M E S KEVEEYAM COLLEGE VALANCHERY

MALAPPURAM-KERALA

(NAAC Accredited with A Grade)

Phone: 0494 – 2644380, 2642670, 2641347(Fax)

www.meskvmcollege.org,Email:principal@meskvmcollege.org

List of Teachers using ICT Facility 2018-19

Sl. No:	Department	Name of Teachers	Topics dealt	ICT tool Used
1.	English	Athira Radhakrishnan	Inspiring Expression Writing for Academics and professional Success Media Studies II Electronic Media	PPT, Ebook, Social media, shodhganga
2.		Najila TY	Zeitgeist:Reading on contemoprary culture The Four Skills For Communication Business English Media Studies I	Online Video Class, PPT, E notes, E books, Videos, Movies, Social media, Shodhganga, www.sciencedirect.com
3.		Sivya Vasudevan	Translation Studies Foundations of Aesthetics and criticism Readings on Society	PPT, Ebook, Social media,
4.		Jisha K	Public Relations British and Continental Drama British and Continental Drama	PPT, Social media
5.		Reji AL	Writing for Academics and professional Success Zeitgeist:Reading on contemoprary culture Reading on society	PPT, Ebook, Social media

M.E.S. Ke Voe Yam College Date..... Valanchery

PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN- 676 552
MALAPPURAM

6.		Shameem MT	British Litreature From the Age of Chaucer to Eighteenth Century Post Colonial Fiction And Drama European Fiction in Translation	PPT, Ebook
7.		Renu G.	Inspiring expression Reading on society	PPT, www. wikipedia.org, Social media
8.		Vidya Viswanathan	Post Colonial Fiction And Drama Indian English Literature Teaching Of English	PPT, www. wikipedia.org, Social media
9.		Shahil Mon PP	Twentieth Century British Literature: Post 1940 Criticism and Theory British Literature the Nineteenth Century	PPT, www. wikipedia.org, Social media
10.		Athira S.	Modern Prose and Drama Culture and Civilization	PPT
11.	Physics	Dr Nabeel Rashin M	Properties Of Matter, Waves and Acoustics Methodology of Science and Physics Electro Dynamics II	PPT, Ebook, Shodhganga, www.sciencedirect.com, e-videos, e-resources like Wikipedia.org
12.		A M P Hamza	Electro Dynamics 1 Electronics (Analogue and Digital) Thermal & Statistical Physics	PPT, you tube videos
13.		Sreeja Lakshmi S	Physical Optics & Modern Optics Electro Dynamics 1 Physical Optics & Modern Optics	PPT, you tube videos, social media

M.E.S. Ke Vee Yam College Date..... Valanchery

PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN- 676 552
MALAPPURAM

14.		Dr Sailaja U	Elementary Medical Physics Quantum Mechanics Electro Dynamics II	PPT
15.		Dhanya Balachandran	Electrodynamics and Plasma Physics Statistical Mechanics Nuclear and Particle Physics	PPT, Social media, You tube videos
16.		Sayed Hussain Koya Thangal	Mathematical Physics I Solid state Physics Lasers and Fibre Optics	Google Classroom, PPT, Ebook, Social media
17.		Suresh VC	Electronics practical II Electronics Microprocessors and Applications	PPT
18.	Chemistry	Minshiya P	Inorganic and Physical Chemistry Environmental Chemistry Food Science & Medicinal Chemistry	PPT, EBooks
19.		Yusafali C	Core Course V:Organic Chemistry I Applied Chemistry Industrial Chemistry	PPT, E Books
20.		Rukkiya KM	Organic Analysis & Preperation Polymer processing and Technology	PPT, Ebooks
21.		Dr. C Rajesh	Chemistry and technology of Polymers Theoretical inorganic Chemistry II	PPT, Ebooks, Animated Video, Shodhganga, www.khanacademy.org, Social media

M.E.S. Ke Voe Yam College Date..... Valanchery

PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN- 676 552
MALAPPURAM

22.		Dr. Jisha V.S.	General Chemistry Gravimetric estimation	PPT, E Books, shodhganga Social Media,
23.		Dr.Saifunneesa TK	Organic And Biochemistry Industrial Chemistry	PPT, NPTEL, E Books
24.		Dr Preethy Alex	Physical Chemistry Organic Chemistry III	PPT, E Books
25.		Sandra	Polymer Chemistry II Testing & Characterization of Polymer	PPT, E Books
26.	Zoology	Shamiyath A	Animal Diversity-Non Chordata Part-I Environmental Biology, Wild Life Conservation and Toxicology	PPT
27.		Sumayya Mohammedali	Biochemistry Biophysics and Biostatistics & systematics	PPT, Social media
28.		Jisha Krishnan E K	General Methodology in Science, Biostatistics and Informatics Cell Biology & Genetics	PPT, Social media
29.		Krishna Prabha K S	Ethology, Evolution and Zoogeography Animal Diversity Chordata Part-II	PPT, Social media, Jamboard, Classdojo, Thinglink, shodhganga
30.		Rasheeda M	Ecology and Ethology Systematics and Evolution	PPT, NPTEL
31.		Jishnu K	Physiology Developmental Biology and Endocrinology	PPT

M.E.S. Ke Voe Yam College Date..... Valanchery

PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN- 676 552
MALAPPURAM

32.	Botany	Thushara C	Morphology,Systematic Botany,Ecnomic Botany, Pharmacognosy, Plant Breeding and Horticulture Cryptogams,Gymnosperms,Plantpathology and Genetics	PPT
33.	Commerce	Nisab T	Auditing Income Tax Law and Practice	Blog, Google Classroom, PPT, NPTEL, Animated Videos, Jamboard, Social media , Shodhganga, www.slideshare.net ,
34.		Dr Santhosh Babu P C	Financial markets and services Management Science	PPT, Shodhganga, www.managementstudygude.com www.slideshare.net , www.youtube.com
35.		Sini V T	Basics for Entrepreneurship and management Human Resource Management	PPT, Animated Videos, Social media, www.managementstudygude.com www.slideshare.net , www.youtube.com
36.		Dr.Divya M.	Business Regulations Human Resource development Cost management	Blog, PPT, Social media, Shodhganga, www.managementstudygude.com www.slideshare.net , www.youtube.com
37.		Febina K.	Financial reporting Banking of Business and Insurance	PPT, www.slideshare.net , www.youtube.com

M.E.S. Ke Voe Yam College Date..... Valanchery

PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN- 676 552
MALAPPURAM

38.		Mohammed Afsal	Corporate Regulations Indian Financial Services	PPT, www.slideshare.net
39.		Shaheera T	Computerised Accounting and Tally Business Application of computers Quantitative Techniques for Business Decisions	PPT, www.slideshare.net , Social Media
40.		Sinija A.S.	IT Application in commerce Accounting For Managerial decisions	Google Classroom, PPT, www.slideshare.net , Social Media
41.		Surya K. T	Income Tax Law and Practice Office Automation tools	PPT, You tube videos, www.slideshare.net , Social Media
42.		Fasna	IT Application in commerce Business Information system	PPT, e-videos, e-resources like Wikipedia.org, books.google.co.in, Social Media
43.		Jamshad Kalody	E commerce Auditing	PPT, e-videos, e-resources like Wikipedia.org, books.google.co.in, Social Media
44.		Abdul Basith C.	Entrepreneurship Development Corporate Accounting	PPT, www.slideshare.net , Social Media
45.		Shabna P.	Basic Numerical Skills Operations Research	PPT, Wikipedia.org, Social Media
46.		K H Abdu Razak	Banking of Business and Insurance	PPT

M.E.S. Ke Vee Yam College Date..... Valanchery

PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN- 676 552
MALAPPURAM

47.	Arabic	Dr Mohamed Riyas	Reading Arabic Literatures Reading Arabic prose and poetry	PPT
48.	Hindi	Dr Preetha S R	Communication skills in Hindi Literature in Hindi	PPT, You tube videos
49.	Malayalam	ShajidP P	Malayalabhashayum Sahithyavum Malayalasahithyapadanam	PPT
50.		Dr. Renuka Jyothi K S	Malayalasahithyapadanam Malayala sahithyam	PPT, Shodhganga
51.	Physical education	Dinil S	Physical activity health and wellness- Open Course	PPT, Social media, Animated Video
52.	Mathematics	Raseena P	Computer oriented numerical and statistical methods Discrete Mathematics	PPT
53.		Muneera K	Mathematics complimentary	PPT
54.	BCA	Abdul Jabbar K.	Problem solving using C Basics of Audio and video and media	PPT
55.		Lijitha Raju	Programming in Java Data Communication & Mobile Computing	PPT
56.		Abdul Muhaimin P.	Problem solving using C Introduction to computers	PPT
57.	Psychology	Shabeebha K.M.	Basic themes in Psychology-I Child and Adolescence development	PPT
58.		Dhanya Nair	Abnormal psychology-I Psychological measurements and testing	PPT

M.E.S. Ke Voe Yam College Date..... Valanchery

PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN- 676 552
MALAPPURAM

59.		Sebin P.	Adult development Psychological statistics	PPT
60.	Computer Science	Najiya K Y	Computer Applications Programming Lab Fundementals Of System Software,Networks and DBMS	PPT, NPTEL
61.	B Voc Retail Management	Nufaila K.	Retail Logistics Management Personality and Soft Skills Development	PPT, e-videos, e-resources like Wikipedia.org, books.google.co.in
62.		Saleena E.C.	Store Display and Visual Merchandising Basic Business Communication Skills	PPT, You Tube
63.	B Voc Optometry and Ophthalmological Techniques	Mohammed Jaseem	Physical Optics Nutrition	PPT, You Tube
64.		Sulfath	Geometrical Optics Biochemistry	PPT, e-videos, e-resources like Wikipedia.org, books.google.co.in
65.	Statistics	Rajesh N	Psychological Statistics Psychological measurements and testing	PPT

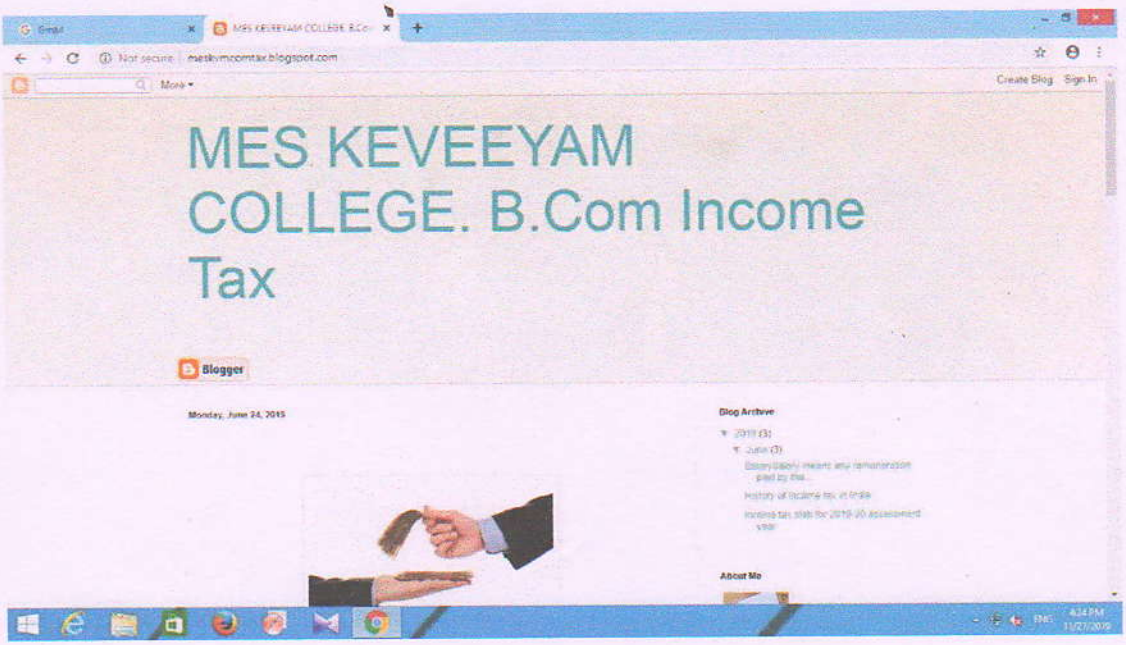
M.E.S. Ke Voe Yam College Date..... Valanchery

(Dr) Abdul Hameed
PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN- 676 552
MALAPPURAM

MES KEVEEYAM COLLEGE VALANCHERY

P.O. Valanchery, Malappuram Dist, Kerala, Pin: 676 552.
Phone: 0494-2642670
www.meskvmcollege.org, Email: principal@meskvmcollege.org

Aided by Govt. of Kerala and Affiliated to University of Calicut
Reaccredited with 'A' Grade by NAAC (Score 3.28)
ISO 9001:2015 certified institution



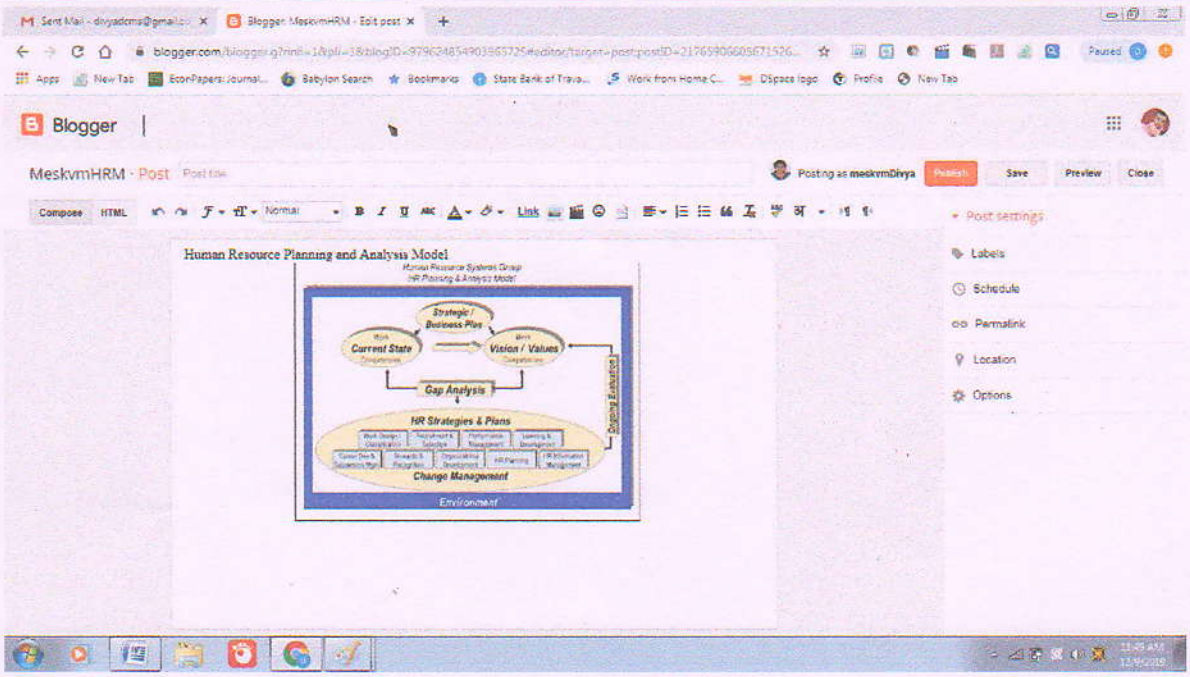
Mr. Nisab T.- PG Dept. of Commerce

PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN: 676 552
MALAPPURAM

MES KEVEEYAM COLLEGE VALANCHERY

P.O. Valanchery, Malappuram Dist, Kerala, Pin: 676 552.
Phone: 0494-2642670
www.meskvmcollege.org, Email: principal@meskvmcollege.org

