

CHAPTER -II

IMPLEMENTATION

The project commences in the month of March 1999 with the appointment of the field investigator. The project was implemented in these distinct stages: -

In the first stage, a list of various courses offered by various I.T.Is was collected from the Directorate of Training & Technical Education, Delhi. Thereafter, the syllabi of these courses were collected. In order to find out the feasibility of in depth study of a few courses, the syllabi of all the trades were examined.

I.T.I offers various courses to the candidates having varied qualifications ranging from 8th passed to Senior Secondary level. The table 2.1 given below shows the title of the courses, the conditions of eligibility for admission and the duration.

Table 2.1

S.NO	Trades	Minimum Admission Qualification
	<u>One year Engineering Trades</u>	
1.	Sheet Metal Worker	Passed Matriculation or its equivalent or 10th classes pass under 10+2 system.
2.	Forger & Heat Treater	
3.	Plastic Processing Operator	
4.	Welder	
5.	Diesel Mechanic	
6	Carpenter	
7.	Foundry Man (Moulder)	Passed 8 th or its equivalent
8.	Tractor Mechanic	
9.	Steel Fabricator	
10.	Plumber	
11.	Scooter & Auto cycle Mechanic	
12.	Auto Electrician Dent Beating & Spray	
13.	Painting	
14.	Mason (Building Construction)	

S.NO	Trades	Minimum Admission Qualification
15.	Computer Operator (Programming Asstt.)	12 th class passed under 10+2 system or duly recognized Diploma in Engg. From any Polytechnic of 3 year duration after class 10 th .
<u>One year Non-Engineering Trades</u>		
1.	Steno (English)	Passed Matriculation or its equivalent or 10 th pass under 10+2 system with English /Hindi as subject
2.	Secretarial Practice (English)	
3	Steno (Hindi)	
4.	Process Cameraman	Passed Matriculation or its equivalent or 10 th pass under 10+2 system with Science (Phy. & Chem.)
5.	Beautician & Hair Dressing	Passed Matriculation or its equivalent or 10 th pass under 10+2 system.
6.	Textile Designing	
7.	Commercial Art	
8.	Photographer	

S. No	Trades	Minimum Admission Qualification
9.	Cutting and Tailoring	Passed 8 th class or its equivalent
10.	Embroidery & Needle work	
11.	C.C.& Home Management	
12.	Book Binder	
13.	Dress Designing	Passed 8 th class with N.T.C in cutting & Tailoring Trades.
14.	Fashion Designing	

<u>Two years Engineering Trades</u>		
1.	D/Man (Civil)	Passed Matriculation with Science (Phy. & Chem. and Maths.) or its equivalent or 10 th class with science (Phy. & Chem. and Maths.) as subject under 10+2 system.
2.	D/Man (Mech.)	
3.	Electronics Mechanic	
4.	Ref. & A/c Mechanic	
5.	Instrument Mechanic	
6.	Surveyor	
7.	Electrician	
8.	Wireman	

S. No	Trades	Minimum Admission Qualification
9 10. 11.	Business Machine Repair Radio & T. V. Mechanic Electroplater	Passed Matriculation with Science (Phy. & Chem.) and Maths or its equivalent or 10 th class with Science (Phy. & Chem.) and Maths as subject under 10+2 system.
12 13. 14. 15. 16.	Fitter Machinist Turner Machinist Grinder Motor Mechanic	Passed Matriculation with science (Phy. & Chem.) and Maths. or its equivalent or 10 th class with Science (Phy. & Chem.) and Maths. as subject under 10+2 system.
17. 18	Pattern Maker Painter (General)	Passed 8 th class or its equivalent.

<u>Three years Engineering Trades</u>		
1. 2.	Tool & Die Maker (Plastic & Moulding) Tool and Die (Jig & Fixture)	Passed Matriculation with Science (Phy. & Chem.) and Maths. to its equivalent or 10 th class with Science (Phy. & Chem.) and Maths. as subject under 10+2 system.

A perusal of the table given above shows that there are 49 trades taught by various I.T.Is located in the National Capital Territory of Delhi. 29 of these trades are of the duration of One year where as 18 trades are of the Two years duration. 2 courses are of Three years.

15 of these trades are offered to the students with 8th passed qualification where as 33 trades to High School passed student and remaining one course that is Computer Operator is for Sr. Secondary passed student.

On the basis of the review of the syllabi, 12 courses were identified which were thought to be taken up for detailed study to find out their feasibility in terms of admitting the blind students in these courses. **Table 2.2** gives the title, conditions of eligibility and the duration of these courses.

Table 2.2.

