Virtual Medical Education; Yet to Achieve the Expertise

Madhu Bala[1]

[1]Centre for the Study of Social Systems, School of Social Sciences, Jawaharlal Nehru University, New Delhi, India. Email: madhu.baghel1392@gmail.com

ABSTRACT

This paper explores the different dimensions of newly introduced 'technology based education in medical field', known as "Virtual medical education In order to look at the specification of the project 'National Programme on Technology Enhanced Learning (NPTEL)' by Ministry of Human Resource and Development (MHRD) Government of India, seven Indian Institute of Technology (IITs) and Indian Institute of Science (IISc) to create technology enhance learning atmosphere in country and to provide mass education through distance learning mode and their plan to enter into medical education through virtual medium. While connecting the idea with the concept of hegemony and power relations, it explores the dominant form of knowledge in medicine and public health and the nature of technology which also celebrate the dominance over other forms of medicine by virtual medical education system. It also explores the philosophical understanding of knowledge system and the post-phenomenological underpinning which explores the multiple realities and their impact in the context of contemporary Indian medical education systems. . It is not only about the plurality of medical knowledge systems in India rather how the crises of developing countries lead to find out the remedies by adopting the western model of development to cater their local problems and virtual education is seen in the form of technological solution to the Indian mass education problems.

1.Introduction

Virtual education, as explained by J. Michael Brooks, "education that is enhanced by the application of electronic technologies to the processes of teaching and learning. Education become virtual to the extent that teachers and learners, who may interact in the traditional classroom mode, are joined in the learning process electronically, possibly across great distances, such that teaching and learning are no longer tethered to a single place, time, or pace. Virtual education, therefore, includes traditional modes of learning supplemented by the use of sophisticated technologies, including personal computers, networks, and perhaps the Internet, plus what is known as distance learning, or learning that does not involve a student being physically present on the home campus of the school offering the course". Technological interaction in medicine is not new and only form here rather the popular form in practice is telemedicine. Telemedicine is defined as the "use of telecommunications to deliver health services to remote patients and to facilitate information exchange between primary care physicians and specialists at some distance from each other" (Bashshur 1997:9). But the medicine is dealing with telemedicine only in the professional practice and that form of medical practice is highly demanded in military purposes but for medical education this technology based system has entered through virtual medium.

'Virtual reality (VR) has a significant relation with the human and environment but as these immersive VRs rest on the view that knowledge is, in the first instance, visual' (Hillis 1999). Even where researchers and developers focus on other senses, their aim is inevitably to harmonize those senses with the visual. Marshal McLuhan's argument in 'Medium is the message' substantiate it more precisely as the virtual medium comes with an ambiguity or a different viewpoint implicit in it. The reality is no more than the 'visual sense' and the world is ideologically presented by the hegemonic groups. I am merging the concept of 'hegemony' (Gramsci) with the Foucault's concept of gaze. But

here it is not only limited to the gaze rather implicitly presented through a technological means which is through virtual education practice. However, as Hillis shows, this appeal to the visual is not without implications; the visual brings with it several thousand years of political and metaphysical baggage.

This paper deals with the 'Virtual Medical Education' under the project known as National Programme on Technology Enhanced Learning (NPTEL) and explores it critically from different dimensions. The questions which I am focuses upon are divided into three parts: one is related to the question on the exclusionary nature of our dominant knowledge system, the second question rests upon the essential focus of this paper which is entirely focusing on the nature of technology through which knowledge system is provided to masses and at last the final part of the paper deals with the education crises and how technology interact in Indian system and what happened next. Before going into discussion the brief introduction about the project and their part 'Virtual Medical Education' will be explored.

2.Methodology

This research is a descriptive and analytical study of the subject matter under the critical sociology framework. The major sources of data are secondary in nature and has been analysed painstakingly through secondary data analysis method. The content is primarily collected from different web links of the project 'National Programme on Technology Enhanced Learning', which is a core idea of this study, from where analyses start. Other sources are secondary theoretical literature and research papers, encountered similar topic or theme. This study encounters the sociological perspective from a critical theoretical lens which makes the study argumentative and theoretically rich from the knowledge point of view. The primary work could not be done because of the focus of the study, which is not going into the functionality of the topic rather to make a philosophical argument and to make an analytical enquiry on this topic.