Aided by Govt. of Kerala and Affiliated to University of Calicut
Reaccredited with 'A' Grade by NAAC (Score 3.28)
ISO 9001:2015 certified institution

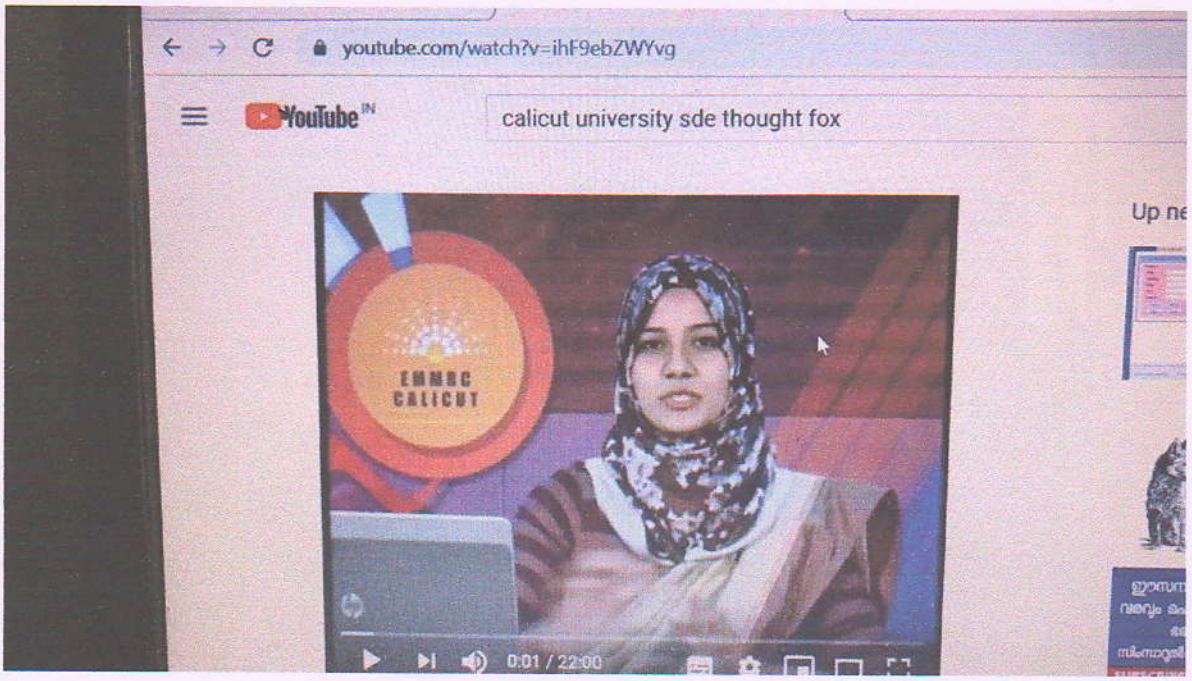


Dr. Divya M. - PG Department of Commerce

PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY

Online Video Classes

Najla T.Y.

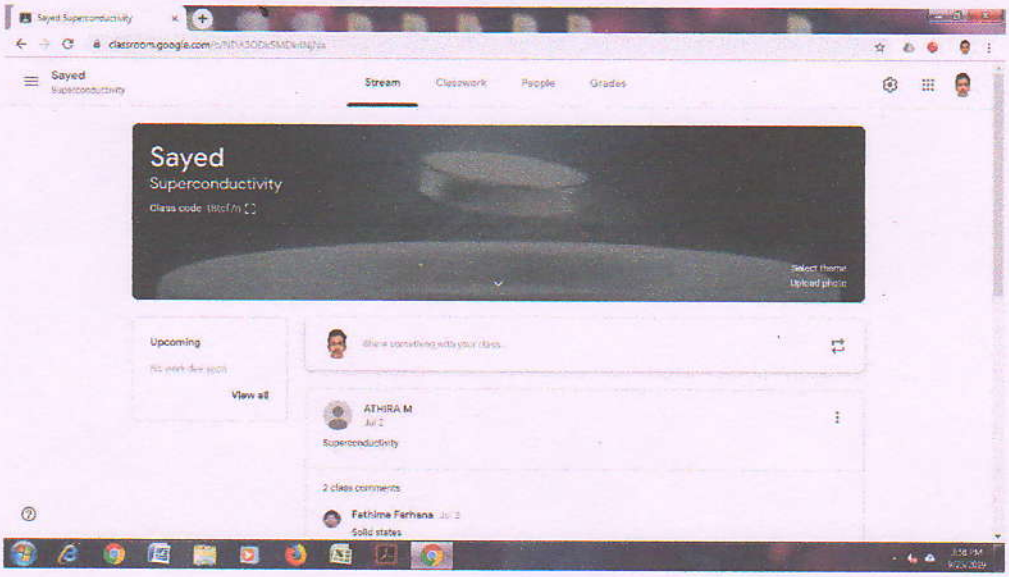


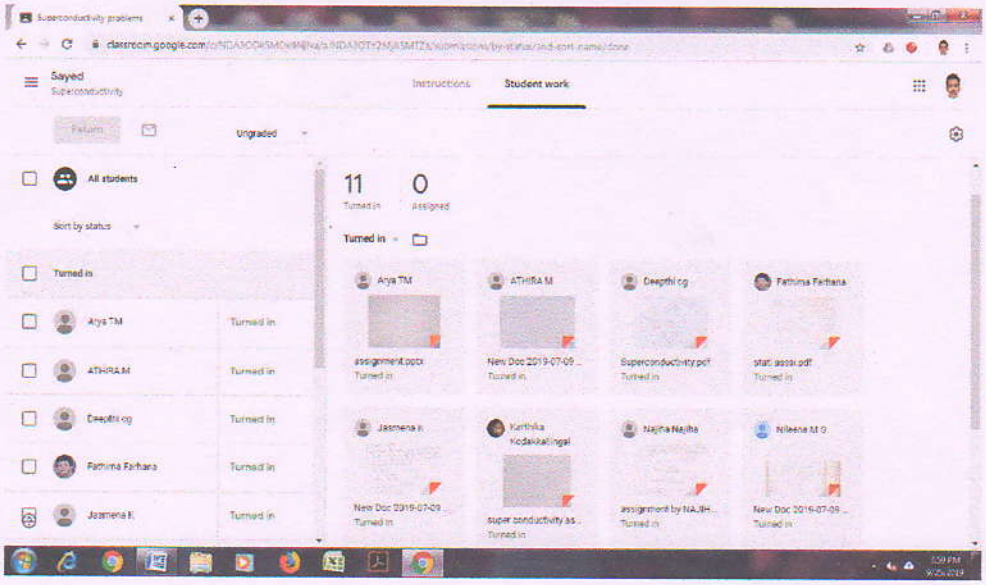
PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VA ERY, PIN
MALAPPURAM

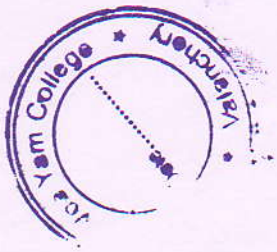
MES KEVEEYAM COLLEGE
VALANCHERY

P.O. Valanchery, Malappuram Dist, Kerala, Pin: 676 552.
Phone: 0494-2642670
www.meskvmcollege.org, Email: principal@meskvmcollege.org

Aided by Govt. of Kerala and Affiliated to University of Calicut
Reaccredited with 'A' Grade by NAAC (Score 3.28)
ISO 9001:2015 certified institution





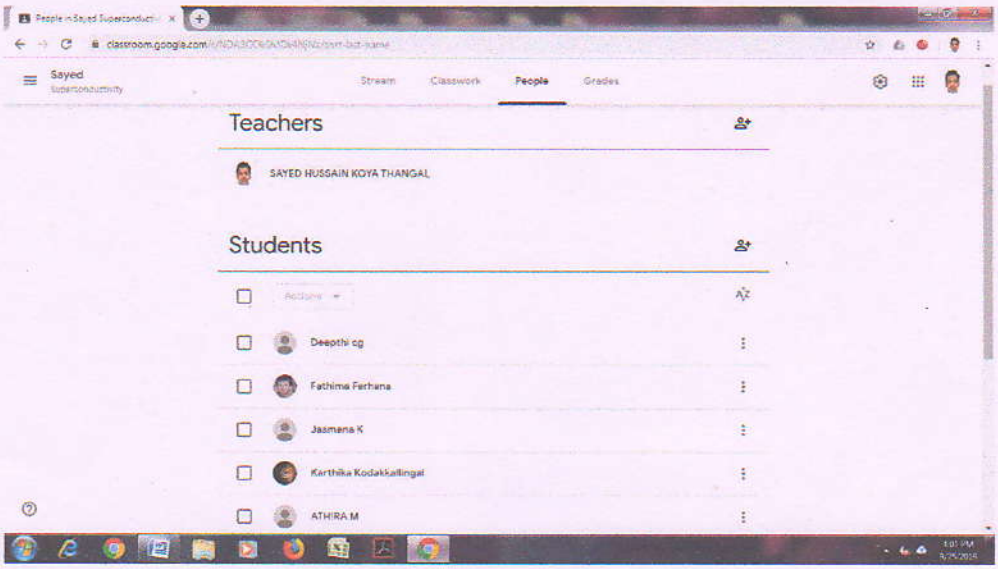


PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY

MES KEVEEYAM COLLEGE
VALANCHERY

P.O. Valanchery, Malappuram Dist, Kerala, Pin: 676 552.
Phone: 0494-2642670
www.meskvmcollege.org, Email: principal@meskvmcollege.org

Aided by Govt. of Kerala and Affiliated to University of Calicut
Reaccredited with 'A' Grade by NAAC (Score 3.28)
ISO 9001:2015 certified institution



Sayed Hussain Koya Thangal- PG Dept. of Physics

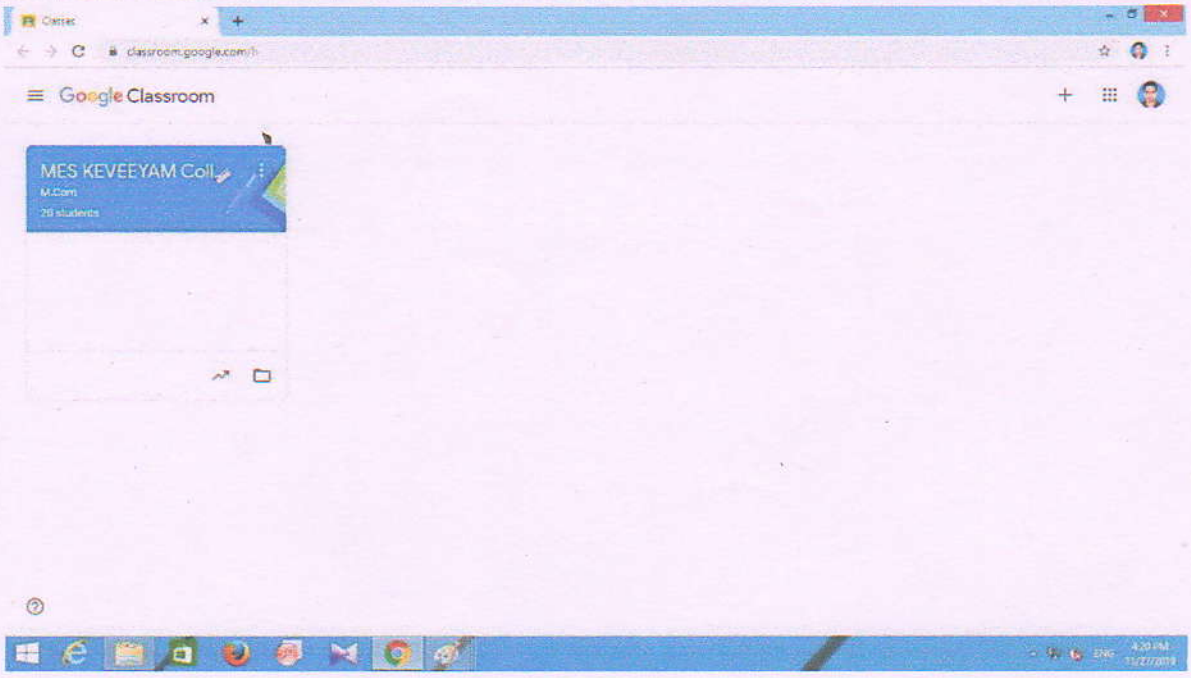
PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY PIN: 676 552

M.E.S. Keveeyam College Valanchery
Date

MES KEVEEYAM COLLEGE
VALANCHERY

P.O. Valanchery, Malappuram Dist, Kerala, Pin: 676 552.
Phone: 0494-2642670
www.meskvmcollege.org, Email: principal@meskvmcollege.org

Aided by Govt. of Kerala and Affiliated to University of Calicut
Reaccredited with 'A' Grade by NAAC (Score 3.28)
ISO 9001:2015 certified institution



Nisab T. -- PG Dept. of Commerce

PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN: 676 552

M.E.S. Ke Voe Vam College Valanchery
Date

E Books

AN INTRODUCTION TO COMPUTATIONAL BIOCHEMISTRY

C. Stan Tsai, Ph.D.
Department of Chemistry
and Institute of Biochemistry
Carleton University
Ottawa, Ontario, Canada

WILEY-LISS
A JOHN WILEY & SONS, INC., PUBLICATION

This book is printed on acid-free paper. ⊗

Copyright © 2002 by Wiley-Liss, Inc., New York. All rights reserved.

Published simultaneously in Canada.

No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, scanning or otherwise, except as permitted under Section 107 or 108 of the 1976 United States Copyright Act, without either the prior written permission of the Publisher, or authorization through payment of the appropriate per-copy fee to the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, (978) 750-8400, fax (978) 750-4744. Requests to the Publisher for permission should be addressed to the Permissions Department, John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158-0012, (212) 850-6011, fax (212) 850-6008, E-Mail: PERMREQ@WILEY.COM.

For ordering and customer service information please call 1-800-CALL-WILEY.

Library of Congress Cataloging-in-Publication Data:

Tsai, C. Stan.
An introduction to computational biochemistry / C. Stan Tsai.
p. cm.
Includes bibliographical references and index.
ISBN 0-471-40124-X (pbk. : alk. paper)
1. Biochemistry--Data processing. 2. Biochemistry--Computer simulation. 3. Biochemistry--Mathematics. I. Title.

QP517.M3 T733 2002
572.0285--dc21 2001057266

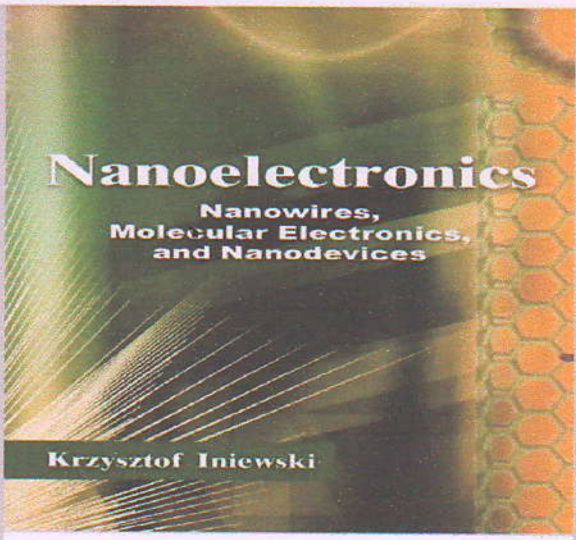
Printed in the United States of America.

