

Azim Premji Foundation

Computer Aided Learning Centres A Study in Karnataka and Andhra Pradesh

Research Report

May 2004

1 INTRODUCTION

1.1 Background

The Azim Premji Foundation has launched programs for use of IT in rural schooling. Presently, the experiments are under way in some schools in rural Karnataka and Andhra Pradesh. The programme envisages deployment of computers as a media to impact learning competencies and to create an attractive environment in the school. The Foundation has developed several CDs designed to aid the class room learning process in specific areas such as mathematics, language, environment sciences etc. Two different versions of the experiment are being followed in the two states.

The model followed in Karnataka (CALC) is designed to provide learning to the children and also work towards making the process self-sustaining after the withdrawal of support by the State Government. The computer and associated hardware is provided by the state government. The centre is housed in the identified schools. Each center is managed by a volunteer selected from the community called the Young India Fellow (YIF). The educational CDs, training of the YIF to man the centres and regular monitoring is provided by the Foundation. The centre is supposed to generate revenue by selling services (data entry, typing application letters, printing etc) to the community outside the school hours. The revenue is expected to cover the salary of the YIF and maintenance costs after the initial 3 year warranty period. as well. These centres are operating in 225 schools in 44 taluks of Karnataka. During the school hours, the children from that school are allotted time to use the computer in the ratio of 4 children to one computer. Facilitation or help needed by the children to operate the computer is provided by the YIF. Presently, there is little or no involvement of the school teachers in the computer aided learning process. The children have freedom to decide which CDs to use and work with. Each center has between 5 and 8 PCs and is thus more suited for larger schools with typical strength of about 300 children.

The design of the model followed in Andhra Pradesh (TICAL) on the other hand is somewhat different. The district administration of West Godavari district of the state has started an e-governance initiative. This initiative promotes Citizen to Government interaction. Under this, 46 e-Seva Kendrams (service centres) have been set up, one in each mandal headquarter town of the district. These are equipped with one computer each and other associated hardware and provides services like collection of electricity bills, printing certificates, handling complaints against utilities or services etc. This has been further extended to cover 144 other non mandal headquarter locations. These centres are called the Rural Service Delivery Points (RSDP). These are public telephone points (STD/ISD booths) upgraded with a computer to provide e-service as in the Kendrams. Under the initiative of the district administration & with the help of the Azim Premji Foundation, these centres make available time in the afternoons for school children to use the computer. The learning CDs are provided by the Foundation. Children from schools nearest the e-centre use the facility. A group of 10 children gets to spend 30 minutes at a time on the computer. In this model the focus is essentially on providing learning to the children with the involvement of the teacher. The Foundation, in addition to providing the CDs also trains the concerned teachers in the appropriate use of the material. Here, since the centers typically have only 1 PC, this model is more suited to smaller schools (less than 200 children). Further, the time available for each child at the computer is perhaps lesser than his/her Karnataka counterpart.

An exploratory study was carried out by the Foundation to assess the impact of the initiatives in the two states. The details of the study are summarized in the following pages.

1.2 Research Design

The impact of the intervention was sought to be measured through appropriately designed 'learning achievement tests'. The assessment was thus restricted only to the curriculum related learning. While exposure to computers would enable the children to gain various non academic skills and competencies as well, the present study was not designed to assess them.

When assessing the impact of the intervention on children's learning outcomes, it was important to understand the CDs that the children had been exposed to. In Andhra Pradesh, the model being a few months old, a feedback exercise was conducted with the Nirvahaks of the E-Seva and RSDP Centres. Since exposure to the Curriculum CDs was not uniform, it was important to zero in on the CDs that all children (across classes 3, 4 and 5) were exposed to and therefore the learning outcomes that children would be tested for mastering. Out of the 8 CDs that were used by children in Andhra Pradesh, 3 CDs were selected for having been used a most and competencies of which were mapped to the curriculum of Classes 3, 4 and 5. (See Table 7 in annexure). It was corroborated that children of the CALCs in Karnataka were also exposed to the 3 CDs in the same time period.

Separate achievement tests were developed for class 3, class 4 and class 5 after mapping the content of three CDs to the respective class curriculum. The three CDs were Chatur Char, Brainstorm and Magic Marbles. Each test had 17 questions (a few had sub-questions) to be answered in written form and had a maximum possible score of 50 marks. The same tests were administered both in Karnataka and AP schools after appropriate translation in Kannada and Telugu.