S.No	Title of the Course	Condition of the eligibility	Duration of the course
1.	Carpenter	10 th passed	One year
2.	Plastic Processing Operation	10 th passed	One year
3.	Book Binder	8 th passed	One year
4.	Plumber	8 th passed	One year
5.	Sheet Metal Worker	10 th passed	One year
6.	Scooter & Motor Cycle	8 th passed	One year
7.	Computer Operator	12 th passed	One year
8.	Stenographer (Hindi/English)	10 th passed	One year
9.	Mason (Building Constructor)	8 th passed	One year
10.	Radio & T.V. Mechanic	10 th passed	Two years
11.	Fitter	10 th passed	Two years
12.	Electroplating	10 th passed	Two years

In the second stage, the Principal of seven I.T.Is were contacted to seek their cooperation in the implementation of this project. Table 2.3 gives the name and address of these I.T.Is and the courses offered by them

Table 2.3

S.No	Name of the I.T.I	Courses offered by them in different Trades
1.	Principal I.T.I, Pusa, New Delhi-12	Carpenter, Fitter, Plastic Processing Operator, Radio & T.V. Mechanic, Stenography, Computer Operator etc.
2.	Principal I.T.I., Arab Ki Sarai, New Delhi-13	Plumber, Sheet Metal Worker, Book Binder, Scooter & Motor Cycle Mechanic, Electroplater, Computer operator, Carpenter, Mason etc.
3.	Principal I.T.I Sabzi Mandi, New Delhi-12	Fitter, Computer operator, Radio & T.V Mechanic, Carpenter, Stenography etc.
4.	Principal I.T.I Nand Nagari, Delhi-93	Fitter, Plumber, Computer Operator, Stenography, Plastic Processing Operator etc.
5.	Principal Jija Bai I.T.I Sri Fort, Khelgaon Marg, New Delhi-49	Carpenter, Stenography, Computer Operator, Radio & T.V Mechanic etc.
6.	Principal I.T.I Shahdra, Vivek Vihar, New Delhi-95	Fitter, Carpenter, Plumber, Scooter & Motor Cycle Mechanic, Stenography etc.
7.	Principal I.T.I, Jail Road Tilak Nagar, New Delhi	Fitter, Carpenter, Scooter & Motor Cycle Mechanic, Computer Operator, Stenography etc.

The Principals of Pusa, Arab Ki Sarai and Sabzi Mandi. I.T.Is showed keen interest and expressed their willingness to cooperate in the implementation of the project.

On the basis of the detailed discussions with the Principal of the three I.T.Is. It was decided that the following eight trades were worth trying to study the possibility of admitting blind student after identifying and incorporating the needed modifications.

Accordingly, the detailed study commenced in the month of October 1999. In the first place, the Carpentry Trade was taken up for detailed study.

Initially, the vocational instructor of these I.T.Is showed resistance and expressed their difficulties in teaching the blind student. Therefore, these instructors were taken to Blind Relief Association, New Delhi and Blind People's Association, Ahmedabad to gain first hand experience of seeing blind students learning technical skills in light engineering and Carpentry Trades as these organizations are offering technical training in these Trades.

The procedure followed for the detailed study is described in following paragraphs:

A Blind students with +2 qualification and having some technical training in light Engineering was appointed as second field investigator on the project. He was directly placed under the woodcraft instructor of I.T.I, Pusa for a period of 17 weeks.

He was taught by the instructor those operations which are included in the course of Carpentry trade Table 2.4.1 below contains the description of operation taught in this course. A structured observation schedule was used to observe the performance of the blind student. The purpose of observation was to identify the difficulties in teaching learning process of this trade. As well as the modification that will need to be made in the tools used in Carpentry work.

Table- 2.4.1 (Carpentry Trade)

S.No	Name of the operation	List of sub operation
1.	Exercise in rule reading	(i) Identification of Hand tools. (ii) Demonstration and use of measuring.
2.	Exercise in dividing a board into a number of equal parts with the help of foot rule and try square	(i) Measuring of wood. (ii) Marking on wood. (iii) Division of woods into different parts accordingly.
3.	Exercise in sawing by holding a board in carpenter vices.	(i) Marking on wood as per requirement. (ii) Clamping of wood into table vice. (iii) Sawing: use of different types of saw. (iv) Exercise on different cuts: cross cutting, curve cutting, oblique sawing etc.
4.	Exercise in ripping on sawing horse	(i) Knowledge of different types of files. (ii) Use of saw, horse, bench hook, and bench- vice.
5.	Planning of wood to a flat surface with the aid of winding strip and tools	(i) Demonstration and use of planes. (ii) Setting of plan, holding, planning technique (iii) Planning face, side face, edge mark, (iv) Testing of accuracy- flatness, twist ness of surfaces.
6.	Planning face-edge straight and	(i) Use of straight edge, bench stop, try