10 9 8 7 6 5 4 3 2 1

CONTENTS

M.E.S. Keveeyam College Valanchery Date

PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VA ERY, PIN· 676 552
APPURAM



Nanoelectronics

M.E.S. Keveeyam College * Valanchery * Date........

PRINCIPAL
M.E.S KEVEEYEM COLLEGE
MALAPPURAM

Nanoelectronics

Nanowires, Molecular Electronics, and Nanodevices

Edited by
Krzysztof Iniewski

New York Chicago San Francisco
Lisbon London Madrid Mexico City
Milan New Delhi San Juan
Seoul Singapore Sydney Toronto

The McGraw-Hill Companies

Copyright © 2011 by The McGraw-Hill Companies, Inc. All rights reserved. Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of the publisher.

ISBN: 978-0-07-166149-3

MHID: 0-07-166149-1

The material in this eBook also appears in the print version of this title: ISBN: 978-0-07-166148-6, MHID: 0-07-166148-3.

All trademarks are trademarks of their respective owners. Rather than put a trademark symbol after every occurrence of a trademarked name, we use names in an editorial fashion only, and to the benefit of the trademark owner, with no intention of infringement of the trademark. Where such designations appear in this book, they have been printed with initial caps.

McGraw-Hill eBooks are available at special quantity discounts to use as premiums and sales promotions, or for use in corporate training programs. To contact a representative please e-mail us at bulksales@mcgraw-hill.com.

Information contained in this work has been obtained by The McGraw-Hill Companies, Inc. ("McGraw-Hill") from sources believed to be reliable. However, neither McGraw-Hill nor its authors guarantee the accuracy or completeness of any information published herein, and neither McGraw-Hill nor its authors shall be responsible for any errors, omissions, or damages arising out of use of this information. This work is published with the understanding that McGraw-Hill and its authors are supplying information but are not attempting to render engineering or other professional services. If such services are required, the assistance of an appropriate professional should be sought.

TERMS OF USE

This is a copyrighted work and The McGraw-Hill Companies, Inc. ("McGrawHill") and its licensors reserve all rights in and to the work. Use of this work is subject to these terms. Except as permitted under the Copyright Act of 1976 and the right to store and retrieve one copy of the work, you may not decompile, disassemble, reverse engineer, reproduce, modify, create derivative works based upon, transmit, distribute, disseminate, sell, publish or sublicense the work or any part of it without McGraw-Hill's prior consent. You may use the work for your own noncommercial and personal use; any other use of the work is strictly prohibited. Your right to use the work may be terminated if you fail to comply with these terms.

THE WORK IS PROVIDED "AS IS." McGRAW-HILL AND ITS LICENSORS MAKE NO GUARAN-

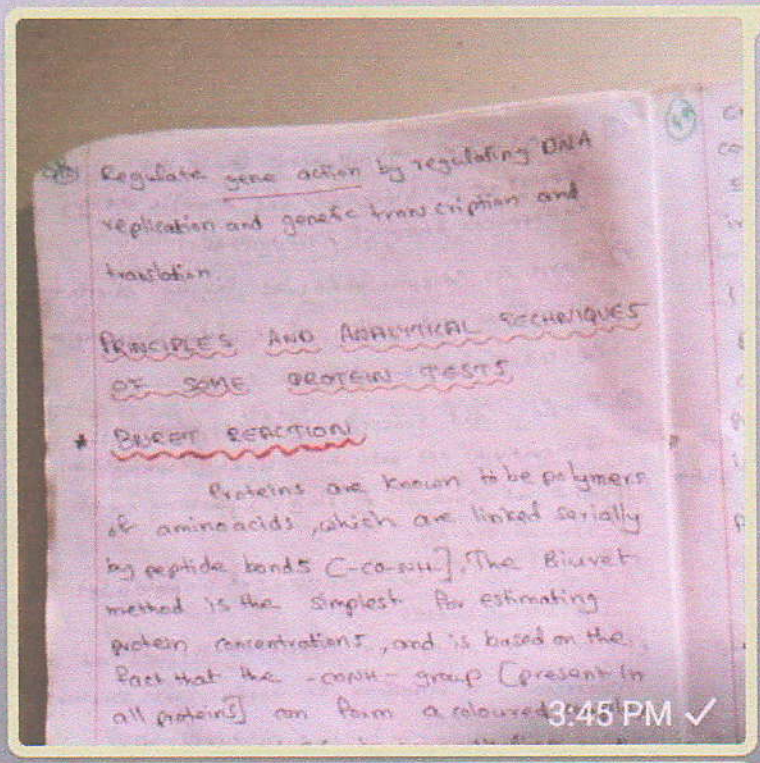
M.E.S Keveeyem College Valanchery * Date:

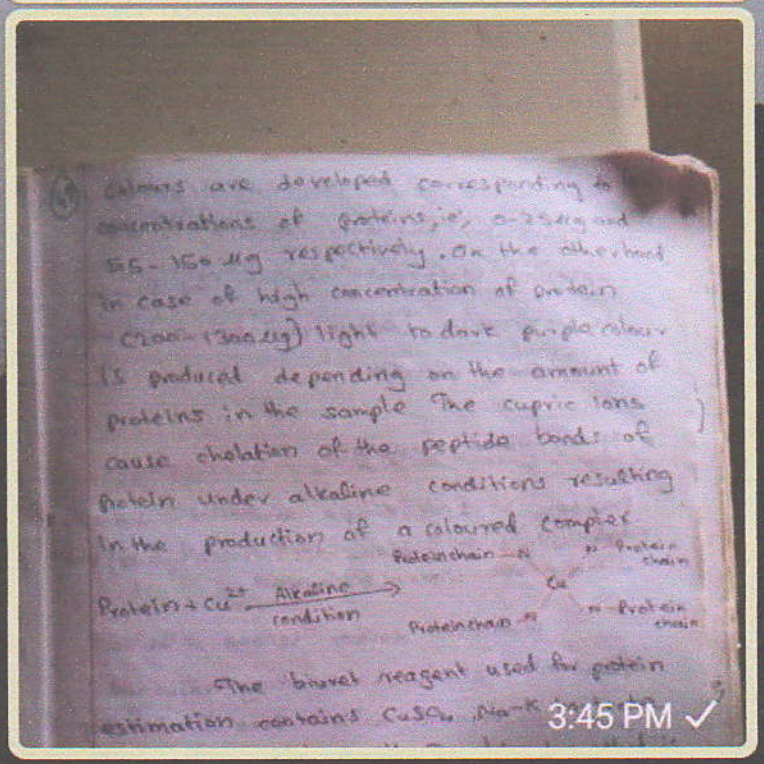
PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN-676 552
MALAPPURAM

3:45 87

Zoos official 2017-2020
Jisha, Prinsha, Rahmathunnissa,...

/100006464148954/posts
/3130121303879977/ 7:13 AM





Type a message

M.E.S. Yam College
PRINCIPAL
M.E.S KEVEEYEM COLLEGE

Theses from Shodhganga

s://shodhganga.inflibnet.ac.in

Please use this identifier to cite or link to this item:
http://hdl.handle.net/10603/260419

Title:	Customer relationship management anc business performance of NBFCs in Keral
Researcher:	Diana Ann Issac
Guide(s):	Nalini J
Keywords:	Customer loyalty Customer relationship management Service quality
University:	Mahatma Gandhi University
Completed Date:	15/09/2018
Abstract:	newline
Pagination:	XXVI,329
URI:	http://hdl.handle.net/10603/260419
Appears in Departments:	K G College

Files in This Item:

File	Description	Size	F
10_list_of_figures.pdf	Attached	60.53	A

M.E.S. Kevyam College Valanchery Date

PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VA 552

CHAPTER 1
INTRODUCTION

We have the Internet of Everything but not the inclusion of everyone

Singh Banga,
CEO and President of Mastercard

1.1 INTRODUCTION

For a country as huge and diverse as India, economic growth could be ensured only by providing financial access to everyone and there by attaining financial inclusion. Even after undertaking aggressive promotional campaigns through programs like the Pradhan Mantri Jan Dhan Yojana, banking access by the poor continues to be low and the banking industry's ability to penetrate into rural households and small traders to provide comprehensive financial services is still below satisfactory levels. In this context, Non Banking Finance Companies (NBFC) sector in India has carved an exclusive story of success which testifies to the truly vibrant and remarkable entrepreneurial zeal of India. From financing large infrastructure projects to small microfinance schemes, from automobile financing to gold loans and housing loans, the sector keeps on innovating itself to attend to the credit requirements of every segment of the economy. The industry has always responded positively to the regulatory efforts of RBI and understood the benefits of becoming a well-monitored and compliant participant in the financial system. Over the years, the sector has undergone revolutionary metamorphosis from a fragmented and informally governed existence to a consolidated and well regulated sector. In many instances they have pioneered and adopted best practices in technology, innovation, customer relationship, risk management as well as governance [8].

Over time, NBFCs have emerged from the shadow of the banks and has established themselves as strong and independent entities in the retail finance landscape of Indian economy [1]. They now play a complimentary and supplementary role to banks, bringing diversity and vibrancy to the financial sector.

NBFCs have been able to maintain their steady growth trajectory in India mainly because of their inherent ability to take quick decisions, assume greater risks and come up with innovative products customized to the needs of the customers The Indian NBFC sector has fashioned an exceptional class of distinction for themselves that was not practicable within the universal banking structure. The sector now takes pride in having a remarkable assortment of participants and players that serve as an efficient stratum of financial intermediation between the informal and formal sectors of the economy. NBFCs should be given due acknowledgement for transforming many Indians from users of informal credit mechanisms to maiden users of formal and regulated financial system. Many unbanked (as well as under banked) borrowers make use of the NBFC route to avail credit for the first

Vam College Date
PRINCIPAL
E.S KEVEEYAM COLLEGE
KALANCHERY, PIN: 676 552
MALAPPURAM

e notes

Surfacing

Essays and Criticism

(Novels for Students)

In her most popular and critically acclaimed novel, The Handmaid's Tale, Atwood traces her heroine's efforts to cope, endure, and survive th oppressive totalitarian regime that governs her life. In a similar vein, Atwood places the unnamed narrator in *Surfacing* into a more realistic, contemporary setting that does not threaten her physical safety. Yet, she too must reconstruct herself to preserve a strong sense c self.

The narrator in *Surfacing* has been victimized and disabled by a society that promoted male superiority and domination. She entered into a relationship with a married man who forced her to abort their unborn child. This experience so devastated the narrator that she has suppresse her memory of it and has cut herself off from any real contact with her world. At one point in the novel, she admits:

> I realized I didn't feel much of

M.E.S. Keveeyam College Valanchery Dept.

PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN 6.6 552
MALAPPU

Surfacing

Themes and Meanings

(Masterpieces of American Fiction)

Surfacing is a postmodern novel in that its ideological strategy is to rethink traditional views and question conventions. Its themes are numerous, virtually unlimited, one of the reasons it is the most widely written about of all Atwood's many works. Foremost is the portraya of male/female relationships and the examination of power relationships of all kinds. It is also a psychological quest. Examining her life under extreme circumstances, the narrator experiences herself as part of a larger wholeness. The dead heron is thus more than itself; it is Christ crucified, the death of the cosmic harmony, humanity destroying the very nature of which it is a part. The feminist themes merge with the autonomy of the individual and the sacredness of life.

All the themes are interrelated. The narrator reclaims integrity as she acknowledges her complicity in the abortion rather than blaming

PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN: 676 552
MALAPPURAM

Surfacing

Critical Overview

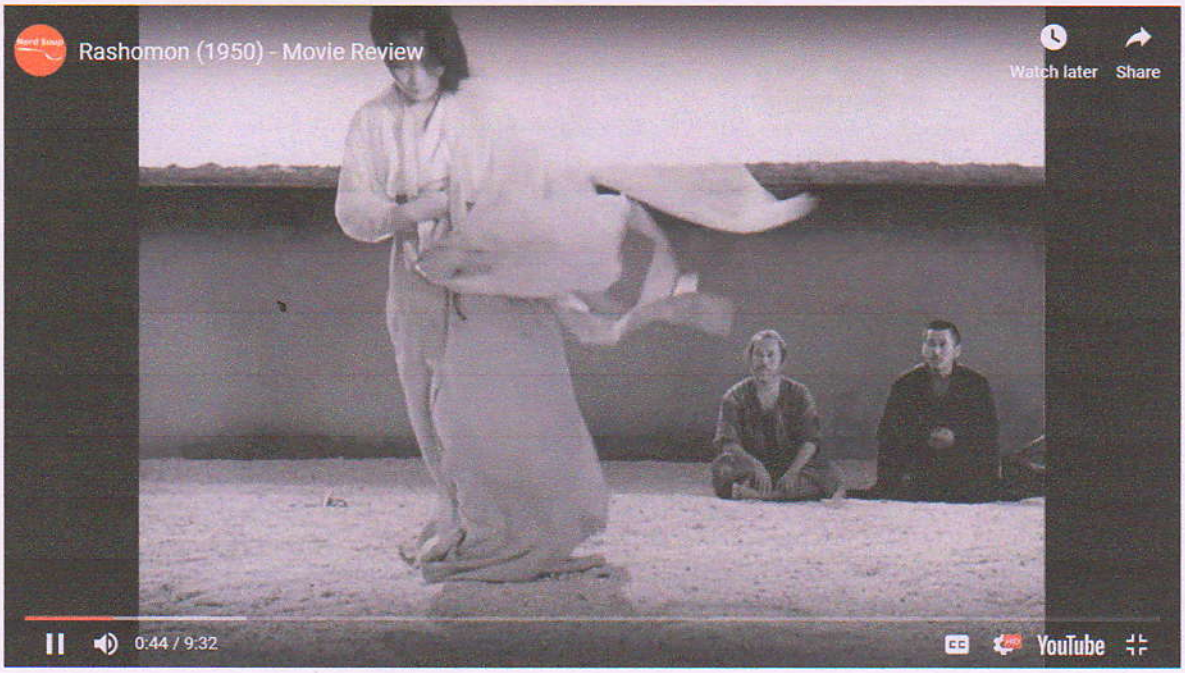
(Novels for Students)

When *Surfacing*, was published in 1972, it earned recognition in Canada and in the United States from scholars and from the general public. Most critics applauded the novel's style, characterizations, and themes. Edward Weeks, in a review for *Atlantic*, writes that Atwood' s "sense of the place, of the lake in its various moods, or the animal life retreating before the intruder, is beautifully conveyed ... [There are] passages of fine writing in this book and scenes of considerable power, such as the diving under the cliff and the discovery of the dead heron." Paul Delany, in the *New York Times Book Review*, determines that:

> at a time when many novelists restrict themselves to a single mode of expression, such as documentary realism or unrestrained fantasy, Miss Atwood has undertaken a more serious and complex task. Denying Emerson's maxim that the true art of