3.Project and Its Implication

About the project:

National Programme on Technology Enhanced Learning (NPTEL) project has started by the collaborative effort of Ministry of Human Resource and Development (MHRD), seven Indian Institute of Technology (IITs) and Indian Institute of Science (IISc) to create technology enhance learning atmosphere in country and to provide mass education through distance learning mode. The proposal was put forward during the year 1999-2003 for creating contents for 100 courses as web-based supplement and 100 complete video courses. NPTEL has completed 12 years since inception and they have 850 web and video courses across 23 disciplines. It started with science and engineering in its first and second phase and NPTEL successfully created its technology enhanced content at national level and hence in the third phase, it has moved into 'Medical Education' through virtual medium. Significantly focusing on medical education because it is different from the engineering and other under graduation and post-graduation courses which are targeted in NPTEL the focus of providing knowledge also incorporated the target of providing expertise to the less resourced institutions or students who are not in reach of the resource full institutions. The plan was put forward by Dr. Manoj Singh (Professor, Pathologist, AIIMS) and the idea of providing virtual medical education is proposed by him by paying faith in the changing nature of technology. He mentioned that 'Virtual Education' in medicine is not new to Indian society rather it has already came into being five-six years ago, in 8 medical colleges and virtual classrooms were set up in those colleges by National Knowledge Network. It was found that the new technology is not fit for our traditional pattern of providing practice based medical education but it can provide information not expertise. So Dr. Manoj considering that fact firmly believes in this project as he elaborate that it has possibilities of bringing change in the current medical education crises and it can achieve the goal by providing virtual medical education to remote areas or institutes situated there which has less expert faculty and lack of resources.

Client:

The need to create courses for health workers, nursing and paramedical assistants reflects the clientele who are in the medical sphere or work with the medical institutes and those who work for public health and should be provided expert medical education. According to him the future employability is high in these areas. But now the online web-portal and its social media availability shows a different picture as anybody can explore the content but the difference between common masses and enrolled students is only about the certificate as validity of learning is provided.

Resource:

The goal is to create videos and lectures for these clients and training workshops for them would be the focus of this Programme. Another aspect which he focuses is related to the content, he clearly mentions that video could be developed by any expert all over the country but then it will be assessed and then will be uploaded by the expert authorities who are related to developing content. So much focus on the virtual medium and content but also he mentions the contradictory statements that content is built for the people who have no access to these expert institutions.

4. Discussion and Analyses
4.1 Hegemonic Nature Of Bio-Medical Knowledge

This project starts with the focus on the expert knowledge which is undoubtedly coming from the intellectual's class of the medical institutions of India and they are undoubtedly present in the resource full institutions such as most prestigious medical college AIIMS. The goal which is set by the collaboration of MHRD, IITs, IISc and AIIMS, to produce the expert medical content and the knowledge dispersion is done through the virtual medium of education and the expert knowledge is required for that content. Here the debate invokes some important issues regarding the hegemonic nature of this solidarity of dominant bio-medical knowledge. It aims to cater the problem of Indian mass education and in the medical education stream, bio-medical creates hegemony and other forms of Indian medical system undermined in this system. It clearly forms a system which is discriminatory in nature. When the social-sciences are discussed all the different subjects are part of a larger discourse and they all have equal importance weather the subject is based upon philosophy, theory or it was based upon empirical reality. In health and medicine it is not visible while it comes to medical education the system only refers to the 'Bio-medical education' and the question of the existence of other forms of medical knowledge systems are refused in terms of creating the hegemony of particular knowledge. As Foucault explains that in contemporary world the 'power' is not the issue but the forms in which the power is exercise is the issue and he categorized three forms out of which one most accurate in this context is 'scientific authority to classify and order knowledge'. The debate is not only between the dominant or dominated class rather it is also between the production of expert skills and who decides what is 'expert knowledge'? The nature of medicine as a subject is very complicated as the people who are making the distinction between the expert knowledge of medicine and practice, are the once who does not consider all other medical practicesauthentic which are out of their 'bio-medical sphere' and defame the impingement. So the nature of this expertise is only limited to its own medical practice which is linked to the hegemonic nature of the medical science. As Gramsci's idea about hegemony reflects the process of class based ideological hegemony emerges from the process of defamation of other ideologies and creates the larger support system for the particular ideology. Hegemony is not the ultimate reality rather spreading of a particular idea on a larger level. Bio-Medicine is just a kind of reality where the other realities of other medical knowledge should also be given acknowledgement as a form of medicine practice at a common ground. As there are multiple ontologies are accepted and therefore the multiple knowledge system in medicine should also have given a thought.