A 'control group' and 'experimental group' design was followed. The schools where the students had exposure to the computers and CDs formed the experimental group while the schools which did not have access to the computers and CDs comprised the control group. For the sake of uniformity, all the experimental group schools were those where the computer installation and use for learning started in the month of September 2003. The schools for the study were selected using a random process. First the universe of experimental group schools where the computer aided process was initiated in September 2003 and where the children had exposure to the three CDs was identified in each state. This universe comprised 43 schools in Karnataka and 106 schools in Andhra Pradesh. A sample of these schools - 6 in Karnataka and 10 in AP - was selected using a random number process. Thereafter, to minimize the effect of other variables, control group schools in the vicinity of the experimental group schools (within a radius of about 5 kms.) were identified and an equal number of schools selected randomly. Thus, for each experimental group school there was a control group school nearby. The vicinity principle ensured that the schools had similar kind of support from the government officials like Cluster Resource Personnel, the Block (or Mandal) Education Officer etc. as also ensuring that the communities had roughly similar socio-economic and cultural profile.

A total of 12 schools (6+6) in Karnataka and 20 schools (10+10) in AP thus formed the sample for the study. The detailed list of schools is presented in Table 7 of the annexure. A total of 2933 students were tested in these schools.

The tests were conducted in the period March 4 – March 11, 2004. In all locations, the test was administered and supervised by appropriately briefed and trained neutral invigilators.

2 FINDINGS

The findings are presented separately for the sample in Karnataka and Andhra Pradesh. The average marks obtained by the children in each class for the experimental group schools and the control group schools are worked out. A simple Analysis of Variance (ANOVA) test has been carried out to determine the statistical significance of the data.

2.1 Karnataka

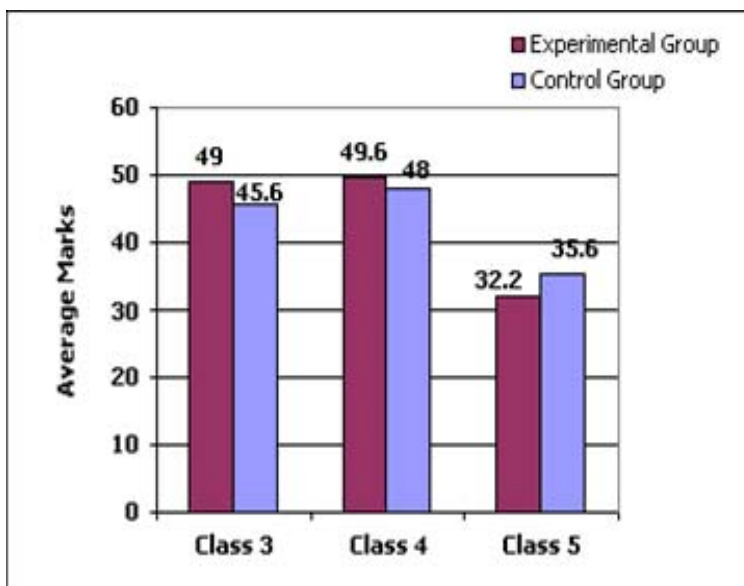
A total of 1161 students were given the written test across the 12 schools. The average percentage of marks is as follows:

Table 1 : Performance of Students in Competency Based Test in Karnataka Schools

	Experimental Group Schools		Control Group Schools		Significance
	No of students	Avg. marks %	No of students	Avg. marks %	
Class 3	236	49.0	162	45.6	Not Significant
Class 4	242	49.6	122	48.0	Not Significant
Class 5	279	32.2	121	35.6	Not Significant

As can be seen, the average marks across the two groups are fairly similar. In addition, the average marks obtained by class 5 students are much less than average marks in class 3 and class 4 in both groups. The results of the ANOVA test to determine if the differences in marks between experimental group schools and control group schools are significant or not are indicated in the last column.

Figure 1: Average Percentage Marks of Students in Experimental Group and Control Group schools in Karnataka



The results clearly indicate that there is no significant difference in the marks of two groups. In other words, exposure to computers and the CDs for the students in the experimental group schools does not seem to have increased their level of learning (as measured by the achievement test) in any way.

The details of the significance tests are provided in the annexure for reference.

