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CHES JOURNAL OF PHILOSOPHICAL QUEST

- Higher Education In India
- National Education Policy 2020
- Indian Perspectives and Policies
- Environment and Climate Change
- Artificial Intelligence
- Research papers on:
  Social Science, Mathematics
- Spirituality

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Shodhdarshan CHES Journal of Philosophical Quest

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"At the heart of every being lies creation's dream
of a principle that will one day give organic form
to its fragmented treasures.
God is unity."

Teilhard de Chardin

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Editorial

Dr. Fr. Sebastian P.L.

Warm greetings from the Editorial Board of Shodhdarshan!

Introducing a new research journal is a momentous endeavour that fosters the dissemination of knowledge and encourages scholarly discourse within a specific field. Our newly established journal, Shodhdarshan CHES Journal of Philosophical Quest aims to provide a platform for researchers, academics and experts to contribute cutting-edge research, share insights and progress through valuable contributions.

In India, the growing tide of industrialization, computerization, digitalization and artificial intelligence has brought new challenges to structural integrity research adding fresh insights to traditional topics of structural durability, reliability, safety, tolerance and interpretation. Topics often integrate with contemporary themes of progress and spirituality, evaluating and monitoring the challenges the nation faces. As a professional society journal, Shodhdarshan will play an invaluable archival role as we nurture it towards being among the preferred journals for the publication of highest-quality and original contributions in the years ahead.

You would be pleased to know that Shodhdarshan is a registered peer-reviewed journal that will be published twice a year; in January and July, covering news, views, articles and high-impact research contributions that are original, innovative and transformative in the rapidly evolving academic scenario. It shall provide an opportunity for the dissemination of advanced research in all fields and report advances in these important areas.

This inaugural issue of Shodhdarshan focuses on the topics of Environment, Climate Change, Artificial Intelligence, Higher Education and National Education Policy besides the conventional subject areas of Arts, Science and Commerce. We shall continue our efforts to constantly share high quality Research papers, reviews, short communications and articles after being peer reviewed.

As the Editor-in-Chief, I, take this opportunity to acknowledge the continued support and availability of Rt. Rev. Dr. Archbishop Raphy Manjaly, President of CHES. Shodhdarshan features a distinguished Editorial Board: Dr. Sunny Joseph CMI, Director, Christ Deemed To Be University, Delhi NCR, Dr. Prof. Marion C.J., Dean and Head of Education, SHIATS, Allahabad, Dr. Denzil John Godin, Head, Department of Botany, Lucknow Christian Degree College, Lucknow, Dr. Johny Antony CMI, Secretary to CHES & principal, - bringing together a highly experienced team of specialists in all aspects of Education. I thank them for their unwavering support, timely processing of manuscripts, and guidance that has propelled the journal to greater heights. I express my sincere gratitude to Assistant Professor Dr. Shainy SRA from Central University, Kasaragod, and Dr. Jose Manjiyil CST for their constant support.

Undoubtedly, the success of Shodhdarshan is attributed to our talented authors and their scholarly contributions, our expert reviewers who dedicate valuable time to review manuscripts and the expertise of those involved in the timely processing of articles.

It is truly an honour to be the Editor-in-Chief of Shodhdarshan, and with our team of highly qualified and dedicated Editorial Board, we look forward to working with all constituents to serve our authors, reviewers and readers for the bright future of Shodhdarshan.

A Momentous Occasion - Inaugural Edition of CHES Journal

Dear Esteemed Members and Patrons,

It is with a heart full of gratitude and a spirit imbued with joy that I pen this note, marking a landmark moment in the annals of Catholic Higher Education Society — the unveiling of our first journal. This heralds the fruition of a shared dream, unwavering commitment and industrious endeavour of each member who has contributed to the enrichment of our knowledge repository through the publication of SHODHDARSHAN.

CHES has long been a fortress of intellectual pursuit, nurturing an atmosphere conducive to both the exploration and dissemination of knowledge and wisdom. With the launch of our journal, we boldly stride forward in our quest to enrich global discourse on educational innovation, management insights, historical understanding, national identity, spiritual exploration, psychological acumen, the art of communication and beyond — each a pillar supporting the edifice of our expanding realm of knowledge and beyond.