Another concern is related to the concept of 'Expert Knowledge'. Bourdieu argues about the 'reproduction of inequality' when he writes about the reproduction of knowledge. In his idea the

dominant class which has resources and cultural and social capital will reproduce the class hierarchy which ultimately brings the dominant class at the same dominant position in society. Focusing upon the idea of reproduction of dominant group and drawing analogy from that school of thought, 'virtual medical education' is spread as a dominant form of knowledge which is provided by NPTEL project and the expert knowledge will only come from who have that expertise but the 'who' is important here as 'the expert' is also decided by the dominant class of 'intellectuals of Bio-medicine'. This knowledge which is substantiated by clinical trial or practice is the only parameter for the 'experts' who declare it as the only superior form of medical knowledge but possibly there might be different worlds of knowledge available in different places in India, related to the medicine practice as highlighted by V. Sujatha in the 'Plurality of Indian Medicine' where she highlights the local forms ofmedicine knowledgeis available in the traditional practice and for them their 'Ayurveda' or 'Siddha' also practiced by the professional experts of their own medicine discipline. So the dominant class of Bio-medical experts and the hegemonic form of bio-medicine in medical sphere has reduced the possibilities of medical knowledge system in different forms rather wants to deliver or limit the medicine as a discipline to bio-medicine and the expertise are also who are culturally and socially reproduced in the dominant culture as to reclaim it one need to welcome the knowledge as 'expertise' rather their form of knowledge or their way of getting it. It is well substantiated in the writing of 'My Vaidya and My Gynecologist' by Harish Narayandas where he present different forms of knowledge system and also they could be attained through different kinds of ways not only hegemonic form of acquiring knowledge rather multiple realities behind their knowledge but they have got expertise. There are all kinds of possibilities which should be celebrated in the health and medicine discourse as it allows accepting the multiple worlds of knowledge rather create a hegemonic structure.

4.2. Virtual Technology and Knowledge Transmission

In this project, the technology enhanced learning is the focus and in medical education, through virtual medium they seem intended to transmit the content to the receiver. As defined by Hillis virtual is based on our one sense entirely, which is called 'vision'. Here I want to invoke Foucault who gave the views on 'Gaze' which he explores particularly in medical practice as how the visual sense is considered as the comprehensive means to understanding but I am relating that with the virtual Gaze. As Arushi Sinha explores the concept of vision from Foucault's lens and explains "In the Western scientific tradition, vision is regarded as the sense least subject to interpretation or ambiguity of meaning. Visual imagery is thought of as the most efficient mode of communication. This assumption is what drives the production of such vision-enhancing technologies as computed tomography (CT) scans and even the printing of scientific journals. The visual sense is the most refined in the practice of medicine and has largely replaced the use of other senses". Here when we explore the technology as virtual medium the similarity of nature of technology comes out but the rendering of such visual medium is entirely different. However the medium is hot (McLuhan) as they engages one sense extremely and does client or learner will not require filling the information gap or the conscious enquiry. The medium in its nature has the factor which creates crises in the knowledge system but also the same way it carries the message (McLuhan) in itself.The crises comes when the interaction with technology creates a different model of 'Para-social interaction' first introduced by Horton and Wohl (1956). This kind of interaction occurs in Virtual medium communication and it creates the imbalance between the relation of receiver and who delivers the knowledge. It is also the beyond space and time limitation and which also create the bias in communication. It always creates the different kind of understanding which we can find in the daily soaps or movies. As we find the receptor generate queries from the content provided by the person who is proving the information on Virtual medium. Sometimes it creates problem in learning as the emotions remains unanswered in these para social interactions. To elaborate the argument, and jump into the medium is the message I am rendering McLuhan who argues not only about the nature of technology rather it also goes deep into the question that how technology perceive hidden messages inside its technical familiarity. We need to shift the focus again on the expert knowledge system as already mentioned by Dr. Manoj Singh that virtual medium could be able to provide information in the form of knowledge transmission but the expertise which is the main focus of this project is entirely dependent on the engagement of the receiver with the medium. So, if the technology is having a different kind of nature in itself how one can derive the expert skills from the same. Another concern

