APPENDICES

Appendix I

Permission Letter for Data Collection

Faculty of Education and Psychology
The Maharaja Sayajirao University of Baroda
Lokmanya Tilak Road, Vadodara – 390 002, INDIA
Phone : (+91-0265) 2792631

FEP/No.

Date:28-11-2014

To,
The Director/ Staff member,

Dear Sir/ Madam,

I, Atman Desai, a research scholar in the Department of Education, Faculty of Education and Psychology, The M.S. University of Baroda, Vadodara am working for my Ph.D. Work entitled "A Study of Community Science Centres in Gujarat" with the following objectives:

1. To critically analyze the objectives of community science centres in Gujarat.
2. To study the extent of objectives achieved by the community science centres in Gujarat.
3. To study the functioning of these community Science centres in Gujarat in terms of General Administration, Financial Management, Human Resource Management, Infrastructural facilities, Planning and Implementation of activities.
4. To study the problems faced by the community science centres in Gujarat.

In this connection, I consider you as a unit of my sample and to collect some data to achieve the objectives of my study. Please do the needful to provide the data in the format given for which I will be thankful to you. I assure you that the data provided by you will be kept confidential and only be used for research purpose.

A D Desai
(Atman Desai)
Researcher

FAC. OF EDU. & PSY. M.S. University of Baroda

Idas
(Dr. Jaishree Das)
Guide

Appendix II

Semi-Structured Interview Schedule for the Director/Head of Community Science Centre

- Name of centre:

- Name of the Director:

1) General Information about the centre-

- Year of Establishment-
- Establishment as an NGO/private organization/commercial-
  Managerial structure of the organization-
- Hierarchical structure of the organization-
- To whom organization reports-

2) Infrastructural facilities

- Building-Own/Rent
- Library-Yes/No
- Classroom-Yes/No
- Seminar Room-Yes/No
- Conference Room-Yes/No
- Auditorium-Yes/No
- Laboratories-Yes/No
  If yes, which laboratories
- Exhibits-Yes/No
  If yes, which exhibits?
- Other facilities available, if any

3) Human Resources Development

- Minimum Educational Qualification for the director-
- Minimum Educational Qualification for staff members-
- Any specific human resources development policy?

4) Financial Management

- Sources of finance-
- Amount of grant from GUJCOST-
- Source of finance apart from GUJCOST-

- Is it such that the grant of GUJCOST is to be used in conducting programmes of GUJCOST only?

- Do you conduct programmes on your own expense? If yes, what are the programmes?

5) Implementation of activities

- Activities as per guidelines of GUJCOST-

- Centre's own activities which has its own identity-

- Events-

- Outreach Programmes-

- Teachers' Training Programmes-

- Special days celebration-

6) Does your centre provide training programme for preparing future science communicators and science educators?

7) Is there any research on science education/science communication conducted by the centre?Yes/No

8) Publications by the centre-
   Magazine (frequency)-
   Books-

Journal (Frequency)

Annual Report

Pamphlet/leaflet/flyer/Any other

9) Does the centre distribute any publication to the students or teachers?
Yes/No
If yes, which type of publication?

10) Does the centre distribute any publication to the public?
Yes/No
If yes, which type of publication?

11) Does the centre sell any of the above publication to the students?
Yes/No
If yes, which type of publication?

12) Does the centre sell any of the above publication to the public? Yes/No
If yes, which type of publication?

13) Any other communication material for students and public? Yes/No
If yes, which type of material?

14) Problems faced related to administration

15) Problems faced related to infrastructure

16) Problems faced related to human resource management

17) Problems faced related to finance

18) Any other information related to the centre

Appendix III

Semi-structured Interview Schedule for the Students

- Name of the Science Centre:
- Name of the Student:
- Standard of Study:
- What did you learn from the activities of the centre?
- Will the activities be useful in your further studies? Yes/No
  If yes, how would it be useful in your studies?
- Are you satisfied with the learning method used here-Yes/No
- Are you satisfied with content knowledge of the instructor-Yes/No
- Are you satisfied with the attitude of the instructor-Yes/No
- Are you satisfied with the management of the club/programme-Yes/No
- Are you satisfied with the time duration given for different club/programme - Yes/No
- Are you satisfied with the available physical facilities at the centre-Yes/No
- Are you satisfied with the overall services of the centre -Yes/No