	square	square, winding strip etc.
7.	Planning to size, width and thickness use of marking gauge.	(i) Cross planning, edge planning etc. (ii) Use of marking gauge (iii) Grinding and sharpening of plane blades.
8.	Marking with pencil, marking gauge, try square & bevel.	Nil
9.	Saw to mark across grain along grain Bevel and angles	(i) Sawing to mark across the grain (ii) Sawing to mark along grain (iii) Sawing to angles & Bevel
10.	Use of back saws, tenon and dove tail	Nil
11.	Marking with the use of face side and face edge.	Nil
12.	Chiseling with the grain across the grain	(i) Demonstration and use of different types of chisels (ii) Chiseling along the grain (iii) Chiseling across the grain
13.	Chiseling oblique vertical & horizontal	(i) Chiseling vertical & horizontal & oblique etc. (ii) Grinding, Sharpening and Honing of chisel
14.	Chiseling of curved surfaces	Nil
15.	Marking boring and counter sinking holes for screws	(i) Marking of points where the hole to be made (ii) Boring of hole (iii) Counter sinking of holes for screw

16.	Holes for bolts using twist, center shell and expansion bits.	<ul style="list-style-type: none"> (i) Making holes through twisting (ii) Holes making through centre shell (iii) Making holes through expansion bit.
17.	Boring across the grain, with the grain, diagonally	<ul style="list-style-type: none"> (i) Boring (ii) Boring across the grain (iii) Boring along the grain (iv) Boring diagonally.
18.	Exercise in sawing, planning, chiseling boring for screwing	<ul style="list-style-type: none"> (i) Sawing (ii) Planning (iii) Chiseling for screwing (iv) Boring
19.	Exercise in preparation of half lap joints.	<ul style="list-style-type: none"> (i) Demonstration about the different types of joints (ii) Making of different types of framing joint including half lap joints
20.	Preparation of composite frame	<ul style="list-style-type: none"> (i) Measuring of wood (ii) Sawing of wood (iii) Planning of wood (iv) Chiseling for half lap joints. (v) Jointing the all sides & marking frame.
21.	Preparation of angle half lap joint	<ul style="list-style-type: none"> (i) Measuring of wood (ii) Sawing & Cutting (iii) Chiseling in required angle. (iv) Preparation of angle half lap joint

<p>22.</p>	<p>Preparation of different types of tenon and mortise.</p> <ol style="list-style-type: none"> 1. Through & housed tenon mortise 2. Stop tenon & mortise 3. Wedged tenon & mortise 4. Double tenon & mortise 5. Haunched tenon & mortise 6. Sloping or angle tenon & mortise 7. Twin tenon & mortise 8. Stud tenon & mortise 9. Dove tail tenon & mortise 	<ol style="list-style-type: none"> (i) Measuring & Marking (ii) Sawing & Cutting (iii) Making different types of Tenon & mortise such as: <ol style="list-style-type: none"> (a) Through and housed, (b) Stoped (c) Wedged (d) Double (e) Haunched (f) Sloping (g) Twin (h) Stud (i) Dove Tail : Common dove Tail, Single Dove Tail, Lapped Dove Tail, Secret or Miter Dove Tail, Use of Dove Tail joints.
<p>23.</p>	<p>Exercise preparation of different corner joints.</p>	<ol style="list-style-type: none"> (i) Measuring, Sawing, Planning (ii) Making different types of joints:- <ol style="list-style-type: none"> (a) Halving joints, Trenching and housing joints (b) Mortise and Tenon Joints, Bridle joints etc. (iii) Bonding of joints:- Simple butt, Related butt, Pocket Screw, Glued butt, tongue and groove butt joints etc. (iv) Lengthening of joints:- different types of scarf joints- Table scarf, Bevel scarf, Tension scarf etc.

24.	Exercise in preparation of office tray (straight sides)	<ul style="list-style-type: none"> (i) Measuring, Marking, Cutting of wood (ii) Planning, Sawing & Chiseling (iii) Making required Tenon & Mortise for joint (iv) Constructing the required frame/ office tray.
25.	Exercise in preparation of simple door.	<ul style="list-style-type: none"> (i) Measuring, Marking, Cutting of wood (ii) Planning, Sawing & Chiseling (iii) Making Tenon-Mortise, Jointing of corner (iv) Making of simple door.

Similar procedure was followed in the investigation of difficulties faced by the blind student in learning other trades namely Plastic Processing Operation, Fitter Trade, Sheet Metal Work, Plumber Trade, Book-Binder Trade, Electroplating Trade & Scooter & Motor Cycle Mechanic, Table 2.4.2, table 2.4.3, 2.4.4, 2.4.5, 2.4.5, 2.4.6, 2.4.7 & 2.4.8 respectively shown various operations included in the course of each trade.