2.2 Andhra Pradesh

In Andhra Pradesh, a total of 1772 students were tested across 20 schools. The average marks percentage is as follows

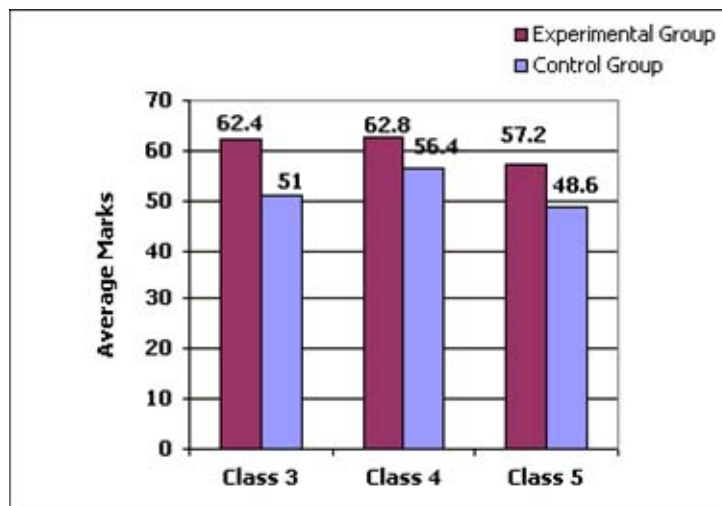
Table 2 : Performance of Students in Competency Based Test in Andhra Pradesh Schools

	Experimental Group Schools		Control Group Schools		Significance
	No of students	Avg. marks%	No of students	Avg. marks%	
Class 3	251	62.4	250	51.0	Sig. at 95%
Class 4	320	62.8	277	56.4	Sig. at 95%
Class 5	390	57.2	284	48.6	Sig. at 95%

The table indicates the average marks among the students in the AP schools. Here too, it can be noticed that the marks among class 5 students are less than the class 3 or class 4 students in both group, as in Karnataka.

As can be seen, in all the three classes, the marks obtained are significantly different in the experimental group schools and the control group schools. This is a clear indication that the computer based inputs have significantly impacted the students in the experimental group schools in a positive way.

Figure 2: Average Percentage Marks of Students in Experimental Group and Control Group Schools in Andhra Pradesh



The details of the significance tests are available in the annexure.

2.3 Further analysis

The achievement data was further analysed by gender to determine patterns if any. Further, a competency wise analysis was also carried out to identify areas needing attention.

Gender wise performance

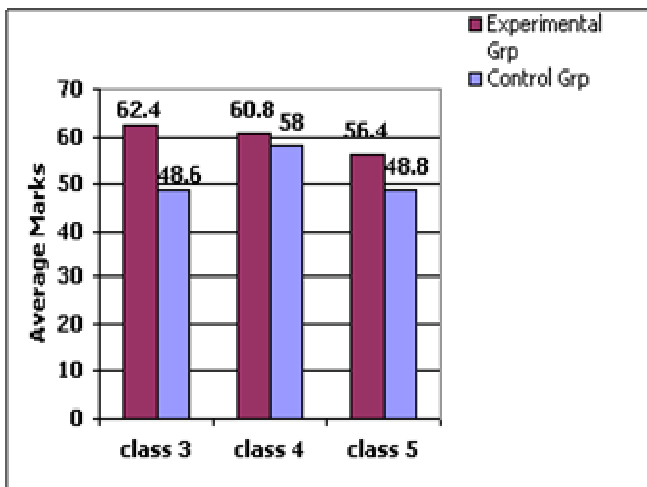
The gender wise analysis did not throw up any notable patterns in Karnataka. In other words, the learning levels among boys and girls there was similar. The data from Andhra Pradesh however showed some interesting patterns.