Appendix IV

Semi-structured Interview Schedule for the Teachers

- Name of the Science Centre:
- Name of the Teacher
- What did you learn from the activities of the centre?
- Are you satisfied with the learning method used here-Yes/No
- Are you satisfied with content knowledge of the instructor-Yes/No
- Are you satisfied with the attitude of the instructor-Yes/No
- Are you satisfied with the management of the club/programme-Yes/No
- Are you satisfied with the time duration given for different club/programme - Yes/No
- Are you satisfied with the available physical facilities at the centre-Yes/No
- Are you satisfied with the overall services of the centre -Yes/No
- Opinions and Suggestions-

Appendix V

Semi Structured Interview Schedule for the Staff of Community Science Centres

- Name-
- Present Designation-
- Educational Qualification-
- How do you make understand science concepts to students? Give eg.
- How do you make understand science concepts to the public? Give eg.
- What innovative learning method you have implemented in the centre? Explain.
- How is your learning method differing from formal education of school?
- How is your learning method of students differing from learning method of public?
- What are the problems you faced at the centre? Administrative, infrastructural, HR, Finance

Appendix VI

Semi Structured Interview for the General Public

- Name-

- Why did you involved in this event/programme?

- Are you satisfied with the overall conduction of the activity of centre-Yes/No

- Are you satisfied with content knowledge of the instructor-Yes/No

- Are you satisfied with the attitude of the staff of centre-Yes/No
  Why?

- Are you satisfied with the management of the programme-Yes/No

- What did you learn from this activity of the centre?

- Are you satisfied with the available facilities at the centre-Yes/No

- Any suggestions?

Appendix VII

Observation Schedule

- Name of the Science Centre: Place:
- Date of Observation: Time:
- Unit of Observation: (name of the club/programme):
- Name of the instructor with position:
- Medium of Instruction:
- Method of imparting instruction Lecture method/demonstration/Discussion:
- Topic of Discussion:
- Aid used in the process:
- Leadership style of the instructor: Democratic/ Autocratic/ Lexus-fare
- Attitude of instructor during session: Positive/ Negative/Neutral
- Fluency of instructor: Fluent/ Not so fluent
- Content knowledge of the Instructor: Good/ Average/ Poor
- Caring for the learners: Good/ Average/ Poor
- Skill of Explanation and illustration: Good/ Average/ Poor
- Time Management: Good/ Average/ Poor
- Punctuality of the Instructor: Good/ Average/ Poor
- Attitude of learners towards the programme- Good/ Average/ Poor
- Attitude of learners towards the Instructor- Good/ Average/ Poor
- Participation of learners during the programme: Good/ Average/ Poor
- Attentiveness of learners during Instruction- Good/ Average/ Poor
- Level of satisfaction of the learners: Good/ Average/ Poor
- Overall Management of club/programme: Good/ Average/ Poor

Overall Observation of the centre

- Building Condition-
- Facility of electricity-
- Facility of drinking water-
- Working condition of models-
- Working condition of instructional aides-
- Condition of materials used during demonstrations-
- Overall atmosphere at the centre-

Appendix VIII

Publication of the Research Paper

ORIGINAL RESEARCH PAPER

VOLUME-6 | ISSUE-6 | JUNE-2017 | ISSN No 2277 - 8179 IF : 4.176 | IC Value : 78.46

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

Non-Formal Science Education: A case of Community Science Centre-Dharampur in Gujarat

Education

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ABSTRACT

Science education plays a pivotal role in the development of rationality, curiosity, objectivity, open-mindedness and critical mindedness. Science Communication to the masses is essential to educate public about scientific aspects. The phenomenon of Science Centre expanded which became an important destination for providing informal science education to the masses. The research paper highlights the case study of Community Science Centre in Dharampur taluka of Gujarat state.