Table -2.4.2 (Plastic Processing Operator Trade)

Hand Operated Injection Moulding Machine

S.No	Name of the Operation	List of Sub-Operations
1.	Barrel Height Adjustment	(i) Familiarization with the Institute and knowledge about the Tools / Machines used in the Trade.
2.	Alignment of moulds sprue hole and nozzle hole.	(ii) Safety precaution and first aids.
3.	Setting of barrel temperature	(iii) Measurement of current, Voltage, Power and Energy by using Voltmeter, Ammeter, Wattmeter and Energy-regulator.
4.	Mould clamping	(iv) Fixing and Connecting of Electrical accessories such as: - Switches, Holders, Energy-regulator, Fuse, Plug sockets on T.W. Boards, Heating elements etc related to the machine.
5.	Feeding of material in the hoper	(v) Familiarization with the basic idea of Mechanical and Electrical system of Hand operated Injection moulding machine and its different parts and their respective functions.
6.	Injection of plastic melts.	
7.	Hold on	
8.	Mould open and product ejection	(vi) Oiling, Lubricating and preventive maintenance of the machine (vii) Operating and controlling of hand operated Injection moulding machine followed by the main operations.

S.No	Name of the Operation	List of Sub-Operations
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Hand Operated Compression Moulding Machine

9.	Day light adjustment and clamping of mould	(i) Fixing and Connecting of Electrical accessories such as: - Switches, Holders, Energy-regulator, Fuse, Plug sockets on T.W. Boards, Heating elements etc related to the machine. (ii) Familiarization with the basic idea of Mechanical and Electrical system of the Hand Operated Compression moulding machine and its different parts and their respective functions.
10.	Temperature setting	
11.	Mould open & Material Changing	
12.	Mould closing	(iii) Oiling, Lubricating and preventive maintenance of the machine (iv) Operating and controlling of Hand operated Compression moulding machine followed by the main operations.
13.	Curing	
14.	Mould open and product ejection.	
15.	Defleshing of the product	

Semi Automatic Compression Moulding Machine

16.	Mould clamping	(i) Fixing and Connecting of Electrical accessories such as: - Switches, Holders, Fuse, Plug sockets on T.W. Boards, Heating elements etc.
17.	Temperature setting	

18.	Curing Time Setting	(ii) Familiarization with the basic idea of Mechanical, Electrical and Hydraulic system of the Semi Automatic Compression moulding machine and its different parts and their respective functions.
19.	Mould open and material charging	
20.	Mould closing	
21.	Curing	(iii) Oiling, Lubricating and preventive maintenance of the machine.
22.	Mould open and product ejection	(iv) Operating and controlling of Semi Automatic Compression moulding machine followed by the main operations.

Automatic Injection Moulding Machine

23.	Mould clamping	(i) Fixing and Connecting of Electrical accessories such as: - Switches, Holders, Fuse, Plug sockets on T.W. Boards, Heating elements etc. (ii) Familiarization with the basic idea of Mechanical, Electrical and Hydraulic system of the Automatic Injection moulding machine and its different parts and their respective functions. (iii) Oiling, Lubricating and preventive maintenance of the machine. (iv) Familiarization with 'Toggle switch' and 'limit switch no. 7'
24.	Material Charging	
25.	Temperature setting	
26.	Shot weight setting	
27.	Speed setting	
28.	Distance setting	
29.	Pressure setting	
30.	Timer setting	

S.No	Name of the Operation	List of Sub-Operations
31.	Mould close	(v) Fitting of mould in the machine according to the requirement with the help of overhead crane, Mould setting injector, locking and cooling of mould adjusting feed of screw. (vi) Fitting and adjusting of nozzle, adjusting injector pressure and speed. (vii) Knowledge of different category Thermoplastic material and their uses. (viii) Operating and controlling of Automatic Injection moulding machine followed by the main operations.
32.	Injection	
33.	Refilling & Cooling	
34.	Mould open & Product Ejection	
35.	Deflashing / Trimming	
36.	Preventive maintenance of machine	

Automatic Blow Moulding Machine

37.	Mould setting	(i) Fixing and Connecting of Electrical accessories such as: - Switches, Holders, Fuse, Plug sockets on T.W. Boards, Heating elements etc.
38.	Barrel setting	
39.	Temperature setting	
40.	Pressure Setting	
41.	Time setting	(ii) Familiarization with the basic idea of Mechanical, Electrical and Hydraulic system of the Automatic Blow moulding machine and its different
42.	Parison Making	

43.	Mould closing	<p>parts and their respective functions.</p> <p>Oiling, Lubricating and preventive maintenance of the machine.</p> <p>(iii) Setting of die, Adjusting Mandrel turn, Controlling Parison, Adjusting thickness uniformity.</p> <p>(iv) Refilling of Air in the cylinder for the Blowing.</p> <p>(v) Use of Dry Air and Lubricated Air Operating and controlling of Automatic Blow moulding machine followed by the main operations.</p>
44.	Blowing	
45.	Mould open and product ejection (stripping)	
46.	Deflashing	