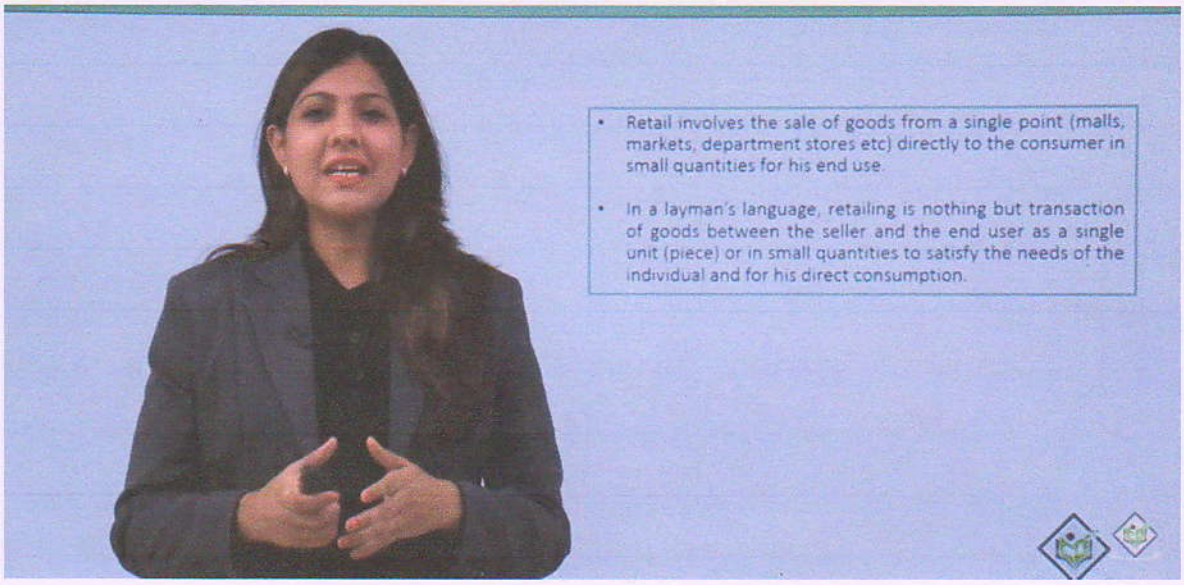
PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN- 676 552
MALAPPURAM

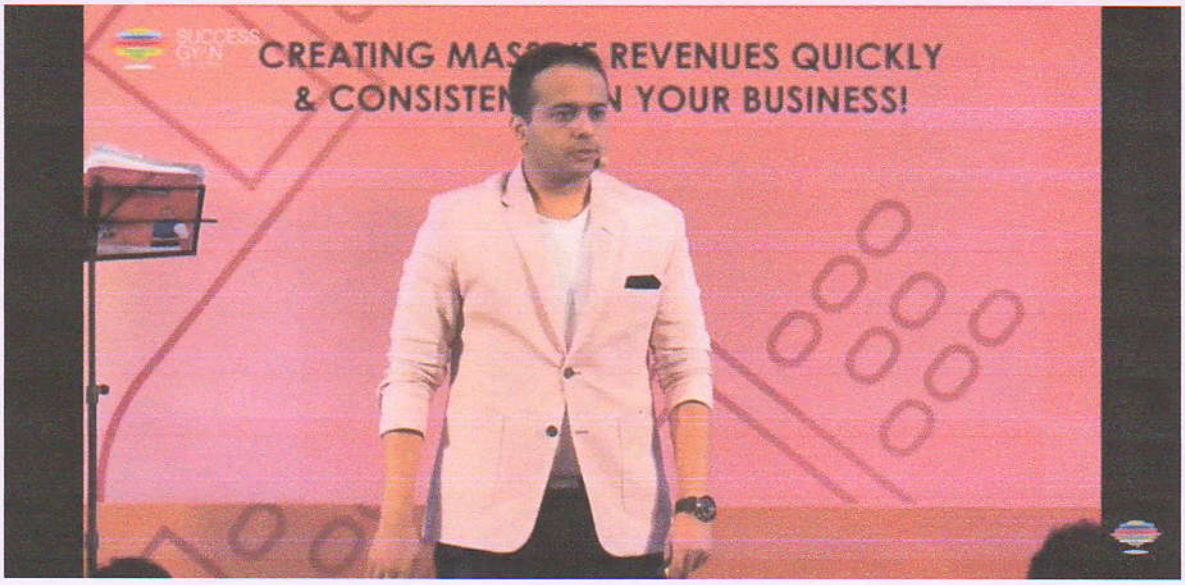
Videos & Movies



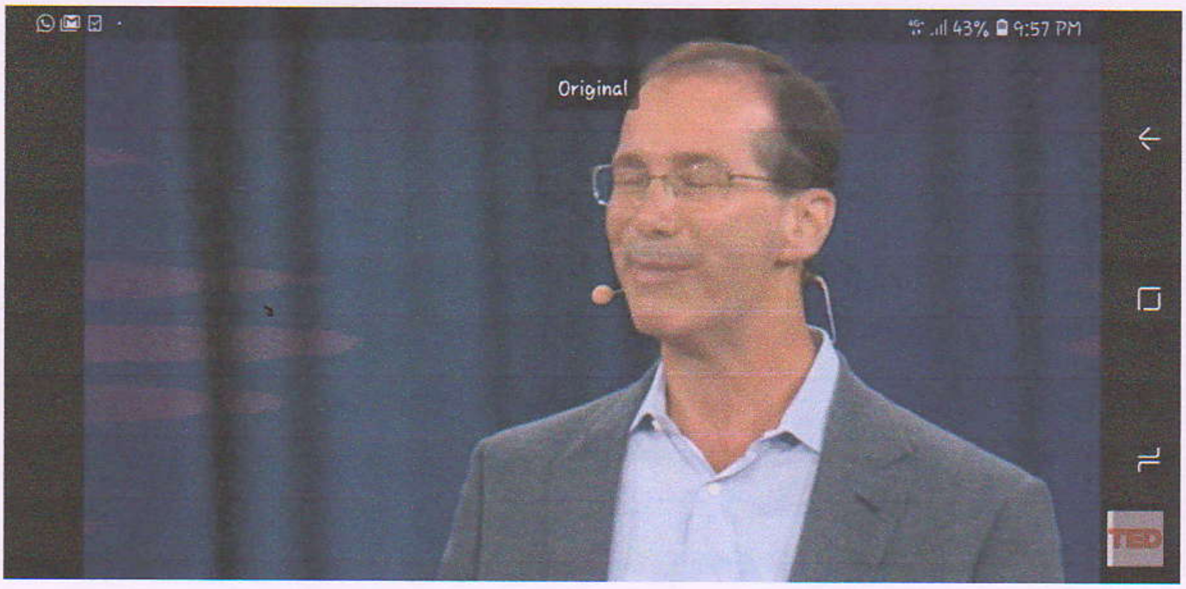
PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN- 676 552
MALAPPURAM

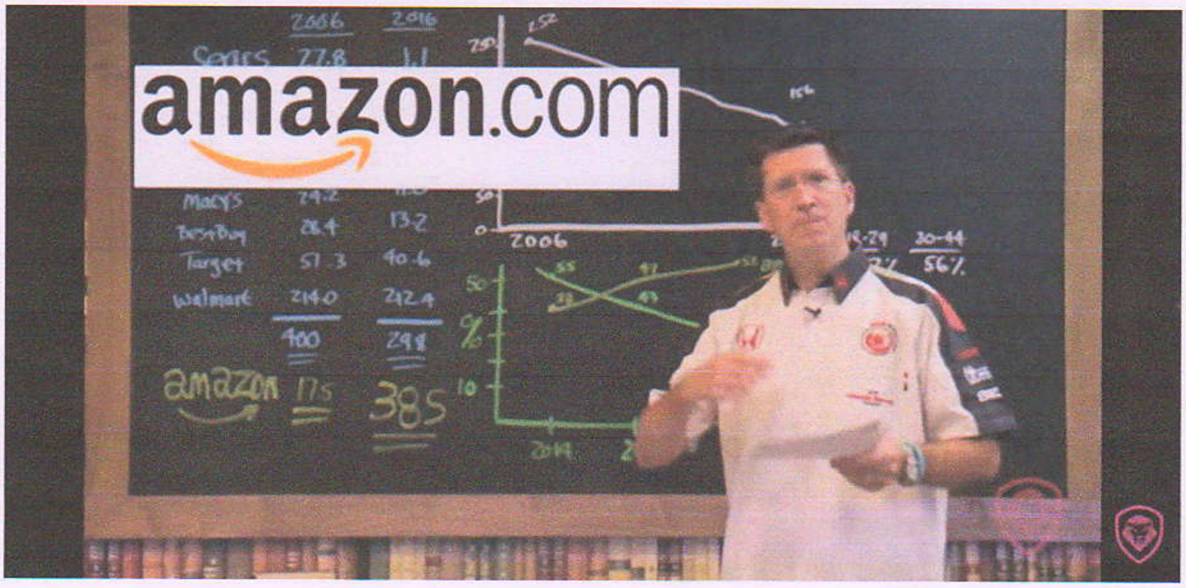
Shots from you tube videos





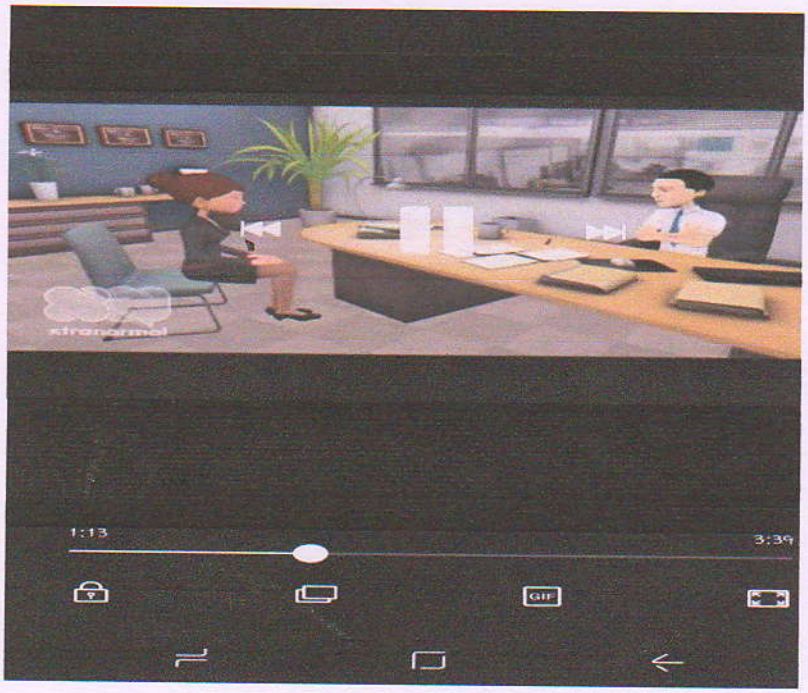
PRINCIPAL
M.E.S KEVEEYEM CO
VALANCHERY, PIN: 676 552
MALAPPURAM

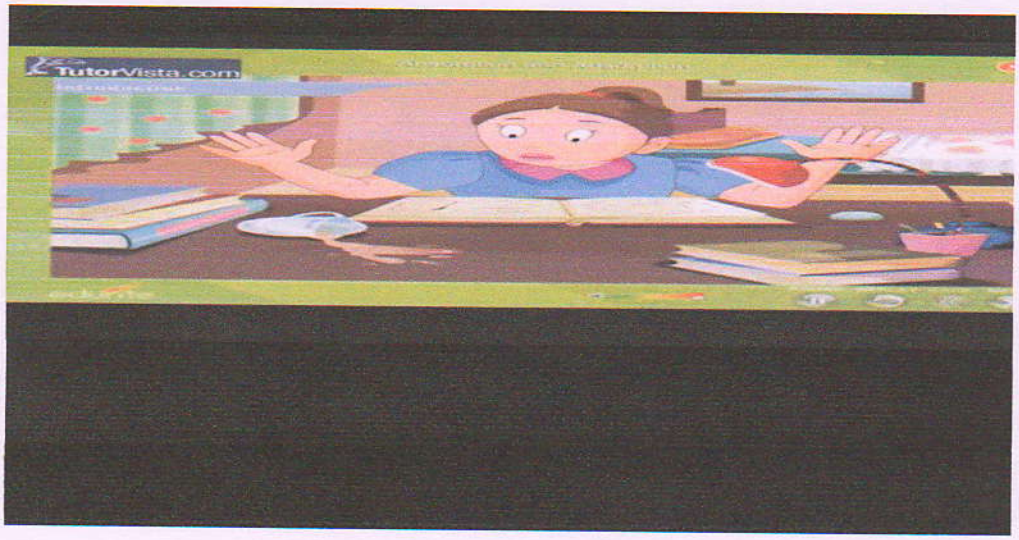




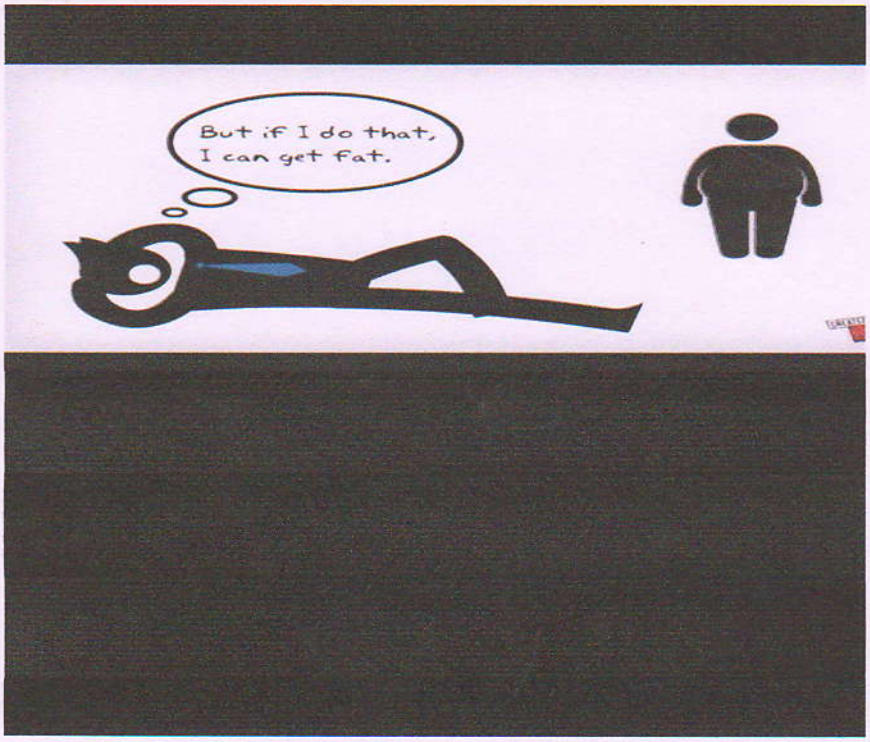
M.E.S. Ke Vea Yam College Valanchery
M.E.S KEV
VALANCHERY, PIN
MALAPPURAM