The journal will illuminate the path of knowledge with incisive research, insightful analyzes, and pedagogical innovations, contributing to the evolution of educational practice. It could be with novel teaching methods, scrutinizing educational policies, or heralding academic accomplishments. It will feature articles delving into strategic management, organizational behaviour, leadership, and various aspects of the corporate world. Shodhdarshan will venture into history and transcend traditional narratives to uncover untold tales, analyzes pivotal events, and draw parallels between past and present. Through erudite articles on geopolitical matters, cultural heritage, and socio-political commentary, we seek to contribute to the dialogue surrounding our nation's path and our collective identity our allegiance to national interests that aligns with our commitment to nurturing a sense of identity and unity. Recognizing our society's diverse fabric, we include a section dedicated to religious and spiritual exploration. We provide a platform for sharing insights that enhance both individual and societal well-being and our journal will spotlight articles on effective communication strategies, media studies, and the evolving landscape of information exchange. By championing clear and influential communication, we aspire to contribute to a more interconnected and informed world.

I extend my heartfelt gratitude to our editorial team, reviewers, contributors, and every member instrumental in realizing this vision. I encourage each one of you to engage actively with this journal, share your insights, and partake in the ongoing intellectual discourse. Let this publication be a living tribute to the vibrancy of our intellectual community. As we collectively navigate the uncharted seas of knowledge, may this journal shine as a guiding light, illuminating our path towards a future rich in wisdom, understanding, and shared learning. May this journal be an invaluable resource for educators, researchers, and policymakers.

With warm regards,

Rt. Rev. Dr. Archbishop Raphy Manjali
President,
Catholic Higher Education Society

Changing Trajectories of Philosophy of History

Pius Malekandathil, *Professor in History(retired), JNU, New Delhi*

The word history in common parlance is used in two different meanings. On the one hand it is used to denote what actually happened in the past. On the other hand, it meant the representation of a part of the past as given by historians in their works. [1]This dual perception about history is intrinsically linked with the very concept as it evolved over time. The German word for history is *Geschichte*, stemming from the German root *geschehen* (to happen) suggesting history as the study of everything that happened. While the Greek word for history is ἱστορία (or *Istoria*=inquiry) indicating history as an inquiry into the past obviously to understand the significant part of the past). Out of the totality of everything that happened or everything that man has thought, said and done in the past, only a portion is inquired into and represented in the works of historians. [2] While joining together the pieces of historical information as obtained from the source materials, the historian adds logic and meanings as to make it an 'intelligible' narrative. The attempts to conceptualize and explain the significant events make the historians look for the prominent type of trends and patterns evolving out of individual events in history and group them under larger frames of argument, which often used to change on the basis of expanding epistemological horizons and also on the basis of the constantly changing socio-cultural and political contexts within which that segment of the past is to be interpreted and re-interpreted. Though such a move led to various twists and turns to the trajectories of philosophy of history, it also shows the plurality of ways how past can be perceived, conceptualized and explained.

I. The Initial Epistemological Issues

Scholars have always been trying to differentiate between history and the past. The epistemological issue comes before us with the question "how we know the past as history?" Often history is understood as a narrative about the past, which is done by analyzing the various thought processes that ultimately went into the shaping of a certain segment of the past 'which the historian has been dialoguing with'. [3] It is the historian who gives philosophical and epistemological formulations to the past, while generating historical explanations. True that historian tries to discover the inherent meaning of the past; but more than that he creates meaning to the past by piecing together arguments on the basis of evidences.[4] In the process of dialogue between the historian in the present and the documents of the past, he is creating a logic and meaning for it, which gets eventually unveiled as the narrative progresses.