Summary

The researcher has taken a case study on Community Science Centre in Dharampur taluka of Gujarat. The centre imparts science education for students and public in a non-formal way. The centre had organized science popularization programmes in urban as well as rural areas and thus they had spread awareness on scientific issues. The programmes of science education have helped students, teachers and public for understanding science.

KEYWORDS:

Non-formal Education, Science popularization, Scientific temperament

Introduction

Science education plays a pivotal role in this process of education for the development of scientific temper and scientific thinking including rationality, curiosity, objectivity, open-mindedness, critical mindedness, intellectual honesty and observation among learners. There are three modes of education formal, non formal and informal. Naik (1977) says that in a non-formal programme, the central point is learning: either by oneself or learning together by a group of interested individuals. The students learn from each other while the teacher merely acts as the facilitator. Apart from curriculum based science, a general science should also reach to communities for development of society. Science Communication to the masses is essential to educate public about different scientific aspects. Science Centres play an important role in science popularization. As per Khened (2013), the science centres have a multifarious objectives which include popularization of science, enhance the understanding of science, imparting scientific temper, etc which they try to achieve through various programmes, exhibitions, competitions and events that are organized for different sections of society. Khened (2013) say that scientific temper include: a) Healthy scepticism, b) Universalism, c) Freedom from prejudice or bias, d) Objectivity, e) Open mindedness and humility, f) Willingness to suspend judgement without sufficient evidence, g) Rationality, h) Perseverance-positive approach to failure.

The phenomenon of Community Science Centre expanded which became an important destination for providing informal science education to the masses with the objectives to inculcate, nurture and disseminate science education among people.

Community Science Centres in Gujarat

The credit for setting the first community science centre in Gujarat goes to the well known scientist Dr. Vikram Ambalal Sarabhai. Vikram Sarabhai felt the need to build a scientific temperament among public especially children. He established Community Science Centre in 1966 at Ahmedabad in Gujarat. Gujarat Council on Science and Technology (GUJCOST) was established in 1986 under the Education Department, Gujarat State. The objectives of GUJCOST are to promote popularization of science and the spreading of scientific temper and attitude among the people of the state. The Community Science Centres in Gujarat are being established as 1) non-governmental organizations which are under GUJCOST and adhere to the Community Science Policy of Govt. of Gujarat, 2) non-governmental organizations which are not under GUJCOST and do not adhere to the Community Science Policy of Govt. of Gujarat and 3) independent science centres, science museums, planetarium and science parks operated by local bodies.

There are 25 community science centres in Gujarat (as in 2014). There is a network of 18 Community Science Centre in different districts of Gujarat which are under GUJCOST. The Community Science Centres under GUJCOST are established at two levels-The science centres at Vadodara, Rajkot and Bhavnagar are of regional level catering the need of the specific region. The science centres at Jamnagar, Gandhinagar, Sabarkantha, Amreli, Junagadh, Anand, Surat, Surendranagar, Banaskantha, Patan, Porbandar, Dang, Kutch, Bharuch and Narmada are of district level catering the need of only specific districts. There are six Community Science Centres which are not under GUJCOST and perform its function independently. 1) Science City managed by Department of Science and Technology, Government of Gujarat. 2) Vikram Sarabhai Community Science Centre at Ahmedabad which is privately funded and managed as NGO. 3) Community Science Centre at Dharampur taluka in Valsad under National Council of Science Museum (NCSM)-Government of India. 4) Vigyan Nagari at Bhavnagar City managed by private trust. 5) Lokbharti Community Science Centre run by Lokbharti Gram Vidyapeeth. 6) Narmadanagar Community Science Centre at Bharuch managed by Gujarat Narmada Fertilizers Company. 7) Science Centre at Surat managed by Surat Municipal Corporation

The researcher has taken a case study of Community Science Centre at Dharampur taluka of Valsad district in Gujarat.

Methodology of the study

Semi structured interview for heads and staff members of the community science centres, students, teachers and public were prepared by the researcher. The researcher spent a week at the Community Science Centre Dharampur. The researcher observed the activities of the centre and interviewed the heads and staff members of the centre. He also interviewed students, teachers and community members who participated in the activities of the centre.