Table 3: Gender wise performance in the state of Andhra Pradesh

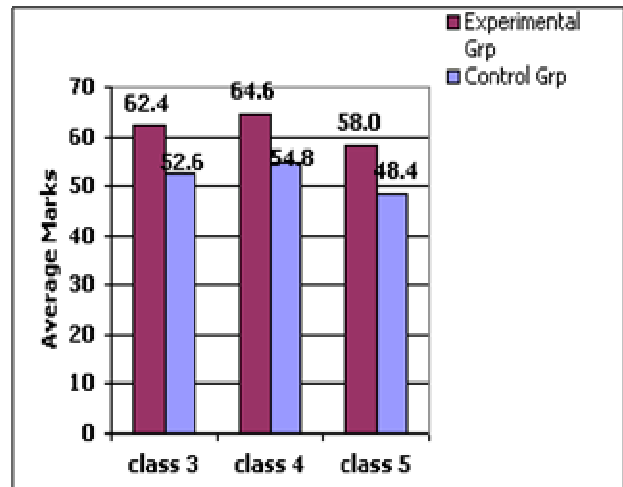
Class	BOYS			GIRLS		
	Experimental	Control	Significance	Experimental	Control	Significance
Class 3	62.4%	48.6%	Sig. at 95%	62.4%	52.6%	Sig. at 95%
Class 4	60.8%	58.0%	Not Significant	64.6%	54.8%	Sig. at 95%
Class 5	56.4%	48.8%	Sig. at 95%	58.0%	48.4%	Sig. at 95%

Figure 3: Gender wise Performance of Students in Andhra Pradesh

Performance of Boys



Performance of Girls



The table indicates the gender wise performance (average marks) of students in the AP schools. When looking at the performance of boys it is seen that except for class 4 students, boy students in the experimental group schools perform significantly better than the control group.

Girl students of all the classes 3, 4 and 5 are seen to perform significantly better than their counterparts in the control group schools.

Learning Competencies Requiring Mastery

The achievement tests were developed to test the learning competencies of children exposed to the 3 CDs (See Table 8 in the annexure). The table below summarizes the question wise response of the students in the form of a class wise analysis of competencies that children were not able to master.

Table 4: Competencies Not Mastered by Many Children

Class/ State	Karnataka	Andhra Pradesh
Class 3	<ul style="list-style-type: none">• Ascending and Descending Order• Multiplication• Fractions	<ul style="list-style-type: none">• Ascending and Descending order• Measurement (metric system)
Class 4	<ul style="list-style-type: none">• Multiplication (word problems)• Conversion from Fractions to Decimals	<ul style="list-style-type: none">• Multiplication Word Problems• Conversion from fractions to Decimals
Class 5	<ul style="list-style-type: none">• Place Value• Greater than, Lesser than• Multiplication• Decimals	<ul style="list-style-type: none">• Greater than, Lesser than• Decimals

The table indicates that there is a pattern to the competencies which the children have not been able to master in both the states. These include fractions and decimals, greater than – lesser than and ascending / descending order .

3 CONCLUSIONS

The findings of the study indicate that the intervention in the form of computer aided learning in the Andhra Pradesh schools has had a considerable impact on the students in terms of their learning levels. Similar results are however not visible in the Karnataka schools.

While it is tempting to compare the results in the two states, it must be noted that there are differences on several counts between them. There are differences in the pedagogy in terms of the curriculum, the text books, the method of teaching etc. Further, even in terms of the availability of uninterrupted power for running the computers during school hours there would be differences between the two states. In addition, when the Karnataka intervention was designed, the focus was somewhat different than when the AP plan was developed. Hence comparison between the two states is ideally not advisable. It must also be borne in mind that this is only a summative assessment at the end of the year. No base line has been carried out. **Hence the findings need to be viewed with caution.**

The findings in Andhra Pradesh however point to the experiment being successful in the context of the environment and the model adopted there. It is possible to hypothesize that the involvement of the teachers in the computer based learning has had a beneficial impact. To be able to replicate this in other parts of the country, it would however be necessary to understand how precisely the involvement of the teachers has been helpful. A clearer assessment of this in terms of parameters like the time spent by teachers on the CD content, the type of linkages that they drew between the class room teaching and the computer exposure, the type of follow-up exercises if any that they exposed the students to, the sequencing of the class room teaching and the computer exposure and the quality of the class room processes in general would be helpful in further improving the CD based learning process. A separate study to understand this is suggested.

Another interesting finding emerging from this study is clearly the lower average marks obtained by the children in class 5 as compared to class 3 and 4. This is evident both in Karnataka and Andhra Pradesh. This is perhaps an indication that the topics may not have been addressed in the regular class. This aspect needs further exploration. In addition, the gender wise impact of the intervention indicates that in Andhra Pradesh, girl students in Classes 3, 4 and 5 and boy students in Classes 3 and 5 of the intervention schools perform better than their counterparts in non-intervention schools

It must be kept in mind that in all the experimental group schools, the computer aided learning started in September 2003. This implies that the students had just about 6 months of CD exposure. This is a somewhat limited time period to judge the full effectiveness of the CD content. While the findings are indicative at this stage, a more detailed study after an exposure of one year is suggested.