Shots from animated videos

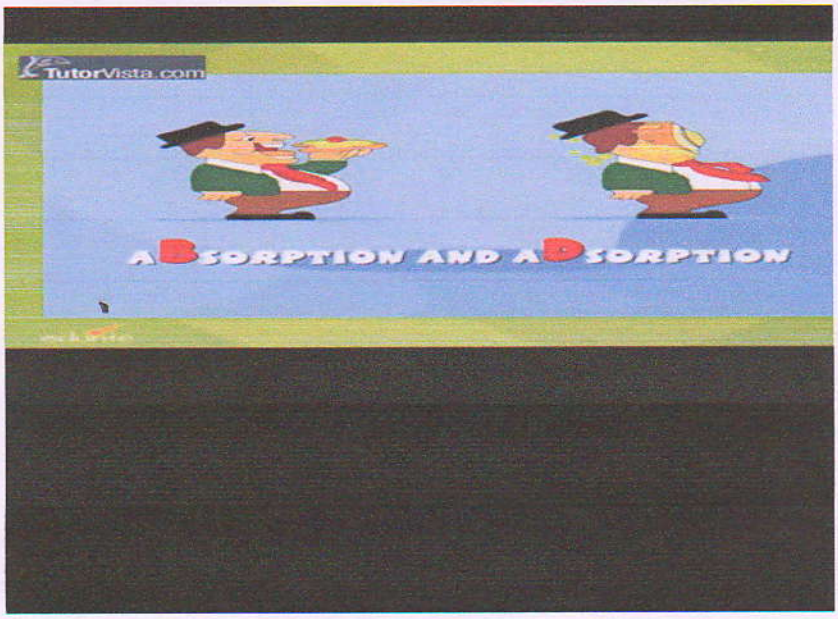




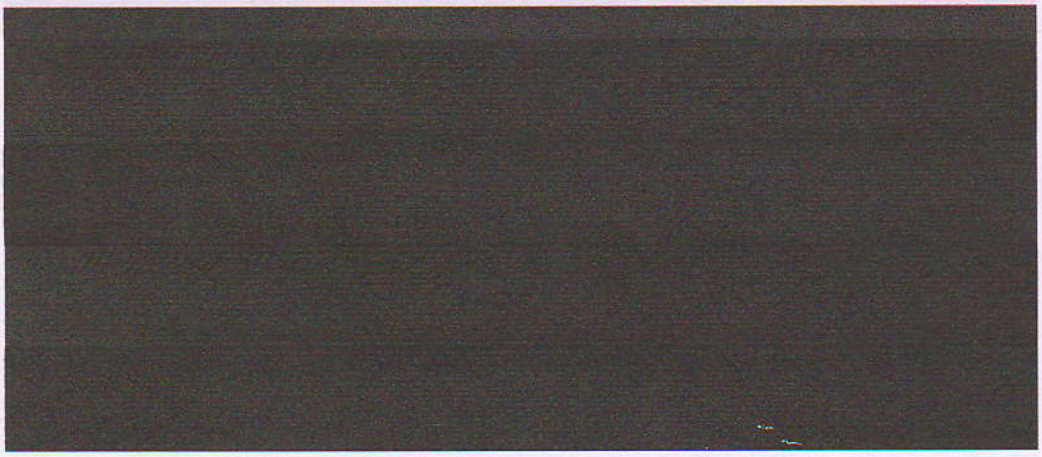
PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN: 676 552
MALAPPURAM



M.E.S KEVEEYEM
VALANCHERY, PIN
MALAPPURAM



7 Benefits of Regular Physical Activity



PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN
MALAPPURAM

NPTEL

M.E.S. Keveeyam College Valanchery Date

PRINCIPAL
M.E.S KEVEEYAM COLLEGE
VALANCHERY, PIN 676 552
MALAPPURAM

NPTEL

swayam

CERTIFICATE

OF APPRECIATION

is awarded to

TOP PERFORMING MENTOR

RASHEEDA M

MES KEVEEYAM COLLEGE VALANCHERY

MALAPPURAM, KERALA

in recognition of his/her role as mentor for the NPTEL Online Certification course offering

ANIMAL PHYSIOLOGY

Jan-April 2019

Mentees	Mentees Registered	Mentees Present	Score (in %)	Certified (Score in %)				
			< 40	40 - 59	60 - 74	75 - 89	>=90	Toppers
13	11	11	0	0	5	6	0	0

Elite

NPTEL Online Certification

(Funded by the Ministry of HRD, Govt. of India)

This certificate is awarded to

DR.SAIFUNNEESA TK

for successfully completing the course

Organometallic Chemistry

with a consolidated score of **80** %

Online Assignments	20.00/25	Proctored Exam	60/75

Total number of candidates certified in this course: **193**

Prof. Sridhar Iyer
Ø CDEEP & NPTEL Coordinator
IIT Bombay

Jan-Feb 2019
(4 week course)

Indian Institute of Technology Bombay

swayam

Roll No: NPTEL19CY03S11550001

To validate and check scores: http://nptel.ac.in/noc

Valanchery

PRINCIPAL
M.E.S KEVEEYAM COLLEGE
VALANCHERY, PIN- 676 552
MALAPPURAM

Jamboard

Assignment on Evolution of Ethology should be submitted on next week

Tomorrow, plse bring your project records

There will be a group discussion Ethology Evolution on coming Monday

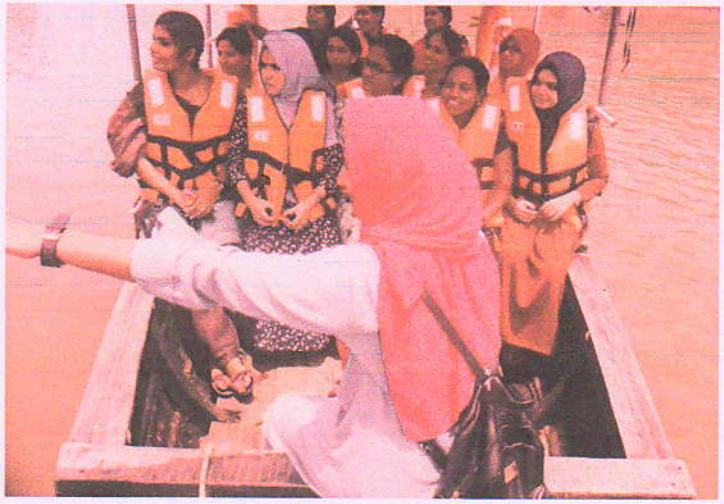
There will be a general discussion on banking transactions. Please refer some banking related books and generate an idea about history of banking

Dear students, please visit your nearest bank and get acquainted with banking transactions, types of bank accounts, and different kinds of loans available from banks.

PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN: 676 552
MALAPPURAM

ThingLink

My Images



Visit to Kadalundy. Wetland conservation

Krishna Prabha

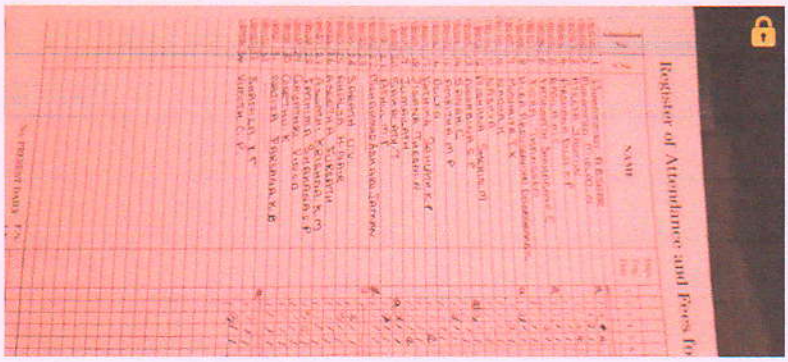
An Interactive Image

Krishna Prabha

M.E.S. Ke Vos Valanchery College
Date
PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN: 676 552
MALAPPURAM

Flood survey

Krishna Prabha 1



Class register

Krishna Prabha 2

M.E.S. Ke Vaya College Valanchery Date

PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN- 676 552
MALAPPURAM

Krishna Prabha 2

Rainwalking

Krishna Prabha 1

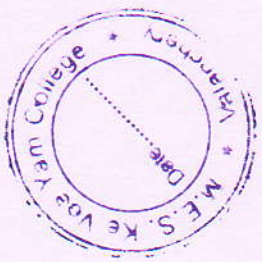
Visit to Kadalundy. Wetland conservation

Krishna Prabha 4

M.E.S. Keveeyam College Valanchery Date

PRINCIPAL
M.E.S KEVEEYAM COLLEGE
VALANCHERY, PIN: 676 552
MALAPPURAM

Class Dojo



PRINCIPAL
M.E.S KEVEEYEM COLLE
VALANCHERY, PIN- 676 552
MALAPPURAM

M.E.S. Keveeyam College Valanchery Date

PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN: 676 552
MALAPPURAM

BSC Zoology 11 nd Semest...

Students Groups

Hibiscus

Jasmin

Lily

Lotus

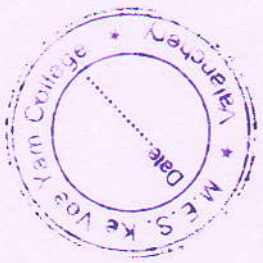
Marigold

Sunflower

Add group

Check out those monsters! Next, invite parents.

Classroom Toolkit Class Story Messages



PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN: 676 552
MALAPPURAM

Afeefa Yasmin K

Redeem

POSITIVE NEEDS WORK

Helping others | On Task | Participating | Persistence

Teamwork | Working Hard | Edit skills | View report

Portfolio

Work submitted by Afeefa will also appear here

Learn more

M.E.S. Ke Vos Vaam College Valanchery Date

PRINCIPAL
M.E.S KEVEEYEM C(
VALANCHERY, PIN 676 . .
MALAPPURAM

Economics Letters 117 (2012) 110–114

Contents lists available at SciVerse ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

On voluntary eco-labeling and fiscal incentives

Aditi Jamalpuria *

National Institute of Science, Technology and Development Studies, India

ARTICLE INFO

Article history:
Received 20 May 2010
Received in revised form
21 April 2012
Accepted 25 April 2012
Available online 3 May 2012

JEL classification:
Q59
H29
L13

Keywords:
Eco-label
Fiscal incentive
Tax rebate
Differentiated duopoly
Environmental damage

ABSTRACT

The conditions under which a government would initiate a fiscal incentive scheme to encourage the use of an eco-label in a duopoly are determined. The results reveal a scope for fiscal incentive provision in conjunction with the eco-label scheme for highly polluting industries.

© 2012 Elsevier B.V. All rights reserved.

1. Introduction

As environmental regulation moves to the information-based third phase, there has been an upsurge of eco-label schemes[1] throughout the world (Tietenberg and Wheeler, 2001). Through eco-labeling programs, governments and/or non-governmental organizations (NGOs) seek to influence a consumer's purchasing decisions and encourage the consumption and thus the production of environmentally benign products. Specifically speaking, eco-labeling serves as an information and market-based instrument intended to bring about environmental improvement through the route of sustainable consumption and production. But such eco-labels used singularly are expected to generate a cost-based competitive disadvantage for a firm using eco-labeling, thereby necessitating the charging of a price premium[2] for the eco-labeled product. When general awareness of environmental issues is low for a consumer population, then only that segment of the consumer population which is both aware of the environmental issues and is additionally willing to pay the price premium attached to the green eco-labeled product would purchase eco-labeled products. The motivation of this paper is the voluntary eco-label scheme called "Ecomark", initiated by the government of India in 1991. Interestingly, even though the scheme has been in existence for the last two decades, there has been no significant impact of Ecomark on the Indian domestic market.[3] Anecdotal evidence attributes this to the costs involved in applying for the Ecomark, which is a self-financing program, requiring manufacturers to pay for the application, testing, licensing, and renewal costs of certification, thereby necessitating a need to provide fiscal incentives to the firms using the eco-label.[4] The specific problem pertaining to India can be generalized across any such economy that confronts the supply-side obstacle to the greening route in the form of a substantial percentage of industrial units facing financial barriers when opting for greener production and subsequent adoption of an eco-label scheme. In a situation like this, an eco-label scheme offered singularly would generate a cost-based competitive disadvantage when the cost of going green and acquiring an

* Correspondence to: c/o Prof. Krishnendu Ghosh Dastidar, Centre for Economic Studies and Planning, School of Social Sciences, Jawaharlal Nehru University, New Delhi-110067, India. Tel.: +91 9891078863.
E-mail address: j.aditi3@gmail.com.

1 See URL: http://www.ecolabelindex.com/ to obtain information about different eco-label schemes functioning all over the world.

2 See Sedjo and Swallow (2002) and Amacher et al. (2004).

3 To date, only 20 licenses have been granted to 15 companies across four product categories: paper, wood substitutes, finished leather, and electrical/electronic goods (CUTS, 2009).

4 See Alam (2005) and Jaura (2011).

0165-1765/$ – see front matter © 2012 Elsevier B.V. All rights reserved.
doi:10.1016/j.econlet.2012.04.087

M.E.S. Keveeyam College Valanchery Date

PRINCIPAL
M.E.S KEVEEYAM COLLEGE
VALANCHERY, PIN 676 552
MALAPPURAM

eco-label[5] is increasing in nature. A fiscal incentive in the form of a tax break or tax rebate to the eco-label-using firm rather stands to provide visible benefits, thereby incentivizing the adoption of eco-labels among other units as well. In practice, however, governments are generally confronted with budget constraints which require them to prioritize the fiscal incentive provision across different sectors. In this paper, we find the condition under which a government would initiate a fiscal incentive scheme such as tax rebate provision to an eco-label-using firm in contrast to the polluting variant to incentivize the use of eco-labels, and we find that the provision of a fiscal incentive is contingent upon the status of environmental damage incurred by a unit in a particular industrial sector. Existing literature on eco-labels comprises extensive empirical and theoretical explorations. Clark (2002), Auriol and Schillizzi (2003), Nadai and Morel (2000), Dosi and Moretto (2001), and Greaker (2006) theoretically explore various aspects related to eco-labeling, but this paper differs from others in the literature as it theoretically explores the issue of fiscal incentive provision to encourage the use of eco-labels.

To draw insight into the issue discussed, we consider a voluntary eco-label scheme in a differentiated duopoly market[6] in which an eco-label-using and a non-eco-label-using firm compete in prices in the second stage and in the first stage a welfare-maximizing government chooses the tax rates to be imposed on both the firms. The choice of fiscal incentive provision is thus taken to be endogenous to the model. The model developed deals with the third-party eco-label provision, and we consider cases where the third-party eco-label is provided by an NGO and by the government itself. In the first setting, when the eco-label scheme is offered by an NGO, the government follows a "mere tax rebate" policy, and in the second, by offering the eco-label scheme itself, it follows an "eco-label cum tax rebate" policy. A comparison of the outcomes in the two settings reveals the best policy option.

In the next section, we develop a simple nonlinear model to draw insights into the issue discussed. Sections 2.1 and 2.2 respectively determine the equilibrium tax rates for the eco-label-using and non-eco-label-using firms, when the eco-label is provided by an NGO and the government follows a "mere tax rebate" policy and when the eco-label is provided by the government, which follows an "eco-label cum tax rebate" policy. There is scope for fiscal incentive provision to highly polluting industries under both settings. A comparison of the two settings reveals that a government reacts more quickly in favor of the eco-label-using firm by initiating a tax rebate scheme when following an "eco-label cum tax rebate" scheme. Section 3 offers some concluding remarks.

2. The model

We consider a price-setting differentiated product duopoly in which the two firms are assumed to be producing goods which are similar with respect to all possible physical characteristics but differ with respect to the environment content of their production process. In the duopoly, firm 1 uses an eco-label and is hence cleaner than firm 2, which does not opt for the eco-label. Non-eco-label-using firm 2 uses a technology of production which is pollution intensive in nature and is the sole contributor to the environmental damage incurred on the society. The source of differentiation in the model is the "green value" attached to firm 1's product which otherwise is similar to firm 2's product as far as the physical attributes are concerned. The demands arise from the following utility function,

$$U = (q_1, q_2)\,.$$

The partial derivatives of the utility function yields the inverse demand functions as

$$p_i = p_i\,(q_1, q_2) \quad \forall i = 1, 2,$$

where q_i is the quantity of product i and p_i its respective price. The direct demand functions follow as

$$q_i = q_i\,(p_1, p_2) \quad \forall i = 1, 2.$$

The restrictions on the demand function are given as

$$\frac{\partial q_i}{\partial p_i} < 0; \qquad \frac{\partial q_i}{\partial p_j} > 0.$$

Further, $\left|\frac{\partial q_i}{\partial p_i}\right| > \left|\frac{\partial q_i}{\partial p_j}\right|$, i.e. the own-price effect dominates the cross-price effect.

Since the demand functions are symmetric, this implies that $\frac{\partial q_i}{\partial p_i} = \frac{\partial q_j}{\partial p_j}$ and $\frac{\partial q_i}{\partial p_j} = \frac{\partial q_j}{\partial p_i}$.