Findings of the study

The Community Science Centre at Dharampur was established in 1984 by the National Council of Science Museums (NCSM), Ministry of Culture, Government of India. Since then the centre has grown tremendously and have focussed on Science education for public through non-formal education. The centre performs science communication activities for students and public. The centre has opened new avenues to promote Science education in whole Gujarat especially in South Gujarat as students and people from other parts of Gujarat also visit it. It has a sprawling campus with excellent infrastructural facilities like library, computer laboratory, auditorium and seminar room. There are three science exhibition halls separately for popular science, perception and fun science. The exhibition hall for popular science has interactive panels and exhibits on forest conservation, nature and human relationship, climate change, pollution control, global warming, plantation, soil erosion, public health, non conventional energy resources, nutrition, genetically

modified food, cleaning etc. The exhibition hall for perception has the exhibits to explain the working of sensory organs of the human body for deeper understanding of the process of brain through sensory organs by recognizing colours, taste, touch, sound and vibrations with the help of interactive and working models. The third hall is on fun science where students and public can do hands on activities with the help of exhibits related to mirrors, optical illusion, multiple reflection, torque, colour mixing, sand pendulum, properties of light, 3D vision, electromagnetism, optical fibre, diffraction, interference, curved images etc.

There is a Science Park where a variety of scientific instruments are kept for understanding of scientific concepts like, probability, oscillation, pulley and gear, worm wheel, inclined planes, sympathetic swing, lever, echo tube, compound pendulum, double cone etc. The instruments are prepared and arranged in such a manner that while playing or working with the exhibits, one can understand easily the principle working behind the model. The park has well maintained herbs, shrubs, trees and flowers. The visitors can avail information on different medicinal plants. There is a life science corner where birds, hares (wild rabbits) and rabbits are kept to make understanding about the biology of these creatures. There is a hall where 3D science shows are organized. The documentaries on science topics are shown here. The centre also has digital planetarium where 3D shows on astronomy are organized where people can get acquainted with our universe by knowing the basic facts related to the formation of stars, information on constellations and planets through films.

For science popularization, the centre organizes science demonstration lectures, popular science lectures, science quiz, teachers' training programmes, outreach programmes in far flung areas of Gujarat, computer awareness programmes, science film festival, National Science drama festival, science exhibition, astronomy awareness programmes, nature education camps, celebration of events like National Science Day, National Technological Day, World Environment Day etc. There is a mobile science exhibition bus which goes to various places of Gujarat to spread science awareness. The bus has exhibits like parallel and series circuit, persistence of vision, invisible light, generator, immiscible liquid, periscope, heartbeat etc. The activities such as model making, scientific experiments on electricity, Newton's laws of motion, gravity and scientific concepts behind the exhibits were observed by the researcher. The exhibits were made in such a way that students and public can easily understand the principles behind it. The text written to explain the exhibits were in English and Gujarati. The leadership style of the instructors were found to be democratic, attitude of instructors were observed positive and content knowledge and skill of explanation of the resource persons were also found good.

87% of the students who came to Community Science Centre in Dharampur were satisfied with the activities while 13% were confused with the complexity of the models. 90% of students were satisfied with the learning method, management of the activities, attitude of the instructors and available of physical facilities whereas, 10% of students felt that the centre should provide more time for demonstration of activities and more resource persons should be there for demonstration. All the students said that they got the feeling of science by performing experiments themselves. All the school teachers were highly satisfied with the exposure of the centre. The teachers believed that the non-formal way of learning in the centre is very much conducive and will help students to enrich their knowledge in science. According to them, the centre is very supportive in infusing confidence among students by performance based activities like science drama, presentation of topics and science seminar. The students and teachers said that the non-formal education at the centre is useful for their school curriculum. 85% of people who visited the centre said that the exhibits were full of entertainment and they were acquainted with the scientific principles behind them, whereas, 15% of people responded that the exhibits were complicated for them to understand. The public said that the labelled diagrams/pictures of the working models make science simpler and the interactive working models make science learning interesting.