Lamination Machine

47.	Loading of film roll	<p>(i) Fixing and Connecting of Electrical accessories such as: - Switches, Holders, Fuse, Plug sockets on T.W. Boards, Heating elements etc.</p>
48.	Pressure setting	
49.	Temperature setting	
50.	Lamination of pages	
51.	Trimming	<p>(ii) Familiarization with the basic idea of Mechanical, Electrical and Heating system of the Lamination Machine and its different parts and their respective functions.</p> <p>(ii) Oiling, Lubricating and preventive maintenance of the machine.</p> <p>(iii) Operating and controlling of Lamination Machine followed by the main operations.</p>

Fabrication of Plastic

52.	Marking	(i) Familiarization with the using tools / machine and equipments
53.	Cutting by Fret-saw	(ii) Marking out lines, gripping suitable in Vice Jaws, Hack-sawing to given dimensions sawing different types of fiber sheet of different sections.
54.	Filing	
55.	Drilling	(iii) Chipping flat surface along a marked line.
56.	Topping	(iv) Filing Channel Parallel, Filing Flat and Square, use of Try square.
57.	Thermoforming	
58.	Riveting	<p>(v) Marking according to position of holes finding centre of round bar with the help of 'V' blocks and scribing block etc.</p> <p>(vi) Marking and Punching / Drilling of holes on flat surface (through holes and blind holes)</p> <p>(vii) Forming internal threads with taps of standard size & preparing studs and bolts.</p> <p>(viii) Types of Rivet and their uses. Standard sizes of Rivets and Riveting Tools. Calculation of Riveting allowance (Pitch and Lap).</p> <p>(xi) Safety precaution and first-aid against Electric joints single and stranded Conductors (if necessary).</p>

F.R.P.(Fiber Re-enforced Plastic) Moulding

S.No	Name of the Operation	List of Sub-Operations
59.	Preparation of mould surface	(i) Testing and Operating machine to determine tensile impact, Cohesion and compressive strength. (ii) Location of stores concentration and testing of aesthetic property. (iii) Cup flow testing –identification of various plastic in relation to properties (iv) Laminating glass fiber polyester etc. (v) Casting of PVC, epoxy etc. (vi) Fabricating acrylic sheet ABS-sheet, HIPS sheet, HMHDPE blocks etc. followed by the main operations.
60.	Preparation of moulding material	
61.	Moulding	
62.	Deflashing	

Extrusion Machine

63.	Die-setting	(i) Fixing and Connecting of Electrical accessories such as: - Switches, Holders, Fuse, Plug sockets on T.W. Boards, Heating elements etc. (ii) Familiarization with the basic idea of Mechanical, Electrical and Hydraulic system of the Extrusion Machine and its different parts and their respective functions.
64.	Temperature setting	
65.	Alignment of accessories	
66.	Extrusion	
67.	Adjustment for die-swelling	

68.	Wind-up & cutting	<p>(iii) Oiling, Lubricating and preventive maintenance of the machine.</p> <p>(iv) Changing and cleaning of Screws in Extruder, Adjusting and Controlling temperature, Adjusting screen pad arrangement, adjusting variable speed, setting and adjusting die head for profile and film etc.</p> <p>(v) Operating and controlling of Extrusion Machine followed by the main Operations.</p>
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Allied Trade – Fitter in P.P.O.

69.	Cutting of iron strip	(i) Familiarization with the using tools / machine and equipments
70.	Filing	(ii) Marking out lines gripping suitable in Vice Jaws, Hack-sawing to given dimensions sawing different types of metals of different sections.
71.	Finishing	
72.	Drilling	(iii) Chipping flat surface along a marked line.

73.	Taping	<ul style="list-style-type: none">(iv) Filing Channel Parallel Filing Flat and Square, use of Try-square(v) Marking according to position of holes finding centre of round bar with the help of 'V' blocks and scribing block etc.(vi) Marking and drilling of holes on flat surface (through holes and blind holes)(vii) Forming internal threads with taps of standard size & preparing studs and bolts. Safety precaution and first-aid against Electric joints single and stranded conductors.
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Table 2.4.3 (Fitter Trade)

S.No	Name of the Operation	List of Sub-Operations
1	Measuring	(i) Familiarization with the using tools / machine and equipments
2.	Gripping in Vice-Jaws	(ii) Marking / Punching out lines gripping suitable in Vice Jaws,
3.	Hack -sawing (Cutting) by hand	Hack-sawing to given dimensions sawing different types of metals of different sections.
4.	Filing of sides & surfaces	(iii) Chipping flat surface along a marked line.
5.	Size making	(iv) Filing Channel Parallel Filing Flat and Square, use of Try square.
6	Marking (Deep marking or punching)	
7	Drilling	
8.	Chiseling (Cutting)	
9	Taping	
10	Threading	Contd....