1 John Tosh, *The Pursuit of History*, New York, 2002(third Edition), p. xix

2 For a detailed study on the nature of history, see Arthur Marwick, *The Nature of History*, London, 1989

3 E.H.Carr, *What is History?,* London, 2001, p.

4 Paul Ricoeur, *The Rule of Metaphor:Multi-disciplinary Studies of the Creation of Meaning in Language*, London, 1978, p.40

The epistemological[5] approaches as launched by the Greek philosophers addressed such big issues like nature of universality and the particular, the nature of continuity and change, reality and its manifestations. Philosophers have been trying to examine history and historical knowledge as to formulate certain generalizations and conceptualizations about historical change. A philosophical enquiry about history starts with the questions about the constituents of history. What role do the individual actions, social structures, the time-periods, geo-physical regions, civilizational patterns, large causal processes, divine interventions etc., play in the making of history . It is obvious that individual thoughts, actions and events are decisive in the making of history. But the question is whether history as a whole has got a meaning or a pattern or whether it takes a direction. One may wonder whether a structure or pattern would evolve out of the collectivity of actions when each individual thinks, behaves and responds in entirely different way. The most intriguing part of the inquiry is the question about how the past, which is dead and gone, is understood, represented and explained. Equally significant is the question about the way how the vast gulf of time between the historian living in the present and the actions of the past is overcome as to make rational historical explanations. There are scholars who enquire as to what extent is human history constitutive of the human present.

II. Forging of Meanings and Patterns

The core areas of historian's enquiry revolve round the questions "what" (what happened?), "how " (how it happened?) and "why" (why it happened?), which he tries to answer by banking upon the evidences from the past. Whatever the historian gets as answer out of these queries are pieced together bringing out the meanings and intentions behind the given complex series of historical actions. In this process historian tries to show the connection between the actors and causes in history and proceeds to conceptualize, describe, contextualize, explain, and interpret events and circumstances of the past. While interpreting events historians also tries often to show the larger picture within which the individual historical event is to be perceived. To them the courses of history are not scattered and dispersed events without meaning; they are moving in a pattern with a large organizing theme, meaning and direction. Here the historians focus more on the interpretation of large historical features rather than on the interpretation of individual meanings and actions.

In the ancient period historical knowledge was obtained and transmitted for morally improving the reader rather than for factual accuracy and in that sense, historians used to give good examples in their writings so that the reader might emulate them. Several of the ancient cultures also believed that history was cyclical with new beginning after every dark phase,[6] as

5 Epistemology (episteme=knowledge and logos=reason) as a branch of philosophy that deals with the origin, character and boundaries of knowledge and belief as well as its justification. Robert Audi, *Epistemology: A Contemporary Introduction to the Theory of Knowledge*, New York, 1998, p.viii

6 The Indian cyclical perception of history is evident in their notions of Kali, Dwapara, Treta and Satya *yugas.* During the time of Renaissance cyclical conceptions of history, often highlighting the decline of Roman empire, was common. Even later in the nineteenth and twentieth centuries cyclical conceptions were maintained by such scholars like Oswald Spengler and Paul Kennedy, who viewed the human past as a series of repetitive rises and falls.

Ibn Khaldun (1332 - 1406) discussed in his *"Muqaddimah."*[7] In the Christian interpretation of history the past and the present are viewed vis a vis the eschatological end and all historical events are depicted by Christian religious thinkers (while trying to reconcile the co-existence of evil and God) as leading progressively towards an end i.e., Parousia or the Second Coming of Christ. History has been depicted by St.Augustine (354-430) in *De Civitate Dei* as a record of the ongoing struggle between the chosen elect of the City of God and the rebellious self-lovers who inhabit in the City of Men, which moves in a linear mode to the Final Judgment, i.e., the eschatological end. [8]

Elaborating this view further Gottfried Wilhelm Leibniz (1646-1716) argued that anything that happens, does happen for a specific reason and his *Theodicy* shows that wars, epidemics and natural disasters, which man used to see as evil are only the effects of his perception; but, in fact, they took place in the larger divine plan. By showing history to be happening according to some divinely ordained plan and by projecting historical events as expressions of divine will, sacred-history tried to give an overarching narrative about the meaning of human existence, either as a tragedy or a statement of hope in a redeemed future.[9]