However, the researcher observed that the students and teachers, who came to the centre, visit it hurriedly without a thorough understanding of the exhibits due to limited time with them. During the visit of school children, chaos was observed among students due to large number of students and mismanagement by the staff of the centre. It was also observed that the attentiveness of school students was poor. It was also found that most of the students and public do not read the text which is meant for understanding the corresponding exhibits. It was found that most of the students and public while observing the working models press the buttons of the interactive panels, watch the corresponding action and left without understanding the course of the actions. They took it as fun and do not understand the principles/concepts working there

Conclusion

Science is not a mere tool for the materialistic development and prosperity of a country, but science education generates analytical thinking and rational outlook and sharpens insights of the people. Science inculcates scientific attitude and scientific temper among the citizens that is much needed in a country like India where caste, creed, custom and ritual persists and divides the society. Community Science Centre-Amreli was found fructifying the purpose of educate to masses through non-formal education.

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Appendix IX

Ph.D Course-Work Certificate

THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA

CERTIFICATE

[As per O.Ph.D. 2 under UGC (Minimum Standards and Procedure for Awards of M.Phil./Ph.D. Degree) Regulation, 2009 for 15 Credits to be earned by Ph.D. Scholars]

This is to certify that **Desai Atman Dilipkumar,** Research Scholar, registered under UGC (*Minimum Standards and Procedure for Awards of M.Phil./Ph.D. Degree) Regulation, 2009,* vide Registration Certificate Number **201** dated **15/04/2014**, for pursuing Ph.D. on has undertaken and completed the course work with the Grade B.

STATEMENT OF CREDITS EARNED

Name of Research Scholar: **Desai Atman Dilipkumar**

Faculty/Institution: Faculty of Education and Psychology

Department: Department of Education

Paper Number	Course Title	Course Credits	Grade Earned
Core Courses – 09 Credits *[Offered At University Level]*			
I.	Introduction To Research & Research Writings	3	D
II.	Introduction To Basic Computer Functions & Application For Research Purposes	3	C
III.	Quantitative Research Techniques & Data Analysis	3	C
Departmental Courses – 06 Credits *[Offered at Departmental Level]*			
IV.	Review of Related Literature	3	A
V.	Conceptual Framework	3	A
		Overall Grade	**B**

ACA3/46

Date of Issue: 19-03-2016
Place: Vadodara

Registrar (OSD)

Grade Conversion Table and Grade Calculation Formula

Grade	Grade Points	Range
O	10	Above 9.01
A	9	8.01 – 9.00
B	8	7.01 – 8.00
C	7	6.01 – 7.00
D	6	5.01 – 6.00
E	5	4.01 – 5.00
F	4	Below 4.00

$$Overall\ Grade = \frac{\sum (Grade\ Points \times Credits)}{\sum Credits}$$

Appendix X

Ph.D Registration Certificate

THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA

CERTIFICATE

Date of Registration: **15/04/2014**

Registration No.: **FoEdu./3/ 201**

Certified that **Desai Atman Dilipkumar** has registered the name as a post-graduate student of this University for the Degree of Ph.D. under the guidance of **Dr. Jaishree Das**, in Department of **Education** in the Faculty of **Education and Psychology.**

The title of the thesis is **"A STUDY OF COMMUNITY SCIENCE CENTRES IN GUJARAT".**