S.No.	Name of the Operation	List of Sub-Operations
11	Counter sinking	(v) Marking according to position of holes finding centre of round bar with the help of 'V' blocks and scribing block etc.
12	Counter Boring	
13	Reaming	(vi) Chiseling of Metal Sheet, Grinding. (vii) Marking and drilling of holes on flat surface (through holes and blind holes).
14	Spot facing	
15	Grinding	(viii) Bore holes-spot face, pilot drill, enlarge hole, using boring tools make a bush. Step bore-cut recess turn bore diameter to sizes.
16	Hack sawing (cutting) by a machine	
17.	Channel making	(ix) Counter Sinking, Counter Boring, Reaming, Spot facing, Grinding, Cutting by machine (Hack-sawing)
18.	Circular Cutting (concave and convex shape) in the corner of rectangular iron plate.	
19	Fitting job (open square fitting of 25-mm side) in a rectangular plate.	(x) Forming internal threads with taps of standard size & preparing studs and bolts. (xi) Safety precaution and first-aid against Electricity joints single and stranded conductors.

S.No	Name of the Operation	List of Sub-Operations
20	T- fitting job in a channel shaped plate of 10 mm border sides.	(xii) Making of different jobs followed by the needed basic operations such as: - (a) Channel Making, (b) Circular Cutting (c) Different types of Fitting job (d) T- fitting job (e) In side square fitting (f) Size fitting of stair- shaped job (g) U- shaped size fitting (h) F- shaped size making of job
21.	In side square fitting of 30 mm sides in a by square of 60 mm side.	
22.	Size fitting of stair- shaped job as per the given size 20 mm each of height & distance of the step	
23.	U- shaped size fitting of the given job as per the size. Finishing	
24.	F- shaped size making of job as per the given size.	

Table 2.4.4 (Sheet Metal Work)

S.No	Name of the Operation	List of Sub-Operations
1.	Planishing of sheet metal	(i) Familiarization with the Institute, Trade and using tools and equipments.
2.	Marking	
3.	Cutting with different types of snip	(ii) Planishing of GI Sheet, Measuring and Drawing Simple Geometrical shapes, Marking and Cutting of G.I. Sheets to various angles and these shapes, Use of different types of snips, use of Wheeling and raising machine.
4.	Notching (corner cutting	
5.	Bending / folding	
6.	Jointing: - Lap joint, Groove Joint, Seam Joint, Long Groove Joint, Pen down Joint, Butt Joint etc.	(iii) Different types of cutting- Straight Cut, Right Cut, Left cut, Cutting off inside and outside cut, Cutting notches and cutting profiles. (iv) Folding, Bending, Seaming, Notching, Turing, Grooving, Edge Stiffening, Hemming, Wiring, Crimping, Swaging etc.
7.	Making holes with solid punches, round punches & hollow punches as per I.S.I	

S.No	Name of the Operation	List of Sub-Operations
8.	Making different types of container/ hollowing as Square shaped, Rounded, Round T-Pipe etc.	(v) Different Seams / Joints such as: - Grooved seam, Locked Grooved seam, Pane down seam, Bottom Lock seams, Corner Fold (Knocked-up seam) Corner Clip Lock, Double Bottom, Clip Lock (Cap Lock), Snap Joint, Lap Joint, Long Groove, Pen Down Joint, Butt Joint etc.
9.	Making of holes with a twist drill in sheet metal	
10.	Riveting	
11.	Making of Dustpan: corner & handle riveted	(vi) Making holes with solid punches, Round punches and use of Hollow punches for making holes in G.I. Sheet. (vii) Making holes in G.I. Sheet using Punching Machine, Twist drill, use of hand and Electric drilling machine, Grinding machine etc.
12.	Making of job: - Hollowing, Square tray, Taper tray, Funnel, Bucket, Heater (squares & rounded). etc.	(viii) Making different types of container / Hollowing such as: - Square Shaped, Rounded, Round T-Pipe Square tray, Taper tray, Funnel, Bucket, Heater (squares & rounded etc. (ix) Riveting, use of various types of Rivet heads, single chain riveted joint, Double chain and Zig Zag riveted joints.

Table 2.4.5 (Plumber Trade)

S.No	Name of the Operation	List of Sub-Operations
1.	Cutting	(i) Familiarization with the using tools and equipments: Steel rule, Engineers square, Scriber and Dividers, Hack-saw, Centre punch, Calipers and different Files, Bench vice and Hand vice.
2.	Filing	
3.	Threading	
4.	Taping	(ii) Use of hack-saw, Centre punch filling to line Drilling Holes, Hammer-chipping and Grinding of Chisels, Cold Chisel, Round nose Chisel, Drilling and Taping making of studs and bolts.
5.	Pipe fitting as per drawing	
6.	Pipe fitting single line Shower fitting	(iii) Filling a job flat and Square various Locking devices, Fixing of Check nut locking pins.
7.	Pipe fitting: double line shower fitting	
8.	Sanitary fitting: Fixing of wash-basin, (Flat back type, Angular back, Pedestal type wash basin)	(iv) Barzing of pipes and various sizes in different angles and tees. (v) Use of masons hand tools straight edge sprit level, Plumb bob, Square etc.
9.	Sink –fitting	
10.	W/C fitting: Indian Type	(vi) Fixing of gully traps, Floor Traps, Nanhi traps etc. Using bricks in cement mortar
11.	W/C fitting: European type	
		(vi) Cutting of pipes of different metals