The total cost for both firms comprises three components: the cost of production, tax to be paid, and the green cost. The basic cost of production for the two firms is assumed to be zero.[7]

The second component is the excise tax bill that both the firms incur. It is different for each of them, depending upon their respective tax rates; t_i and quantity produced.

Tax cost: $t_i q_i$.

Finally, there is a cost for going greener, which arises if the firm opts for the eco-label. Therefore, we have the following.

Green cost: for firm 1, this is $cq_1 + Eq_1$, and for firm 2 it is 0, where c is the marginal cost of green production following the "life-cycle approach" that entails an increasing marginal cost of going green; $c > 0$. E is the eco-label fee, which is exogenous; $E > 0$. The total eco-label fee is thus contingent upon the quantity produced by firm 1.[8] Therefore,

$$TC_1 = t_1 q_1 + cq_1 + Eq_1.$$

$$TC_2 = t_2 q_2.$$

The aggregate welfare (W_I) in the first setting when the eco-label is provided by a third party other than the government, i.e. an NGO, is defined as the sum of the profits obtained by each of the two firms, the consumer surplus enjoyed by the consumers, and the tax revenue earned by the government, minus the damage incurred by the polluting firm's production,[9] i.e.

$$W_I = \sum_i \pi_i + \sum_i CS_i + \sum_i t_i q_i - \gamma q_2,$$

where γ is the social marginal damage incurred due to one unit of pollution; $\gamma > 0$. In the second situation, where the government is the sole eco-label provider, the aggregate welfare

[5] An estimate in a CUTS report suggests that the existing fee structure of the Ecomark would lead to at least a 10% increase in the unit's cost of production (CUTS, 2009).

[6] An eco-label product market is imperfect because an eco-labeled product is differentiated from the non eco-labeled polluting variety on the basis of its high environmental quality content.

[7] Since the products are similar with respect to all possible physical attributes, the basic cost of production is similar too. Therefore, a zero cost of production would not have any effect on the results obtained.

[8] In this model, we are only considering the label mark-up fee payable annually that depends upon the quantum of annual production and not the auditing cost which the firm has to incur to apply for the Ecomark.

[9] An eco-label-using firm is clean since an eco-label is awarded to that firm which is clean in all the stages of its life, i.e. from cradle to grave of its production process. Therefore, no damage is incurred on the environment by its production.

M.E.S. Keveeyam College Valanchery Library Date
PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN: 676 552
MALAPPURAM

(W_{II}) has an addition in the form of eco-label revenue earned by the government, i.e.

$$W_{II} = \sum_i \pi_i + \sum_i CS_i + \sum_i t_i q_i + Eq_1 - \gamma q_2.$$

In the second stage, the firms play a price game, and we determine the Bertrand equilibrium in prices.[10] We start by solving the second-stage price game, followed by the first-stage policy game for the two cases, and look at the subgame perfect Nash equilibrium.

Stage 2: The price game

Let π_i be the profit of firm i in the second stage, i.e. for the given tax rates t_1 and t_2. Therefore,

$$\pi_1 = (p_1 - t_1 - c - E)\, q_1(p_1, p_2) \quad (1)$$

$$\pi_2 = (p_2 - t_2)\, q_2(p_1, p_2). \quad (2)$$

Differentiating (1) and (2) with respect to p_1 and p_2, respectively, and setting them equal to zero, we get the first-order conditions as

$$\frac{d\pi_1}{dp_1} = 0 \quad (3)$$

$$\frac{d\pi_2}{dp_2} = 0. \quad (4)$$

Solving (3) and (4), we get the equilibrium prices in the second stage, given the tax rates, as

$$p_1^* = p_1^*(t_1, t_2)$$
$$p_2^* = p_2^*(t_1, t_2).$$

Using the Implicit Function Theorem, we get

(i) $\dfrac{\partial p_i}{\partial t_i} > 0; \quad \dfrac{\partial p_i}{\partial t_j} < 0$

(ii) $\left|\dfrac{\partial p_i}{\partial t_i}\right| > \left|\dfrac{\partial p_i}{\partial t_j}\right|$

(iii) $\dfrac{\partial p_i}{\partial t_i} = \dfrac{\partial p_j}{\partial t_j}$

(iv) $\dfrac{\partial p_i}{\partial t_j} = \dfrac{\partial p_j}{\partial t_i}.$

2.1. When the government follows a "mere tax rebate" policy

Stage 1: The policy game

In the first stage of the game, the government chooses the tax rates it wishes to impose on the eco-label-using and the non-eco-label-using firm by maximizing the welfare of the society. Expression (5) defines the objective function of the government when the third-party eco-label provider is an NGO.[11]

$$W_I = \int_{p_1}^{\infty} q_1(y, p_2)dy + \int_{p_2}^{\infty} q_2(p_1, x)dx + \pi_1(p_1, p_2) + \pi_2(p_1, p_2) + t_1 q_1(p_1, p_2) + t_2 q_2(p_1, p_2) - \gamma q_2(p_1, p_2). \quad (5)$$

Differentiating (5) with respect to t_1 and t_2, respectively, and setting them equal to zero, we get the first-order conditions as

$$\frac{\partial q_1}{\partial p_1}\cdot\frac{\partial p_1}{\partial t_1}t_1 + \frac{\partial q_2}{\partial p_2}\cdot\frac{\partial p_2}{\partial t_1}t_2 = U \quad (6)$$

$$\frac{\partial q_1}{\partial p_1}\cdot\frac{\partial p_1}{\partial t_2}t_1 + \frac{\partial q_2}{\partial p_2}\cdot\frac{\partial p_2}{\partial t_2}t_2 = V, \quad (7)$$

where

$$U = \frac{\partial p_1}{\partial t_1}q_1(.) + \frac{\partial p_2}{\partial t_1}q_2(.) - q_1(.) + \gamma B - \int_{p_1}^{\infty}\frac{\partial q_1}{\partial p_2}\cdot\frac{\partial p_2}{\partial t_1}dy - \int_{p_2}^{\infty}\frac{\partial q_2}{\partial p_1}\cdot\frac{\partial p_1}{\partial t_1}dx - (p_1 - c - E)\frac{\partial q_1}{\partial p_2}\cdot\frac{\partial p_2}{\partial t_1} - p_2\frac{\partial q_2}{\partial p_1}\cdot\frac{\partial p_1}{\partial t_1}$$

$$V = \frac{\partial p_1}{\partial t_2}q_1(.) + \frac{\partial p_2}{\partial t_2}q_2(.) - q_2(.) + \gamma N - \int_{p_1}^{\infty}\frac{\partial q_1}{\partial p_2}\cdot\frac{\partial p_2}{\partial t_2}dy - \int_{p_2}^{\infty}\frac{\partial q_2}{\partial p_1}\cdot\frac{\partial p_1}{\partial t_2}dx - (p_1 - c - E)\frac{\partial q_1}{\partial p_2}\cdot\frac{\partial p_2}{\partial t_2} - p_2\frac{\partial q_2}{\partial p_1}\cdot\frac{\partial p_1}{\partial t_2}$$

and

$$B = \left(\frac{\partial q_2}{\partial p_1}\cdot\frac{\partial p_1}{\partial t_1} + \frac{\partial q_2}{\partial p_2}\cdot\frac{\partial p_2}{\partial t_1}\right) > 0;$$

$$N = \left(\frac{\partial q_2}{\partial p_1}\cdot\frac{\partial p_1}{\partial t_2} + \frac{\partial q_2}{\partial p_2}\cdot\frac{\partial p_2}{\partial t_2}\right) < 0; \quad |B| > |N|.$$

Eqs. (6) and (7) can be written in matrix form as

$$\begin{bmatrix} \frac{\partial q_1}{\partial p_1}\cdot\frac{\partial p_1}{\partial t_1} & \frac{\partial q_2}{\partial p_2}\cdot\frac{\partial p_2}{\partial t_1} \\ \frac{\partial q_1}{\partial p_1}\cdot\frac{\partial p_1}{\partial t_2} & \frac{\partial q_2}{\partial p_2}\cdot\frac{\partial p_2}{\partial t_2} \end{bmatrix}\begin{bmatrix} t_1 \\ t_2 \end{bmatrix} = \begin{bmatrix} U \\ V \end{bmatrix}.$$

$$\text{Let, } [J] = \begin{bmatrix} \frac{\partial q_1}{\partial p_1}\cdot\frac{\partial p_1}{\partial t_1} & \frac{\partial q_2}{\partial p_2}\cdot\frac{\partial p_2}{\partial t_1} \\ \frac{\partial q_1}{\partial p_1}\cdot\frac{\partial p_1}{\partial t_2} & \frac{\partial q_2}{\partial p_2}\cdot\frac{\partial p_2}{\partial t_2} \end{bmatrix} = \frac{\partial q_1}{\partial p_1}\cdot\frac{\partial q_2}{\partial p_2}\left[\frac{\partial p_1}{\partial t_1}\frac{\partial p_2}{\partial t_2} - \frac{\partial p_2}{\partial t_1}\frac{\partial p_1}{\partial t_2}\right] > 0.$$

(Since, $\left|\frac{\partial p_i}{\partial t_i}\right| > \left|\frac{\partial p_i}{\partial t_j}\right|$.)

Therefore, a solution to the system of equations exists. Using Cramer's rule, we solve the system of equations to get $t^*_{i(I)}$ as

$$t^*_{1(I)} = \frac{\frac{\partial q_2}{\partial p_2}\left[U\frac{\partial p_2}{\partial t_2} - V\frac{\partial p_2}{\partial t_1}\right]}{\frac{\partial q_1}{\partial p_1}\cdot\frac{\partial q_2}{\partial p_2}\left[\frac{\partial p_1}{\partial t_1}\frac{\partial p_2}{\partial t_2} - \frac{\partial p_2}{\partial t_1}\frac{\partial p_1}{\partial t_2}\right]};$$

$$t^*_{2(I)} = \frac{\frac{\partial q_1}{\partial p_1}\left[V\frac{\partial p_1}{\partial t_1} - U\frac{\partial p_1}{\partial t_2}\right]}{\frac{\partial q_1}{\partial p_1}\cdot\frac{\partial q_2}{\partial p_2}\left[\frac{\partial p_1}{\partial t_1}\frac{\partial p_2}{\partial t_2} - \frac{\partial p_2}{\partial t_1}\frac{\partial p_1}{\partial t_2}\right]}$$

and

$$t^*_{1(I)} - t^*_{2(I)} = \frac{U\left[\frac{\partial q_2}{\partial p_2}\frac{\partial p_2}{\partial t_2} + \frac{\partial q_1}{\partial p_1}\frac{\partial p_1}{\partial t_2}\right] - V\left[\frac{\partial q_2}{\partial p_2}\frac{\partial p_2}{\partial t_1} + \frac{\partial q_1}{\partial p_1}\frac{\partial p_1}{\partial t_1}\right]}{\frac{\partial q_1}{\partial p_1}\cdot\frac{\partial q_2}{\partial p_2}\left[\frac{\partial p_1}{\partial t_1}\frac{\partial p_2}{\partial t_2} - \frac{\partial p_2}{\partial t_1}\frac{\partial p_1}{\partial t_2}\right]}.$$

Therefore, $t^*_{1(I)} < t^*_{2(I)}$ iff

$$\gamma > \gamma_{(I)} = \frac{1}{\left[\frac{\partial q_i}{\partial p_j} - \frac{\partial q_i}{\partial p_i}\right]} \times \left\{[q_1(.) - q_2(.)]\left[\frac{1}{\left(\frac{\partial p_i}{\partial t_i} - \frac{\partial p_i}{\partial t_j}\right)} - 1\right] - \frac{1}{\left(\frac{\partial p_i}{\partial t_i} - \frac{\partial p_i}{\partial t_j}\right)}\left[\int_{p_1}^{\infty}\frac{\partial q_i}{\partial p_j}\left(\frac{\partial p_i}{\partial t_i} - \frac{\partial p_i}{\partial t_j}\right)dy\right.\right.$$

[10] When the firms play a quantity game under a Cournot specification, the findings of the paper do not change. The policy game under the Cournot specification can be obtained from the author on request.

[11] Since the NGO is assumed to break even and not make profits, the eco-label fee collected by the NGO is excluded in calculating the welfare in the first setting when the eco-label is provided by the NGO.

PRINCIPAL
M.E.S KEVEEYAM
VALANCHERY, PIN 676 552
MALAPPURAM

$$- \int_{p_2}^{\infty} \frac{\partial q_i}{\partial p_j}\left(\frac{\partial p_i}{\partial t_i} - \frac{\partial p_i}{\partial t_j}\right) dx\Bigg] - \frac{\partial q_i}{\partial p_j}(p_1 - p_2) + \frac{\partial q_i}{\partial p_j}(c + E)\Bigg\}. \quad (8)$$

Expression (8) yields the condition under which the government initiates a tax rebate provision to encourage the eco-label-using firm when an NGO is the eco-label provider. $\gamma_{(I)}$ in the expression represents the critical value of social marginal damage incurred due to one unit of pollution, and it can be defined as that value of social marginal damage at which the government initiates the fiscal incentive provision to encourage the eco-label scheme when following a "mere tax rebate" scheme. Thus, for industries for which the social marginal damage incurred due to one unit of pollution is higher than this critical value, a welfare-maximizing government would provide a fiscal incentive in the form of a tax rebate to encourage the use of eco-labels among firms. From expression (8), we can also conclude that both a high degree of substitutability between the two products as reflected in their cross-price elasticity and a high price elasticity of the product as reflected in the own-price elasticity deflates the value of the critical social marginal damage. Therefore, when the products being offered in a particular industry are highly substitutable and/or have a high price elasticity of demand, then the government's provision of a tax rebate would require a lower value of critical social marginal damage.

Next, we determine the equilibrium tax rates for the eco-label-using and non-eco-label-using firms when the government itself is the provider of the eco-label.