again related to the understanding different expert medical practicing world which are different from the point of view of their engagement with the patient or most substantially I say that the pluralism in Indian Medicine is well described (V. Sujatha) that in Indian medicine there are variation in medical practices and also the diagnosis vary which might not be feasible to support virtual medium as in 'Ayurveda' the practice is all depends on the knowing patients pain (hearing), diagnosing by touch and feel and also by engagement of the body itself which is opposed the nature of virtual medium. If the diagnosis doesn't support the virtual medium or the specific technology, then how will the expert knowledge be made available in the field of virtual medical education? In that case the technology is having the inherent message of discrimination and which is under the category of 'taste based discrimination' against the rest of the medicine practices except the dominant clinical practice in bio-medical world. The argument is meant to critically analyze the world of technology as suggested by the Feenberg's primary contribution to the philosophy of technology:

"What human beings are and will become is decided in the shape of our tools no less than in the action of statesmen and political movements. The design of technology is thus an ontological decision fraught with political consequences".

4.3. Interaction with Technology

When the course is designed for virtual medical education, one area which is ignored by the planning committee and implementation committee is related to the empirical reality and the cultural influence over the knowledge production is very fascinating. This is only about the interaction between the technology and who is receiving the training. So the question of the learner and why do we need to introduce this technology to that audience? So the project is not for them who are getting training in AIIMS rather it is made for the people who have no access to such institution and expert knowledge providers. In India, the biggest crises is to provide good education and in medical education the resource is a big hurdle for local institute to provide better education and the public private partnership in education system, short term projects and these kind of distance learning mode becomes the remedy or alternative to such big crises to the basic need of the nation. B.P. Narsimharao focuses on the current Indian crises and the factors which are there in society not to access good education. He elaborates it by invoking the shortcoming of Indian contemporary reality, "such as the bureaucracy, unemployable graduates, diversity of languages and culture, the large unwieldy population base, the large segment of the population still below the poverty line, low farming productivity and poor peasants, and so on. The World Bank report (2005) titled 'India and the Knowledge Economy: Leveraging Strengths and Opportunities' argues that when supported by the right kind of government policy incentives, the country can increase its economic productivity and the well-being of its population by making more effective use of knowledge. In the entire concept of the knowledge economy and knowledge society, universities and other higher educational institutes play a pivotal role. It is important to see how we can establish strong relationships between universities and the knowledge needs of a post-industrial society by focusing on the increased importance of knowledge generation and organisation for economic and social well-being (see Lindenstein 1995)."

The point which should be the focus here is the resource less society who needs remedy or solution for getting the good education. The NPTEL project and particularly by providing Virtual medical education to this social setting again raises the question that without resources what kind of knowledge will they get and as a result by this effort again they will remain at lower strata of medical knowledge system rather get the equal opportunity with enough institutional conditions to get themselves trained under those experts. Therefore the level of this kind of education training is always remains below the expert knowledge system and the alternative or a substitute is provided by the state.

One more study is there to follow up the argument that how these kind of project are started to by Government to not to cater the crises or need of education system or society rather they provided the alternative in an experimental manner. The study done, showing the need of ICT and experiment done in rural area by HP India Company in collaboration with the Indian Government. This research was done on the villagers and for them the place, which was situated in Andhra Pradesh, Kuppam was taken as a living lab and for them the villagers were also the object of their research. The project called 'i-community' was run by this private organization in collaboration of Government and in this project

ICT training was provided to rural villagers with the vision that these kind of technology based system can make a change in current deploying situation of country. ICT works to reduce the social issues and lead the system to work in an efficient manner. But when the project reached to its juvenile level the project got stopped as because of the lack of resource and economic and practical reasons such as the low aspiration of HP India, local companies started taking interest in ICT and political crises which was the major factor in this change, change in government of AP because of the which HP India finally left the living labs in between and the situation got verse when it was found that the involvement of villagers in this project left then in a great trouble as they were not trained and they already left their previous work. The people who were involved and were taken as the object of study came forward and raised their voice that in these kind of project they hide the reality and involve you by invoking high hopes but then these kind of projects which are based on the systemic variations mostly ends with frustration and socio-economic-political failure (Anke sachwittay, 2008).