ANNEXURES

Table 5: List of Schools in the Research Studied

State	School Code	School Name	Status
Andhra Pradesh	101	MPE School ,Nallajerla	Experimental Group
	102	MPE 20th Ward School, Bhimavaram	Experimental Group
	103	MPE School (M),Devarapalli.	Experimental Group
	104	MPES - P C Nagar, Chintalapudi	Experimental Group
	105	MPE School,4th Ward, TP Gudem	Experimental Group
	106	MPES(G),Veeravasaram	Experimental Group
	107	MPE School,Mogaltur No.2, Mogalathur	Experimental Group
	108	CSI UP- Cyprinpetta, Chintalapudi	Experimental Group
	109	MPUP School,J R Gudem,	Experimental Group
	110	MPE P V Palem, Penumantra	Experimental Group
	111	MPES,Prakash rao Palem	Control Group
	112	MPES,Betani	Control Group
	113	MPES(Spl),Devarapalli	Control Group
	114	CSI UP,Buyagudem	Control Group
	115	Municipal Elementry School-Sanjav Nagar, Near Town Maternity Hospital	Control Group
	116	MPES,Phintagaruvu.	Control Group
	117	MPUP School,Kukkalavarithota.	Control Group
	118	MPES,Gandhinagar	Control Group
	119	MPUP School,Ramanaadapuram.	Control Group
	120	MPES,Juttiga	Control Group
Karnataka	201	GHPS K Bettahally	Experimental Group
	202	GHPS Itkal	Experimental Group
	203	D.K Zila Panchayat HPS Manchi Kukkaaje	Experimental Group
	204	D.K Zila Panchayat HPS Uli Kakyapadav	Experimental Group
	205	GHPS Ravindranagar	Experimental Group
	206	GHPS Bukkambudi	Experimental Group
	211	GHPS Dammadahalli	Control Group
	212	GHPS Mothakapalli	Control Group
	213	GHPS Ira	Control Group
	214	GHPS Uli Bail	Control Group
	215	GHPS Venkateshnagar	Control Group
	216	GHPS Kenchapura	Control Group

Table 6: CD exposure to Children in E-Seva and RSDP centres in Andhra Pradesh

	e-Seva Centres (Base 37)	RSDP Centres (Base 80)
Chiluka palukulu	37	80
Brain storm	27	40
Chatur Char	17	42
Magic marbles	20	35
Magic potion -I	18	30
Magic Potion -II	8	29
Trip to village fair	19	35
Troublesome twins	8	18

Table 7: Learning Competencies Mapping on CDs – Brainstorm, Chatur Char, Magic Marbles

Name of the CD	Learning Competencies
Brainstorm	1. Word picture association of simple words like boy, dog, pen, bag, car, pig, sun, lion...
	2. Identifying big numbers
	3. Concept of x and y axis/co-ordinates in a 2d plane
	4. Recognizing greater and lesser number
	5. Basic mathematics skill of addition, subtraction, multiplication & division
	6. Addition of 1 – digit numbers with 2 – digit numbers, addition of 2 – digit numbers with 2 – digit numbers
	7. Recognizing basic colours by building coloured blocks
	8. Solve coloured jigsaw puzzle
	9. Simple division
	10. Concept of greater and lesser numbers, division & weight
	11. word building exercise – click and drag letters to form words by looking at the pictures
Chatur Char	1. Practice additions of two digit numbers with carry over
	2. Practice subtraction of two digit number
	3. Learn to write numbers with correct place value
	4. Learn to measure, Learn Fractions
Magic Marbles	1. Identify decimals as fractions with 10 or multiples of ten as denominator
	2. $20/100 = 0.05$
	3. Describe the concept of tenths, hundredth and thousandths
	4. Read the decimal using the symbol (.) 'point' in the correct way
	5. State the place value of digits of a given decimal number
	6. Locate the position of decimals in place value chart after 'units' value
	7. Compare and match decimals with fractions
	8. Arrange decimals in ascending/ descending order

Table 8: Competency Mapping of Question Paper administered to Children in the Present Study