12.	Urinal fixing	of different dimensions.
13.	Fixing of gulley Trape (Mason related work at 1.5' under ground level)	(vii) Threading of G.I. Pipes, using pipe die of various sizes upto 50 mm. Simple pipe connection using G.I. Pipes
14.	Practice of main hole & inspection chamber (Gutter type Chamber making)	(viii) Layout of water pipe connection to the sanitary fitting using different types of valves / fittings, different Sanitary ware fitting (Wash-basin, Sink etc.)
15.	C.I pipe jointing (led jointing)	(ix) Installation of Indian Style and European Style W/C fitting, Urinal fixing.
16.	S/W pipe jointing	(x) Installation of Water meter and Water heater.
17.	Water-meter fixing	(xiii) Main hole and Inspection chamber (Gutter type) making,
18.	Water-heater fixing (Geyser)	(xiv) C.I. pipe jointing (led jointing), S/W pipe Jointing etc. (xv) Reconditioning of Taps, Valves, Flushing Tank, Testing for correct functioning.

Table 2.4.6 (Book Binder Trade)

S.No	Name of the Operation	List of Sub-Operations
1.	Folding	(i) Familiarization with trade and using Tools / Machine and equipments
2.	Perforating	(ii) Cleaning, Lubrication and general maintenance of Machines and Tools / Equipments.
3.	Gathering /Mixing	(iii) Operation of hand folding standard folding upto 16 pages, Gathering/ Mixing and making up into books.
4.	Sewing/Stitching	(iv) Stitching, Thread / Wire stitching by hand / machine, Saving, Rounding and Backing, Tipping, Knocking and Counting.
5.	Rounding & Backing	(v) End paper, Preparation and pasting ordinary and reinforced, Guillotine, Handling, Care and use, Cutting, Trimming.
6.	Knocking & counting	(vi) Pad making and Operation - Ruling, Perforating, Numbering, Eye letting etc. equipment used, their handling & operation, Flush binding, Work involving Perforating, Numbering duplicate and Triplicate copies.
7.	Topping on end papers	(vii) File covering and Box making- simple exercises
8.	Forwarding operation a) End papering b) Backing c) Doing paste down	(viii) Adhesives making and its use
9.	Preparation of adhesive (paste making)	(ix) Safety / Preventive measures.
10.	Cutting	(ix) Safety / Preventive measures.
11.	Edge decoration	

12.	Covering of books	
13.	File covering	
14.	Box making	
15.	Pad making	

Table 2.4.7(Electroplating Trade)

S.No	Name of the Operation	List of Sub-Operations
1.	To prepare salt solution of different salts according to the material of the job to be Electroplated.	(i) Familiarization with Trade and using Tools / Machines and equipments
2.	To set (fix), the job/ material to be electroplated on cathode	(ii) Practice on Connection of electric wires and Polarity test of D.C. supply, practice in connecting, measuring instrument such as voltmeter, ammeter and different electric accessories such as switches
3.	To set the metal (rod of the element) on anode which to be plated on the job	Wall Sockets, Lamp holder etc, and difference between series and parallel circuits, Measurement of Electrical power and energy by using energy meter etc.
4.	To connect the equipment with electric power	(iii) Some basic operation of Fitter Trade- Marking, Cutting, Cheeping, Grinding, Hardening and Tempering, filing, Drilling, Taping, etc.
5.	Time curing	(iv) Cutting by different Snips, Bending, Riveting, etc.

S.No	Name of the Operation	List of Sub-Operations
6.	Remove-out the material from the tank	<p>(v) Verification of different Laws related to electrolysis. (Faraday's, Joules Laws etc.)</p> <p>(vi) Testing and identifying of acids, alkalies & salts. Mixing of electrolytes and use of hydrometers, different types of electroplating solutions first and antidotes for cyanide poisonings</p> <p>(vii) Setting up the plating Vat, Securing Vat rod's position. Mixing electrolyte for copper plating and filling the electroplating vat for copper, Standard types of water to be used for Electroplating work.</p> <p>(viii) Cleaning articles before plating by scribing with emery paper, Wet sand, Scratch, Brushes, Wire wheels etc. Suspending anodes and cathodes in Electroplating vat surface preparation of Ferrous/Non-Ferrous metals and alloys before plating using Acid base cleaner etc.</p>

7.	Buffing	<p>(ix) Cleaning by means of tumbling and varnishing barrels. Preparing of suitable dips and pickles, removing of scales from surface of iron and steel cleaning metallic surface of oil, grease and dirty matters roughing smooth surface, preliminary electroplating, Cathode and Anode cleaning, operation on Buffing machine.</p> <p>(x) Safety and preventive measures related to the total electrolysis process of electrolysis.</p>
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Table 2.4.8 (Scooter And Motor -Cycle Mechanic Trade)