2.2. When the government follows an "eco-label cum tax rebate" policy

Stage 1: The policy game

Expression (9) defines the objective function of the government in the situation in which it offers an eco-label scheme.

$$\begin{aligned} W_{II} = & \int_{p_1}^{\infty} q_1(y, p_2)dy \\ & + \int_{p_2}^{\infty} q_2(p_1, x)dx + \pi_1(p_1, p_2) + \pi_2(p_1, p_2) \\ & + t_1 q_1(p_1, p_2) + t_2 q_2(p_1, p_2) \\ & + Eq_1(p_1, p_2) - \gamma q_2(p_1, p_2). \end{aligned} \quad (9)$$

Differentiating (9) with respect to t_1 and t_2, respectively, and setting them equal to zero, we get the first-order conditions as

$$\frac{\partial q_1}{\partial p_1}.\frac{\partial p_1}{\partial t_1}t_1 + \frac{\partial q_2}{\partial p_2}.\frac{\partial p_2}{\partial t_1}t_2 = R \quad (10)$$

$$\frac{\partial q_1}{\partial p_1}.\frac{\partial p_1}{\partial t_2}t_1 + \frac{\partial q_2}{\partial p_2}.\frac{\partial p_2}{\partial t_2}t_2 = S, \quad (11)$$

where

$$\begin{aligned} R = & \frac{\partial p_1}{\partial t_1}q_1(.) + \frac{\partial p_2}{\partial t_1}q_2(.) - q_1(.) + \gamma B \\ & - \int_{p_1}^{\infty} \frac{\partial q_1}{\partial p_2}.\frac{\partial p_2}{\partial t_1}dy - \int_{p_2}^{\infty} \frac{\partial q_2}{\partial p_1}.\frac{\partial p_1}{\partial t_1}dx \\ & - (p_1 - c)\frac{\partial q_1}{\partial p_2}.\frac{\partial p_2}{\partial t_1} - p_2\frac{\partial q_2}{\partial p_1}.\frac{\partial p_1}{\partial t_1} - \frac{\partial q_1}{\partial p_1}.\frac{\partial p_1}{\partial t_1}E \end{aligned}$$

$$\begin{aligned} S = & \frac{\partial p_1}{\partial t_2}q_1(.) + \frac{\partial p_2}{\partial t_2}q_2(.) - q_2(.) + \gamma N \\ & - \int_{p_1}^{\infty} \frac{\partial q_1}{\partial p_2}.\frac{\partial p_2}{\partial t_2}dy - \int_{p_2}^{\infty} \frac{\partial q_2}{\partial p_1}.\frac{\partial p_1}{\partial t_2}dx \\ & - (p_1 - c)\frac{\partial q_1}{\partial p_2}.\frac{\partial p_2}{\partial t_2} - p_2\frac{\partial q_2}{\partial p_1}.\frac{\partial p_1}{\partial t_2} - \frac{\partial q_1}{\partial p_1}.\frac{\partial p_1}{\partial t_2}E \end{aligned}$$

and

$$B = \left(\frac{\partial q_2}{\partial p_1}.\frac{\partial p_1}{\partial t_1} + \frac{\partial q_2}{\partial p_2}.\frac{\partial p_2}{\partial t_1}\right) > 0;$$

$$N = \left(\frac{\partial q_2}{\partial p_1}.\frac{\partial p_1}{\partial t_2} + \frac{\partial q_2}{\partial p_2}.\frac{\partial p_2}{\partial t_2}\right) < 0: \quad |B| > |N|.$$

Eqs. (10) and (11) can be written in matrix form as

$$\begin{bmatrix} \frac{\partial q_1}{\partial p_1}.\frac{\partial p_1}{\partial t_1} & \frac{\partial q_2}{\partial p_2}.\frac{\partial p_2}{\partial t_1} \\ \frac{\partial q_1}{\partial p_1}.\frac{\partial p_1}{\partial t_2} & \frac{\partial q_2}{\partial p_2}.\frac{\partial p_2}{\partial t_2} \end{bmatrix} \begin{bmatrix} t_1 \\ t_2 \end{bmatrix} = \begin{bmatrix} R \\ S \end{bmatrix}.$$

Again, $[J] = \begin{bmatrix} \frac{\partial q_1}{\partial p_1}.\frac{\partial p_1}{\partial t_1} & \frac{\partial q_2}{\partial p_2}.\frac{\partial p_2}{\partial t_1} \\ \frac{\partial q_1}{\partial p_1}.\frac{\partial p_1}{\partial t_2} & \frac{\partial q_2}{\partial p_2}.\frac{\partial p_2}{\partial t_2} \end{bmatrix} = \frac{\partial q_1}{\partial p_1}.\frac{\partial q_2}{\partial p_2}\left[\frac{\partial p_1}{\partial t_1}\frac{\partial p_2}{\partial t_2} - \frac{\partial p_2}{\partial t_1}\frac{\partial p_1}{\partial t_2}\right] > 0.$

Using Cramer's rule, we solve the system of equations to get $t^*_{i(II)}$ as

$$t^*_{1(II)} = \frac{\frac{\partial q_2}{\partial p_2}\left[R\frac{\partial p_2}{\partial t_2} - S\frac{\partial p_2}{\partial t_1}\right]}{\frac{\partial q_1}{\partial p_1}.\frac{\partial q_2}{\partial p_2}\left[\frac{\partial p_1}{\partial t_1}\frac{\partial p_2}{\partial t_2} - \frac{\partial p_2}{\partial t_1}\frac{\partial p_1}{\partial t_2}\right]};$$

$$t^*_{2(II)} = \frac{\frac{\partial q_1}{\partial p_1}\left[S\frac{\partial p_1}{\partial t_1} - R\frac{\partial p_1}{\partial t_2}\right]}{\frac{\partial q_1}{\partial p_1}.\frac{\partial q_2}{\partial p_2}\left[\frac{\partial p_1}{\partial t_1}\frac{\partial p_2}{\partial t_2} - \frac{\partial p_2}{\partial t_1}\frac{\partial p_1}{\partial t_2}\right]}$$

and

$$t^*_{1(II)} - t^*_{2(II)} = \frac{R\left[\frac{\partial q_2}{\partial p_2}\frac{\partial p_2}{\partial t_2} + \frac{\partial q_1}{\partial p_1}\frac{\partial p_1}{\partial t_2}\right] - S\left[\frac{\partial q_2}{\partial p_2}\frac{\partial p_2}{\partial t_1} + \frac{\partial q_1}{\partial p_1}\frac{\partial p_1}{\partial t_1}\right]}{\frac{\partial q_1}{\partial p_1}.\frac{\partial q_2}{\partial p_2}\left[\frac{\partial p_1}{\partial t_1}\frac{\partial p_2}{\partial t_2} - \frac{\partial p_2}{\partial t_1}\frac{\partial p_1}{\partial t_2}\right]}.$$

Therefore, $t^*_{1(II)} < t^*_{2(II)}$ iff

$$\begin{aligned} \gamma > \gamma_{(II)} = & \frac{1}{\left[\frac{\partial q_i}{\partial p_j} - \frac{\partial q_i}{\partial p_i}\right]} \\ & \times \Bigg\{[q_1(.) - q_2(.)]\left[\frac{1}{\left(\frac{\partial p_i}{\partial t_i} - \frac{\partial p_i}{\partial t_j}\right)} - 1\right] \\ & - \frac{1}{\left(\frac{\partial p_i}{\partial t_i} - \frac{\partial p_i}{\partial t_j}\right)}\Bigg[\int_{p_1}^{\infty} \frac{\partial q_i}{\partial p_j}\left(\frac{\partial p_i}{\partial t_i} - \frac{\partial p_i}{\partial t_j}\right)dy \\ & - \int_{p_2}^{\infty} \frac{\partial q_i}{\partial p_j}\left(\frac{\partial p_i}{\partial t_i} - \frac{\partial p_i}{\partial t_j}\right)dx\Bigg] \\ & - \frac{\partial q_i}{\partial p_j}(p_1 - p_2) + \frac{\partial q_i}{\partial p_j}c + \frac{\partial q_i}{\partial p_i}E\Bigg\}. \end{aligned} \quad (12)$$

Expression (12) yields the condition under which the government initiates a tax rebate provision to encourage the eco-label-using firm. In the expression, $\gamma_{(II)}$ represents the critical value of social marginal damage incurred due to one unit of pollution in the second setting when the government provides the eco-label. Again, for industries for which the social marginal damage incurred due to one unit of pollution is higher than the critical value, a welfare-maximizing government would provide a fiscal incentive in the form of a tax rebate to encourage the promulgation of eco-labels among firms. From expression (12), we can also conclude that, when the products being offered in a particular industry are highly substitutable and/or have a high price elasticity of demand, then the government's provision of a tax rebate would require a lower value of critical social marginal damage. Therefore, we have the following.

M.E.S. Keveeyam College
PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN 676 552
MALAPPURAM

Result 1. The provision of a fiscal incentive to promote eco-labels is contingent upon the critical value of the social marginal damage incurred due to one unit of pollution under both government policy schemes.

Moreover, on comparing expressions (8) and (12), we get

$\gamma_{(I)} - \gamma_{(II)} = E$

$\Longrightarrow \gamma_{(I)} > \gamma_{(II)}$.

Therefore, we have the following.

Result 2. A government initiates a fiscal incentive scheme at a lower critical marginal environmental damage value when providing the eco-label itself.

3. Concluding remarks

In this paper, we have determined the conditions under which a government would initiate a fiscal incentive scheme to encourage the use of an eco-label in a duopoly. We find that the provision of a fiscal incentive to promote the use of eco-labels is contingent upon the critical value of the social marginal damage incurred due to one unit of pollution. For industries having a high value of social marginal damage incurred due to one unit of pollution, a welfare-maximizing government would provide a fiscal incentive in the form of a tax rebate to the eco-label-using firm to promote the use of eco-labels. This finding, therefore, strengthens the case for the government to provide fiscal incentives to firms under the category of the 17 most polluting industries[12] in India, as for them the value of social marginal damage incurred due to one unit of pollution is high. Provision of a tax rebate would, therefore, incentivize the use of eco-labels and a cleaner mode of production in such highly polluting industries. Moreover, the government's "eco-label cum tax rebate" scheme scores over the "mere tax rebate" scheme, as the government's provision of a fiscal incentive to promote eco-labels requires a lower critical marginal environmental damage value in the former setting. A government reacts more quickly against pollution intensive production activity in the case when it is the eco-label provider by initiating the tax rebate policy in favor of the eco-label-using firm. A lower level of social marginal damage value is enough for a government to initiate the tax rebate policy, indicating that a government reacts more quickly against the polluting non-eco-label-using firm when it is following an "eco-label cum tax rebate" scheme in contrast to a "mere tax rebate" scheme. Such a scheme is also practically applicable at the regulatory level in contrast to the standard Pigouvian tax[13] imposition, as suggested by a market-based regulatory initiative, since to set the pollution tax correctly a government has to assess the marginal social cost of pollution, which can be difficult even under the best conditions. Instead, if the eco-label schemes are tied to the state or central government tax rebates in countries where the units generally face supply-side constraints to the greening route, then such a scheme would not only incentivize the use of eco-labels among clean industrial units but would also penalize the polluting variants for not adopting a cleaner mode of industrial production.

Acknowledgments

This paper is a part of author's Ph.D. thesis submitted to the Centre for Economic Studies and Planning, Jawaharlal Nehru University, India. The author would like to thank her supervisor (Prof. Krishnendu Ghosh Dastidar) and an anonymous referee for their helpful comments on the paper.

References

Alam, G., 2005. A Study of Eco-labels in India and the European Union and their Impact on the Export of Leather Products from India. Available from URL: www.cuts-international.org/documents/DRAFT-REPORT-LEATHER-PROJECT.doc (accessed 09.04.12).

Amacher, G.S., Koskela, E., Ollikainen, M., 2004. Environmental quality competition and eco-labeling. Journal of Environmental Economics and Management 47, 284–306.

Auriol, E., Schillizzi, S.G.M., 2003. Quality signaling through certification: theory and application to agricultural seed markets. IDEI Working Paper. Available from URL: http://neeo.univ-tlse1.fr/1590/1/certif5.pdf (accessed 09.04.12).

Baumol, W., Oates, E., 1988. The Theory of Environmental Policy. Second ed. Cambridge University Press, Cambridge, U.K.

Clark, C., 2002. Deriving an optimal environmental certification standard with a spatial product differentiation model. Working Paper. Available from URL: http://weber.ucsd.edu/~carsonvs/papers/864.pdf (accessed 09.04.12).

CUTS, 2009. Indian Ecomark Scheme—the Need for an Alternative Framework, Briefing Paper 11/2009. CUTS Centre for International Trade, Economics and Environment. Available from URL: http://www.cuts-citee.org/pdf/BP09-DI-05.pdf (accessed 09.04.12).

Dosi, C., Moretto, M., 2001. Is eco-labeling a reliable environmental policy measure? Environmental and Resource Economics 18, 113–127.

Greaker, M., 2006. Eco-labels, trade and protectionism. Environmental and Resource Economics 33, 1–37.

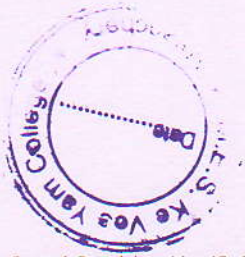
Jaura, A, 2011. Green labels and certification. Technology Review India 3, 42–43.

Nadai, A., Morel, B., 2000. Product eco-labeling, competition and the environment. Nota di Lavoro 82, FEEM, Milan.

Sedjo, R.A., Swallow, S.K., 2002. Voluntary eco-labeling and the price premium. Land Economics 78, 272–284.

Tietenberg, T., Wheeler, D., 2001. Empowering the community: information strategies for pollution control. In: Folmer, H. (Ed.), Frontiers of Environmental Economics. Edward Elgar Publishing, pp. 85–120.

World Bank, 2000. Greening Industry: New Roles for Communities, Markets and Governments. World Bank Policy Research Report. Oxford University Press.



[12] The Central Pollution Control Board has identified the 17 most polluting industries in India. The list of these 17 most polluting industries can be obtained from the URL: http://www.cpcb.nic.in/faq2.php.

[13] See Baumol and Oates (1988) and World Bank (2000).

Sl. No.	Course/Paper	Consulted	Prescribed	Additional Resource provided
1	I Sem B.Sc Foundations in Chemistry	Text books and reference books given in the syllabus, Internet	Text books and reference books given in the syllabus. Lecturer Notes	'"Chemistry, Matter and the Universe" by Richard E. Dickerson and Irving Geis (Internet)
2	II Sem B.Sc Theoretical Chemistry	Text books and reference books given in the syllabus. Internet	Text books and reference books given in the syllabus. Lecturer Notes	Khan Academy study materials https://www.khanacademy.org/science/physics/quantum-physics/quantum-numbers-and-orbitals/a/the-quantum-mechanical-model-of-the-atom
3	III Sem B.Sc Physical Chemistry I	Text books and reference books given in the syllabus. Internet materials	Text books and reference books given in the syllabus. Lecturer Notes	Lecture notes on Thermodynamics by IIT Kanpur http://home.iitk.ac.in/~suller/lectures.htm
4	IV Sem B Sc Organic Chemistry I	Text books and reference books given in the syllabus. Internet materials	Text books and reference books given in the syllabus. Lecturer Notes	Lecture note of SD Samant, ICT Mumbai http://nius.hbcse.tifr.res.in/lecture-notes/chemistry/organic-reaction-mechanism.pdf
5	V Sem Physical Chemistry II	Text books and reference books given	Text books and reference books given in the syllabus.	NPTEL lecture notes http://nptel.ac.in/courses/103104045/pdf_version/lecture25.pdf

M.E.S Keveeyem College Valanchery

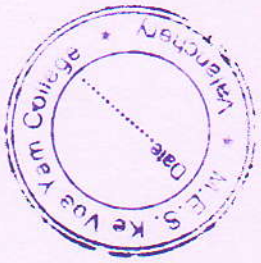
PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN - 676 552
MALAPPURAM

		in the syllabus. Internet materials	Lecturer Notes	
6	VI Sem Organic Chemistry II	Text books and reference books given in the syllabus. Internet materials	Text books and reference books given in the syllabus. Lecture Notes	VSSUT Lecture notes https://www.vssut.ac.in/lecture_notes/lecture1425072667.pdf
7	I Sem M Sc Inorganic Chemistry I	Text books and reference books given in the syllabus. Internet materials	Text books and reference books given in the syllabus. Lecture Notes	Power Point Presentation on Solid state symmetry
8	II Semester M Sc Organic Chemistry II	Text books and reference books given in the syllabus. Internet materials	Text books and reference books given in the syllabus. Lecture Notes	Animated presentations of reaction mechanisms
9	III Sem MSc Polymer Chemistry I	Text books and reference books given in the syllabus. Internet materials	Text books and reference books given in the syllabus. Lecture Notes	
10	IV Sem MSc Polymer Technology	Text books and reference books given	Text books and reference books given in the syllabus. Lecture	Literature survey through INFLIBNET

