of prospective secondary school teachers.

2. There exists a significant relationship between handwriting and self-concept of prospective secondary school teachers.

3. There exists a significant relationship between handwriting and mental health of prospective secondary school teachers.

4. There exists a significant relationship between personality and self-concept of prospective secondary school teachers.

5. There exists a significant relationship between personality and mental health of prospective secondary school teachers.

6. There exists a significant relationship between self-concept and mental health of prospective secondary school teachers.
   a. There exists a significant relationship between dimensions of self-concept and dimensions of mental health of prospective secondary school teachers.
   b. There exists a significant relationship of dimensions of handwriting analysis with dimensions of personality, dimensions of self-concept and dimensions of mental health of prospective secondary school teachers.
   c. There exists a significant relationship of dimensions of personality with dimensions of self-concept and dimensions of mental health of prospective secondary school teachers.

7. There exists no significant difference between handwriting analysis of male and female prospective secondary school teachers.

8. There exists no significant difference between personality of male and female prospective secondary school teachers.

9. There exists no significant difference between self-concept of male and female prospective secondary school teachers.

10. There exists no significant difference between mental health of male and female prospective secondary school teachers.

11. There exists no significant difference between handwriting analysis of Prospective Secondary School Teachers of Government and Private Colleges of education.
12. There exists no significant difference between personality of prospective secondary school teachers of government and private colleges of education.
13. There exists no significant difference between self-concept of prospective secondary school teachers of government and private colleges of education.
14. There exists no significant difference between mental health of prospective secondary school teachers of government and private colleges of education.
15. There exists no significant difference between handwriting analysis of prospective secondary school teachers of education colleges of Chandigarh and Punjab.
16. There exists no significant difference between personality of prospective secondary school teachers of education colleges of Chandigarh and Punjab.
17. There exists no significant difference between self-concept of prospective secondary school teachers of education colleges of Chandigarh and Punjab.
18. There exists no significant difference between mental health of prospective secondary school teachers of education colleges of Chandigarh and Punjab.
19. There exists no significant difference between handwriting of prospective secondary school teachers of all the four colleges individually.
20. The variables of Personality, self-concept and Mental Health will significantly contribute to the total variance in the Handwriting Analysis of prospective secondary school teachers.

2.11 Delimitations of the Study

The population of prospective secondary school teachers is very large and it was not possible to cover the whole population in this investigation so a sample needed to be delimited. Also, one can study only one language at a time, hence in order to streamline the research and complete the study in a limited time frame/focussed manner, the study was delimited in following aspects:

1. Only English handwriting of prospective secondary school teachers was studied.
2. Sample was limited to two government and two private colleges of Chandigarh and Punjab only.
3. The study was limited to a sample of 476 prospective secondary school teachers.
4. The study was limited in its scope of finding relationship of handwriting analysis with personality, self-concept and mental health only.