In other empirical study which has done on the relative area of virtual education elaborates that "we might also take note of the work of Pascarella and Terenzini (1991) showing that in hundreds of studies, the "greater the student's degree of involvement, the greater the learning and personal development" (cited in Astin 1996:124)". One more interesting work done by Jahnavi Phalkey is based on the project of Akash Tablet but it did not work out or later on it just got closed because of the political-economic crises and the systemic failure which she studied through looking the history of collaboration of technology into Indian education system. But overall analyses which she raised as the concern of the empirical study was based on the nature of the dominant authority who introduced new plans, either by the political or economic interest in technology based education as it is also an illusion of Indian elite society that technology is the only solution to all Indian problems. But as we have also explored that the reality is not the same rather it is also renders the question of less well planning, less supervision and lack of rationality.

The point which is invoked here is that the Virtual Medium hardly provides any supervision during the practice which brings a high risk to the patient's life and the credibility of the practitioner as well. As the project NPTEL has no supervision guidelines rather they have incorporated the quizzes as their assessment parameter which will substantiate the informative knowledge rather skills or efficiency in medicine which is not possible without the trainer. The designers should also keep this into consideration that the number of patient the experts are encountering at institute like AIIMS is very much higher than the number any learner would be getting in any remote area of the country or the small medical institutes. That weakens the possibility of learning and achieving the expertise for the learners. All these are part of the deprived nature of technological adoption in Indian education system because most of the times it has found that the innovative or development projects which are promoted in India are directly taken from the west and without any changes they are experimented here in Indian setting but then it comes up with harmful repercussion on society or system. As it is already substantiated by the different research done on the learning outcomes of students from virtual medical practice are very low and sometimes destructive in the sense that they did not get any clinical practice or case based learning or the hands on practice.Ludvigsen also comments on the complexities of research involving tool mediated learning and interaction in medical settings, where outcome measures at the level of the individual tell very little about the skills that people develop in settings with a high division of labour. "Although the articles contribute different insights to developing medical education, one message stands out clearly: if students are left to their own devices for too long, many are likely to give up trying before reaching intended standards. Many will also end up with misconceptions. Digital technologies, however sophisticated, are not standalones: guidance and support from teachers and seniors are still necessary ingredients of the teaching and learning process". Also Wenger understands of practice as a duality of participation and reification. According to this analysis, objects are incorporated into meaningful practice through participation. In this regard Virtual medical education is highly unsatisfactory and this technology failed because lack of supervision.

In biomedical systems, as Gramsci (1971) views "the healer is the mediator between the elite and the non-elite, a "locus of hegemony," and health and disease are defined by the elite for the purposes of control". Navarro (1981) describes biomedicine as an extension of capitalist machinations. In lesser developed or developing countries science and technology are the better way to utilise the national

resources. Furthermore, express by Drory "such policies assume a hierarchical connection between science, technology and economic development. Each of these factors is conceptualized as a necessary investment in the development of the next factor on this recursive continuum. Thus, science is perceived as a necessary infrastructure for further application of knowledge, while technology is perceived as applied science" (Gili S. Drory). Moreover, science's effect on the economy is mostly mediated by technology and in this way the technology enhanced learning project of NPTEL is also inspired from the national, political and economic interest where technology interacts with the knowledge system only for promoting the idea of national development.

5.Conclusion

The Virtual technology is a medium to deliver medical education but it is the only centre for attraction in this paper which is criticised from a different lens as the nature of 'Virtual' technology and why how it rare to the hidden social realities in it as a message of technology. The interaction with virtual technology is not only limited to the teaching-learning rather it goes into the relation between the participant and which is based on para-social interaction. A different reality which is not in philosophical aura rather understood from a political perspective. These interactions are always built upon the interest of dominant group weather state or elite education institutions that might undermine the idea of knowledge, expertise, skills and service in public health to fulfil their national or individual interest from a political gain. In these kinds of promoted projects, the health sector is also turning into capitalist market where the knowledge is sold out in the form of information and also substantiated by providing validation in the form of certificates. The story doesn't end here rather the most important argument which is based upon the idea of marginal knowledge systems (Gramsci's) or the multiple ontologies should be considered with their own worlds of medical knowledge systems. I would focus on the reality of plurality of Indian medicine and the expert knowledge should not only limit to dominant bio-medicine or virtual medical training rather it should also encourage the expertise from different local forms of medical knowledge. So there is real world and other is Virtual world which has been accepted by the modern societies so now it is the time that modern societies should acknowledge the multiple forms of worlds of medical knowledge systems. Technology is not only tool to transmit knowledge and it is not creating any such difference rather in this context virtual medical education is not feasible as the expertise required in this field, demands the engagement of all the senses together as the medical practice is related to living subjects not objects. As Hillis statement says "on the virtual medium, the individual's appearance is no more than the packaging that encloses any product on a shelf".