Class	Competency	Question Nos.
3	<ul style="list-style-type: none"> ➤ Place value ➤ Numerical value in words and vice versa ➤ Ascending and Descending order ➤ Greater than Lesser than ➤ Addition ➤ Subtraction ➤ Fractions ➤ Multiplication ➤ Measurement/Metric System ➤ Match picture to the word ➤ Seriation ➤ English Words to Kannada 	<p>1 2, 3 9 16 4, 10, 13 6 , 11,12 7 8 5 14 15 17</p>
4	<ul style="list-style-type: none"> ➤ Place value ➤ Addition ➤ Subtraction ➤ Multiplication ➤ Division ➤ Fractions to Decimals ➤ Ascending and Descending order ➤ Greater than and Lesser than ➤ Unscrambling English Words ➤ Word picture matching ➤ Seriation ➤ Kannada words in Filling the blanks 	<p>1 2, 8, 10, 12 7,11 9,13 5 3 4 6 14 15 16 17</p>
5	<ul style="list-style-type: none"> ➤ Addition ➤ Multiplication ➤ Subtraction ➤ English words in Kannada ➤ Seriation ➤ Unscramble English Words ➤ Greater than Lesser than ➤ Decimals ➤ Sentences from words ➤ Ascending and descending ➤ Fractions ➤ Place Value 	<p>4 7 12, 13 15 17 16 2,9 3 14 8 10 5, 6, 11</p>

Table 9 : Details of ANOVA Test

KARNATAKA – CLASS 3

TOTAL MARKS

	N	Mean	Std. Dev	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
NON INTERVENTION	162	22.8951	10.89482	.85598	21.2047	24.5855
INTERVENTION	236	24.5487	11.75941	.76547	23.0407	26.0568
Total	398	23.8756	11.43039	.57295	22.7492	25.0020

	Sum of squares	df	Mean Square	F	Sig.
Between Groups	262.688	1	262.688	2.016	.156
Within Groups	51606.906	396	130.320		
Total	51869.594	397			

KARNATAKA - CLASS 4

TOTAL MARKS

	N	Mean	Std. Dev	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
NON INTERVENTION	122	24.0410	10.65433	.96460	22.1313	25.9507
INTERVENTION	242	24.8678	9.21454	.59233	23.7010	26.0346
Total	364	24.5907	9.71402	.50915	23.5894	25.5919

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	55.445	1	55.445	.587	.444
Within Groups	34198.064	362	94.470		
Total	34253.508	363			

KARNATAKA - CLASS 5

TOTAL MARKS

	N	Mean	Std. Dev	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
NON INTERVENTION	121	17.8430	9.46397	.86036	16.1395	19.5464
INTERVENTION	279	16.1183	8.45621	.50626	15.1217	17.1149
Total	400	16.6400	8.79709	.43985	15.7753	17.5047

TOTAL MARKS

	Sum of squares	df	Mean Square	F	Sig.
Between Groups	251.047	1	251.047	3.262	.072
Within Groups	30627.113	398	76.953		
Total	30878.160	399			

ANDHRA PRADESH - CLASS 3

TOTAL MARKS

	N	Mean	Std. Dev	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
NON INTERVENTION	250	25.5418	12.49053	.78997	23.9859	27.0977
INTERVENTION	251	31.2214	10.61963	.67030	29.9012	32.5415
Total	501	28.3872	11.92322	.53269	27.3407	29.4338

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4040.216	1	4040.216	30.072	.000
Within Groups	67041.431	499	134.352		
Total	71081.647	500			

ANDHRA PRADESH - CLASS 4

TOTAL MARKS

	N	Mean	Std. Dev	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
NON INTERVENTION	277	28.2509	12.09411	.72666	26.8204	29.6814
INTERVENTION	320	31.4655	10.57215	.59100	30.3027	32.6282
Total	597	29.9740	11.40755	.46688	29.0570	30.8909

	Sum of squares	df	Mean Square	F	Sig.
Between Groups	1534.264	1	1534.264	12.008	.001
Within Groups	76024.583	595	127.772		
Total	77558.847	596			

ANDHRA PRADESH - CLASS 5

TOTAL MARKS

	N	Mean	Std. Dev	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
NON INTERVENTION	284	24.3187	10.62107	.63024	23.0781	25.5592
INTERVENTION	390	28.6551	10.66116	.53985	27.5937	29.7165
Total	674	26.8279	10.85009	.41793	26.0073	27.6485

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3090.260	1	3090.260	27.275	.000
Within Groups	76138.276	672	113.301		
Total	79228.536	673			