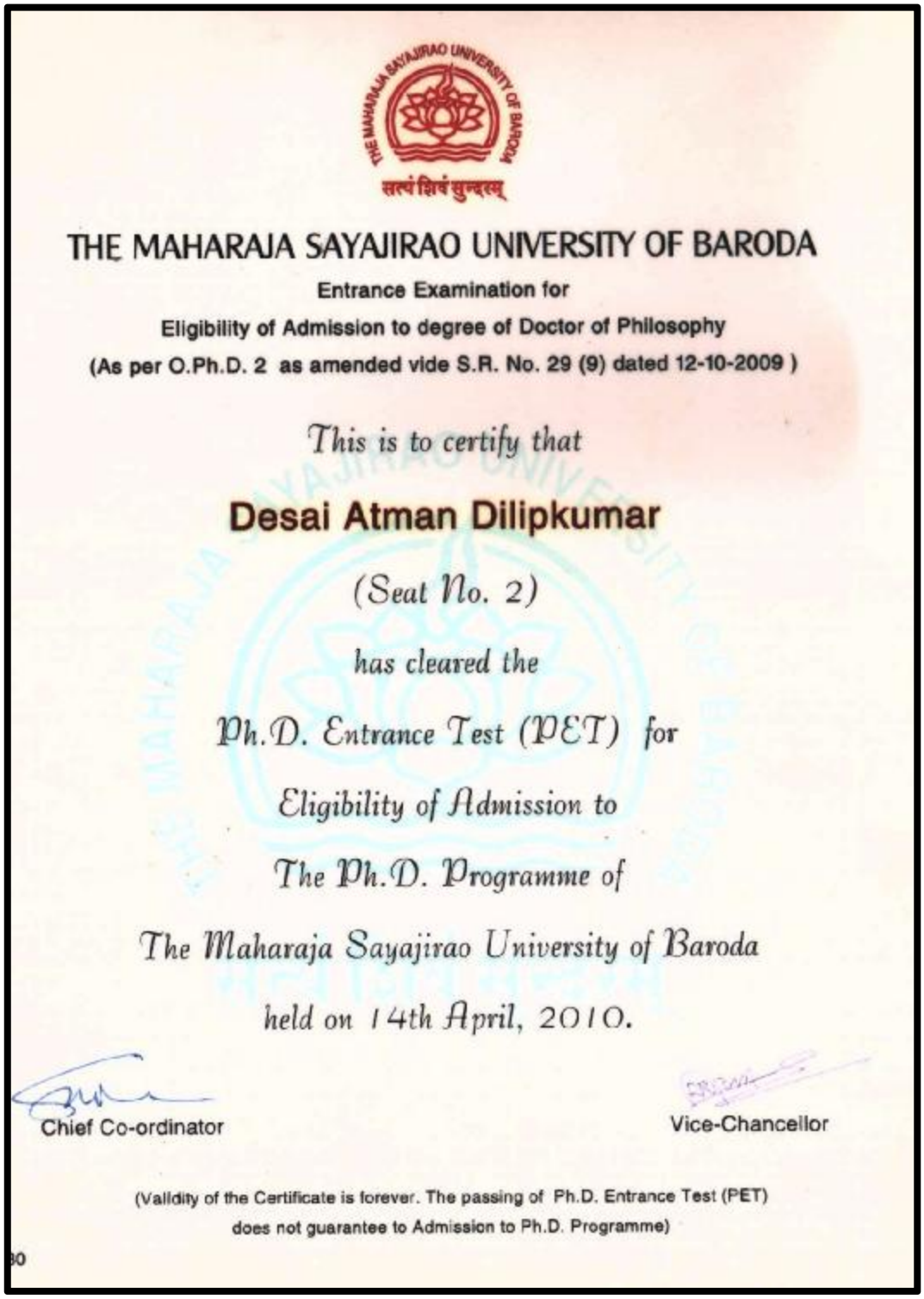
Education and Psychology

VADODARA
DATE: 31-05-2014

DY. REGISTRAR
(Academic)

Appendix XI

Ph.D Entrance Examination Certificate



सत्यं शिवं सुन्दरम्

THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA

Entrance Examination for

Eligibility of Admission to degree of Doctor of Philosophy

(As per O.Ph.D. 2 as amended vide S.R. No. 29 (9) dated 12-10-2009)

This is to certify that

Desai Atman Dilipkumar

(Seat No. 2)

has cleared the

Ph.D. Entrance Test (PET) for

Eligibility of Admission to

The Ph.D. Programme of

The Maharaja Sayajirao University of Baroda

held on 14th April, 2010.

Chief Co-ordinator

Vice-Chancellor

(Validity of the Certificate is forever. The passing of Ph.D. Entrance Test (PET) does not guarantee to Admission to Ph.D. Programme)