Bibliography:

Charles, K. K. (n.d.). Taste-based Discrimination. The New Palgrave Dictionary of Economics, 2012 Version.

Drori, G. S. (1993). The Relationship between Science, Technology and the Economy in Lesser Developed Countries. Social Studies of Science, 23(1), 201-215.

Foucault, M., Martin, L. H., Gutman, H., & Hutton, P. H. (1988). Technologies of the self: A seminar with Michel Foucault. Amherst: University of Massachusetts Press.

Gramsci, A., 1929–35 [1971]. Selections from the prison notebooks. Q. Hoare and G. N. Smith, eds and trans. London: Lawrence and Wishart.

Hamlin, C. (1992). Reflexivity in Technology Studies: Toward a Technology of Technology (and Science)? Social Studies of Science, 22(3), 511-544.

Helle, L., & Säljö, R. (2012). Collaborating with digital tools and peers in medical education: Cases and simulations as interventions in learning. Instructional Science Instr. Sci. 40(5), 737-744.

Jaffee, D. (2003). Virtual Transformation: Web-Based Technology and Pedagogical Change. Teaching Sociology, 31(2), 227.

Johnson, E. (2007). Surgical Simulators and Simulated Surgeons: Reconstituting Medical Practice and Practitioners in Simulations. Social Studies of Science, 37(4), 585-608.

Laudan, R. (1984). The Nature of technological knowledge: Are models of scientific change relevant? Dordrecht: D. Reidel Pub.

Naraindas, H., Quack, J., & Sax, W. S. (2014). My *Vaidya* and My Gynaecologist: Agency, Authority, and Risk in Quest of a Child. In Asymmetrical conversations: Contestations, circumventions, and the blurring of therapeutic boundaries (Vol. 14, p. 118). New York: Barghahan Books.

Narasimharao, B. P. (2009). Knowledge Economy and Knowledge Society--Role of University Outreach Programmes in India. Science Technology & Society, 14(1), 119-151.

Phalkey, J., & Chattapadhyay, S. (2015). The *Aakash* tablet and technological imaginaries of mass education in contemporary India. History and Technology, 31(4), 452-481.

Radder, H. (2008). Critical Philosophy of Technology: The Basic Issues. Social Epistemology, 22(1), 51-70.

R. M. (2004). Cultural capital: Objective probability and the cultural arbitrary. British Journal of Sociology of Education, 25(4), 445-456.

Rassool, N. (1993). Post-Fordism? Technology and Mew Forms of Control: The case of t echnology in the curriculum. British Journal of Sociology of Education, 14(3), 227-244.

Schwittay, A. (2008). 'A Living Lab': Corporate Delivery of ICTs in Rural India. Science Technology & Society, 13(2), 175-209.

Shields, R. (2000). Ken Hillis, Digital Sensations: Space, Identity and Embodiment in Virtual Reality. Space and Culture, 3(4-5), 246-247.

Sinha, A. (2000). An Overview of Telemedicine: The Virtual Gaze of Health Care in the Next Century. Medical Anthropology Quarterly, 14(3), 291-309.

Sujatha, V. (2007). Pluralism in Indian medicine: Medical lore as a genre of medical knowledge. Contributions to Indian Sociology, 41(2), 169-202.

Urbinati, N. (1998). From the Periphery of Modernity: Antonio Gramsci's Theory of Subordination and Hegemony. Political Theory, 26(3), 370-391.

Wright, D. (n.d.). Cultural capital and tastes. Handbook of Cultural Sociology.

http://nptel.ac.in/LocalChapter/statewise_list.php, accessed on 12:14, 25/04/2016

http://nptel.ac.in/pdf/picmeeting/june%2022-23%2014.pdf, accessed on 14:23, 2 5/04/2016

http://nptel.ac.in/pdf/picmeeting/November%2023,%202014.pdf6:49, 25/04/2016