S.No	Name of the Operation	List of Sub-Operations
1.	Identification of tools and equipments	(i) Familiarization with Trade and Tools and equipments used and their safety precautions.
2.	General Servicing, Washing, Oiling and Greasing	(ii) Fitting, use of Centre punch, Dividers, Calipers, Steel rules etc. (iii) General servicing of Scooter & Motor Cycle (Washing, Cleaning, oiling and Greasing), repair of
3.	Inspection of Chassis and Frame of Different bikes	Tubes of Tyre for leaks (iv) Inspection of Chasis Frame, Check and install of Bearing, Servicing of
4.	Servicing of shock absorbers.	Shock absorbers, Retinue Eye Bushes, Repair and Assemble
5.	Servicing of Suspension	brake unit, adjustment of brake pedal, brake shoes for proper play.
6.	Handle Alignment	(v) Repair of Clutch unit, Relining Clutch plates, Overhauling of Gear
7.	Maintenance & repair of Break	box and its assembling. (vi) Overhauling and setting carburetor, Front and Rear Wheel.
8.	Hydraulic Break system	
9.	Repairing of Clutch unit	(vii) Setting of ignition timing and Cleaning of Spark Plug
10.	Gear –Box repairing	(viii) Overhauling and cleaning of fuel tank, Petrol Tap (Cock) etc.

11.	Repairing of Carburetor	(ix) General repair work and Changing of Handle Alignment, Front Shocker, Clutch wire, Brake wire, Accelerator wire, Gear wire etc and its setting for proper play. Decarbonising of engine, repair of silencer, and wheels etc.	
12.	Wheel repairing (Puncher etc)		
13.	Decarbonising of Engine		
14.	Checking the part of Engine		
15.	Electrical Wiring		(ix) Checking and change of electric wiring and bulbs and spark plug.
16.	Repair of Magnetic Ignition System		
17.	Over hauling of fuel tank and petrol tape etc		

Through an open discussion with the instructors their views regarding the difficulties the blind students will face if admitted in above courses were obtained. On the basis of the discussion an observation schedule was designed to identify the difficulties in learning these trades. A specimen of the observation schedule is given in **Appendix I**

On the completion of this work the same blind student was placed in the Plastic Processing Operator trade for a period of 14 weeks, in Fitter Trade 10 weeks, in Sheet Metal Work 2 weeks, in Plumber Trade 2 weeks, in Electroplating Trade 2 weeks, in Book-Binder Trade 3 weeks and in Scooter & Motor Cycle Mechanic Trade 3 weeks. This is shown in the **Table 2.5**

Table- 2.5

S.No	Name of the Trade	Duration of weeks
1	Carpentry	17
2	Plastic Processing Operating	14
3	Fitter	1
4	Sheet Metal Work	2
5	Plumber	2
6	Electro-Plating	2
7	Book-binding	3
8	Scooter & Motor Cycle Mechanic	3

In the third stage the performance of the blind students in learning various operations in different trade was observed with the help of the observation schedule mentioned above. On the basis of the difficulties experienced by the vocational instructor of these trades, a draft curriculum was prepared. The same was discussed at length in a two-days workshop held at Blind People's Association, Ahmabad on 14th & 15th September 2001. The report of the workshop and the final curriculum for the training of vocational instructors of I.T.Is are given in **Appendix II & III** respectively.

Limitations of Blindness

Lowenfield (1952) describes the difficulty in getting about as one of the measure limitations of the Blindness. The trades taught in the LT.Is could be practised either in a factory situation or on a freelance basis. In that case the workers may have to travel from place to-place and home-to-home. In a particular home/factory, also the work may have to be done in different places.

We have studied the feasibility of the operations that could be practised by blind and severely visually impaired peoples. It must be born in mind that their mobility limitations will not enable them to work as freelancers. They could work in a factory situation. More over in no trade can the blind perform all the operations independently. Therefore, they must be given work in a factory or workshop situation work and that to in a group or assembly line situation. This applies to all the trades identified as suitable for the blind.

Limitations of the Study

The study was limited to three LT.Is in Delhi. However, many, studies have shown that mechanical performance is largely culture free except genetic disposition. Therefore, we do not expect the results to be biased in favor of any particular region. It should be applicable to all regions of the country. It is important to bear in mind, however that the study is based on the performance of a single individual. While on an average the findings should applied to every average blind person, individual differences can not be ruled out. Moreover, the study has been made on a blind man. We do not know how well it will apply to blind woman.

Productivity is determined to a significant extent by the person's aptitude. Currently, there is no standardized test in India, specially designed to assess the mechanical aptitude of blind people. However, need based tools could be designed by LT.Is or by institution for the blind to assess mechanical aptitude of a blind person. Vocational rehabilitation centers of the Ministry of Labour could assist in this task.