M.E.S. Keveeyam College Valanchery Date

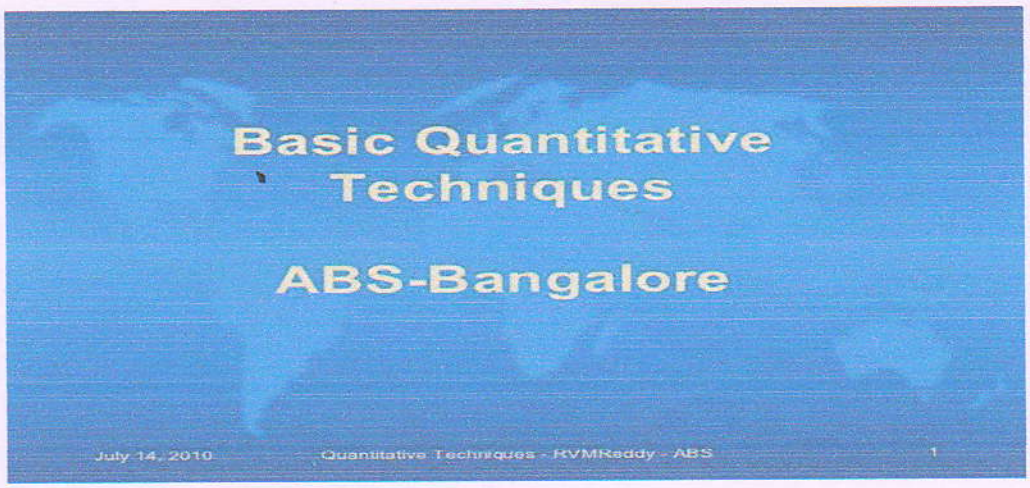
PRINCIPAL
M.E.S KEVEEYEM COLL
VALANCHERY, PIN- 676 552
MALAPPURAM

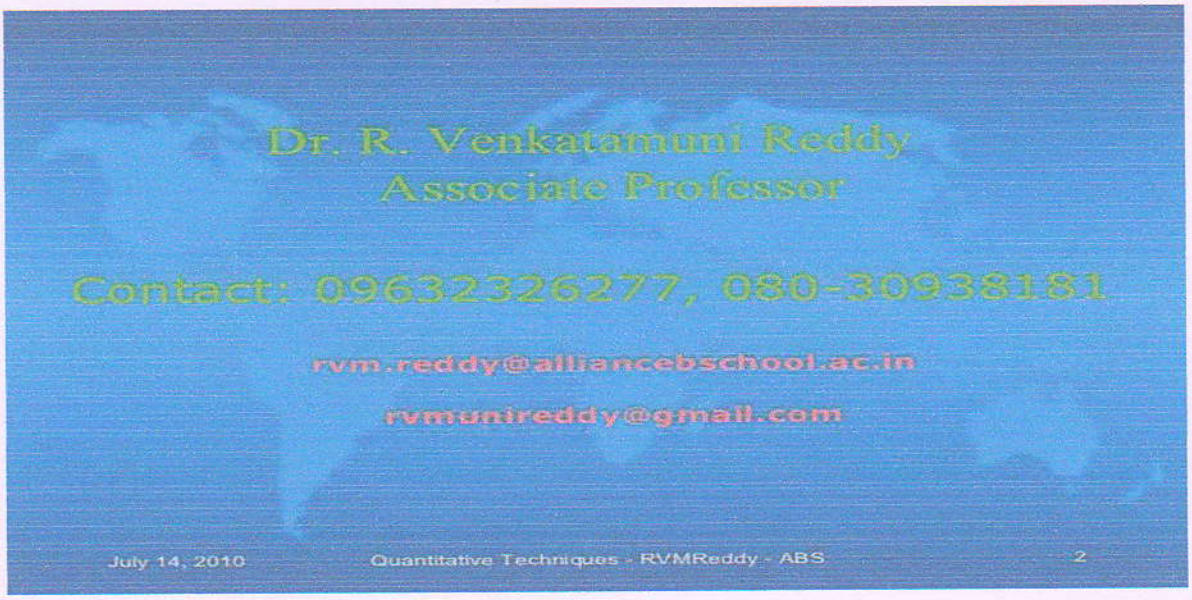
		in the syllabus. Internet materials	Notes	



PRINCIPAL
M.E.S KEVEEYEM C
VALANCHERY, PIN- 676 55
MALAPPURAM

Data from Slide share net





PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN: 676552
MALAPPURAM

Introduction

- A person managing a production unit, where it is a farm, factory, or domestic kitchen, has to coordinate men, machines, and money against several constraints like that of time, cost and space, in order to achieve the organizations objectives in an efficient and effective manner.
- The manager has to analyze the situation on a continuous basis, determine the objectives, identify the best options from the set of available alternatives, implement, coordinate, evaluate and control the situation continuously to achieve these objectives

Topics to be Covered

- **Introduction**
- **Definitions**
- **Evolution**
- **Classification**
- **Role of Quantitative Techniques in Business and Industry**
- **Quantitative Techniques and Business Management**
- **Advantages and Limitations**

M.E.S. Ke Vee Yam College * Valanchery * Date

PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN: 6
MALAPPURAM

campaigns that help sell the product.

Without an effective advertising management process in place, the media campaigns are not that fruitful and the whole marketing process goes for a toss. Hence, companies that believe in an effective advertising management process are always a step ahead in terms of selling their goods and services.

As mentioned above, advertising management begins from the market research phase. At this point, the data produced by marketing research is used to identify what types of advertising would be adequate for the specific product. Gone are the days when there was only print and television advertising was available to the manufacturers. These days apart from print and television, radio, mobile, and Internet are also available as advertising media. Advertising management process in fact helps in defining the outline of the media campaign and in deciding which type of advertising would be used before the launch of the product.

If you wish to make the advertising effective, always remember to include it from the market research time. Market research will help to identify the niche segment of the population to which the product or service has to be targeted from a large population. It will also identify why the niche segment would opt for the product or service. This information will serve as a guideline for the preparation of advertising campaigns.

Once the niche segments are identified and the determination of what types of advertising will be used is done, then the advertising management focuses on creating the specifics for the overall advertising campaign. If it is a radio campaign, which type of ads would be used, if it is a print campaign, what write ups and ads will be used, and if it is a television campaign, what type of commercials will be used.

There might also be a mix and match advertising in which radio might supplement television advertising and so on. It is important that through advertising

M.E.S. Ke Vee Yem College Valanchery
Date

PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN: 676 552
MALAPPURAM

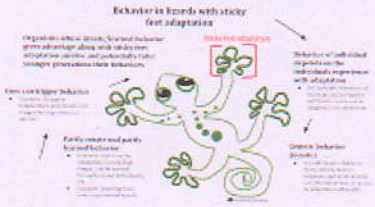
Ethology

From Wikipedia, the free encyclopedia
Jump to navigationJump to search
Not to be confused with ethnology or ecology.

"Animal behaviour" redirects here. For other uses, see Animal behaviour (disambiguation).

For the journal, see Ethology (journal).

A range of animal behaviours



Change in behavior in lizards throughout natural selection

Ethology is the scientific and objective study of animal behaviour, usually with a focus on behaviour under natural conditions, and viewing behaviour as an evolutionarily adaptive trait.[1] Behaviourism as a term also describes the scientific and objective study of animal behaviour, usually referring to measured responses to stimuli or to trained behavioural responses in a laboratory context, without a particular emphasis on evolutionary adaptivity.[2] Throughout history, different naturalists have studied aspects of animal behaviour. Ethology has its scientific roots in the work of Charles Darwin (1809-1882) and of American and German ornithologists of the late 19th and early 20th century,[citation needed] including Charles O.

Ke Voz Law College
PRINCIPAL
M.E.S KEVEEYEM COLL
VALANCHERY. PIN: 676 55
PURAM

Whitman, Oskar Heinroth (1871-1945), and Wallace Craig. The modern discipline of ethology is generally considered to have begun during the 1930s with the work of Dutch biologist Nikolaas Tinbergen (1907-1988) and of Austrian biologists Konrad Lorenz and Karl von Frisch (1886-1982), the three recipients of the 1973 Nobel Prize in Physiology or Medicine.[3] Ethology combines laboratory and field science, with a strong relation to some other disciplines such as neuroanatomy, ecology, and evolutionary biology. Ethologists typically show interest in a behavioural process rather than in a particular animal group,[4] and often study one type of behaviour, such as aggression, in a number of unrelated species.

Ethology is a rapidly growing field. Since the dawn of the 21st century researchers have re-examined and reached new conclusions in many aspects of animal communication, emotions, culture, learning and sexuality that the scientific community long thought it understood. New fields, such as neuroethology, have developed.

Understanding ethology or animal behaviour can be important in animal training. Considering the natural behaviours of different species or breeds enables trainers to select the individuals best suited to perform the required task. It also enables trainers to encourage the performance of naturally occurring behaviours and the discontinuance of undesirable behaviours.[5]

Contents

Etymology[edit]

The term *ethology* derives from the Greek language: ἦθος, *ethos* meaning "character" and -λογία, *-logia* meaning "the study of". The term was first popularized by American myrmecologist (a person who studies ants) William Morton Wheeler in 1902.[6]

History[edit]

The beginnings of ethology[edit]

Charles Darwin (1809–1882) explored the expression of emotions in animals.

Because ethology is considered a topic of biology, ethologists have been concerned particularly with the evolution of behaviour and its understanding in terms of natural selection. In one sense, the first modern ethologist was Charles Darwin, whose 1872 book *The Expression of the Emotions in Man and Animals* influenced many ethologists. He pursued his interest in behaviour

M.E.S. Ke Vos Vam College
Date
PRINCIPAL
M.E.S KEVEEYEM COLL
VALANCHERY, PIN- 676 552
MALAPPURAM

by encouraging his protégé George Romanes, who investigated animal learning and intelligence using an anthropomorphic method, anecdotal cognitivism, that did not gain scientific support.[7]

Other early ethologists, such as Charles O. Whitman, Oskar Heinroth, Wallace Craig and Julian Huxley, instead concentrated on behaviours that can be called instinctive, or natural, in that they occur in all members of a species under specified circumstances. Their beginning for studying the behaviour of a new species was to construct an ethogram (a description of the main types of behaviour with their frequencies of occurrence). This provided an objective, cumulative database of behaviour, which subsequent researchers could check and supplement.[6]

Growth of the field[edit]

Due to the work of Konrad Lorenz and Niko Tinbergen, ethology developed strongly in continental Europe during the years prior to World War II.[6] After the war, Tinbergen moved to the University of Oxford, and ethology became stronger in the UK, with the additional influence of William Thorpe, Robert Hinde, and Patrick Bateson at the Sub-department of Animal Behaviour of the University of Cambridge.[8] In this period, too, ethology began to develop strongly in North America.

Lorenz, Tinbergen, and von Frisch were jointly awarded the Nobel Prize in Physiology or Medicine in 1973 for their work of developing ethology.[9]

Ethology is now a well-recognized scientific discipline, and has a number of journals covering developments in the subject, such as *Animal Behaviour*, *Animal Welfare*, *Applied Animal Behaviour Science*, *Animal Cognition*, *Behaviour*, *Behavioral Ecology* and *Journal of Ethology*, *Ethology*. In 1972, the International Society for Human Ethology was founded to promote exchange of knowledge and opinions concerning human behaviour gained by applying ethological principles and methods and published their journal, *The Human Ethology Bulletin*. In 2008, in a paper published in the journal *Behaviour*, ethologist Peter Verbeek introduced the term "Peace Ethology" as a sub-discipline of Human Ethology that is concerned with issues of human conflict, conflict resolution, reconciliation, war, peacemaking, and peacekeeping behaviour.[10]

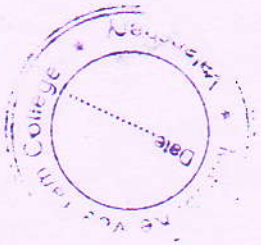
Social ethology and recent developments[edit]

In 1972, the English ethologist John H. Crook distinguished comparative ethology from social ethology, and argued that much of the ethology that had existed so far was really comparative ethology—examining animals as individuals—whereas, in the future, ethologists would need to concentrate on the behaviour of social groups of animals and the social structure within them.[11]

E. O. Wilson's book *Sociobiology: The New Synthesis* appeared in 1975,[12] and since that time, the study of behaviour has been much more concerned with social aspects. It has also been driven by the stronger, but more sophisticated, Darwinism associated with Wilson, Robert Trivers, and W. D. Hamilton. The related development of behavioural ecology has also helped transform ethology.[13] Furthermore, a substantial rapprochement with comparative psychology has occurred, so the modern scientific study of behaviour offers a more or less seamless spectrum of approaches: from animal cognition to more traditional comparative psychology, ethology, sociobiology, and behavioural ecology.

Relationship with comparative psychology[edit]

Comparative psychology also studies animal behaviour, but, as opposed to ethology, is construed as a sub-topic of psychology rather than as one of biology. Historically, where comparative psychology has included research on animal behaviour in the context of what is known about human psychology, ethology involves research on animal behaviour in the context



of what is known about animal anatomy, physiology, neurobiology, and phylogenetic history. Furthermore, early comparative psychologists concentrated on the study of learning and tended to research behaviour in artificial situations, whereas early ethologists concentrated on behaviour in natural situations, tending to describe it as instinctive.

The two approaches are complementary rather than competitive, but they do result in different perspectives, and occasionally conflicts of opinion about matters of substance. In addition, for most of the twentieth century, comparative psychology developed most strongly in North America, while ethology was stronger in Europe. From a practical standpoint, early comparative psychologists concentrated on gaining extensive knowledge of the behaviour of very few species. Ethologists were more interested in understanding behaviour across a wide range of species to facilitate principled comparisons across taxonomic groups. Ethologists have made much more use of such cross-species comparisons than comparative psychologists have.

Instinct[edit]

Kelp gull chicks peck at red spot on mother's beak to stimulate regurgitating reflex

The Merriam-Webster dictionary defines instinct as "A largely inheritable and unalterable tendency of an organism to make a complex and specific response to environmental stimuli without involving reason".[14]

Fixed action patterns[edit]

Main article: Fixed action pattern

An important development, associated with the name of Konrad Lorenz though probably due more to his teacher, Oskar Heinroth, was the identification of fixed action patterns. Lorenz popularized these as instinctive responses that would occur reliably in the presence of identifiable stimuli called sign stimuli or "releasing stimuli". Fixed action patterns are now considered to be instinctive behavioural sequences that are relatively invariant within the species and that almost inevitably run to completion.[15]

One example of a releaser is the beak movements of many bird species performed by newly hatched chicks, which stimulates the mother to regurgitate food for her offspring.[16] Other examples are the classic studies by Tinbergen on the egg-retrieval behaviour and the effects of a "supernormal stimulus" on the behaviour of graylag geese.[17][18]

One investigation of this kind was the study of the waggle dance ("dance language") in bee communication by Karl von Frisch.[19]

Learning[edit]

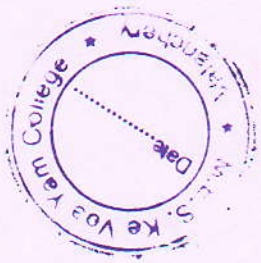
Habituation[edit]

Main article: Habituation

M.E.S. Keveeyam College

PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN: 676 552
MALAPPURAM

Habituation is a simple form of learning and occurs in many animal taxa. It is the process whereby an animal ceases responding to a stimulus. Often, the response is an innate behaviour. Essentially, the animal learns not to respond to irrelevant stimuli. For example, prairie dogs (*Cynomys ludovicianus*) give alarm calls when predators approach, causing all individuals in the group to quickly scramble down burrows. When prairie dog towns are located near trails used by humans, giving alarm calls every time a person walks by is expensive in terms of time and energy. Habituation to humans is therefore an important adaptation in this context.[20][21][22]



PRINCIPAL
M.E.S KEVEEYEM COLLEGE
VALANCHERY, PIN: 676 552
MALAPPURAM