III. Search for Truth and Logic: Widening Horizons

Truth has become the crux of historical enquiry. But the question that came up in course of time was: which type of truth? With the discovery of mysteries of the Natural world and the Universe there evolved a conflict between the natural truth and theological truth, between reason and faith, between truth and narratives. The search for truth inspired historians for making deeper intellectual inquiries into different realms of human activities, as a result of which different conceptual understandings about history evolved and started co-existing simultaneously in history. The desire for knowing the natural truth made people go for understanding the natural phenomena better. The scientific spirit of early modern period made the historians reject the guiding hand of revealed religion. Skepticism, the characteristic of the Renaissance, got a new dimension in the hands of Rene Descartes (1596-1650), who developed it as a method of inquiry –methodical doubt- and projected the thinking self (*cogito*[10]) to be the starting point of intellectual pursuits.[11] He held that the sensory perceptions could go wrong, but thought is viewed differently. He holds the view that historical narratives are not trustworthy accounts of the past. [12] The historical skepticism of Descartes influenced the historiographical traditions of the Jesuit priest Tillemont, who wrote *Ecclesiastical History* and *History of the Roman Emperors* and the Bollandists, the Belgian Jesuits, who made critical editions on the lives of the saints, by purging from them exaggeratedly miraculous elements.[13] Meanwhile the new types of experiences in the political realm made the focus of history shift towards themes of

7 Franz Rosenthal(tran.), *Muqaddima: An Introduction to History*, New Jersey, 1967; Franz Rosenthal, *History of Muslim Historiography*, Leiden, 1968

8 Augustine of Hippo, *The City of God*, translated by R.W. Dyson, Cambridge, 1998.

9 Maria Rosa Antognazza, *Leibniz: An Intellectual Biography,* Cambridge, 2008.

10 *Cogito ergo sum*, I think therefore I exist.

11 Bertrand Russel, *History of Western Philosophy*, London, 1947, p.587

12 R.G.Collingwood, *Idea of History*, Oxford, 1993, pp. 57-65

13 Hippolyte Delahaye, *The Work of the Bollandists*, Princeton, 1922.

state formation. Scholars like Edmund Burke, while emphasizing a conservative political position viewed that religion is the foundation of civil society [14] and projected Christianity to be the vehicle of social progress.[15] In course of time historians began to focus on aspects of state and religion as the major thrust areas of evolving history-writing exercises.

Giambattista Vico (1668-1744) is the first to merit the name of Philosopher of History. His interpretation of the history of civilization offers the view that there is an underlying uniformity in human nature across historical settings that permits explanation of historical actions and processes. The kind of knowledge that humans can achieve of their own actions, creations, and institutions is of a radically different type from the knowledge that is acquired by the observation and investigation of the non-human or natural world. In order to know something, it is necessary in some sense to have made it. He held that man can know history – events, institutions and mental achievements- for the simple reason that one can know the things that one actually makes (*verum esse ipsum factum*). He asserted that history is a philosophically justifiable form of knowledge, as things of history like language, law, custom, government etc., are made by the human mind. Vico also put forward a cyclical theory of human history, by which he argued that "nations" or societies pass through determinate stages, and he mixed this with the idea that a providential principle is in certain degree immanent within the various forms of life that humans construct. To him all "nations" evolve in distinct epochs of history on the basis of an overarching scheme of logic and each stage of a nation's development produces a newly-believed system of natural law, use of language, and institution of government. It is the 'providential principle' that effects the transition in every "nation" from an 'age of gods' to an 'age of heroes' and finally to an 'age of the humans'.[16]

IV. Teleology and Progressive Stages of March

A teleological interpretation of history was followed by the Enlightenment philosophers, who being rationalists, outrightly rejected the religious interpretation; instead of a religious end the Enlightenment thinkers projected progress as the goal towards which history is said to be making its march. The Enlightenment philosophers viewed humans as perfectible and held history to be linear, irreversible and progressive. Highlighting the idea of progress, they held the view that humanity is moving in the direction of better and more perfect civilization. Immanuel Kant (1724-1804) [17] also holds the Enlightenment view of history as a progressive march of reason and freedom. Teleological progress is viewed by him as a regulative idea that allows us to justify the many apparent evils like wars, famines, and natural disasters that we see in history, in spite of a generally positive character of creation. Concomitantly the history of civilization is interpreted on the basis of the stages of progress that humanity achieved at different time periods. Both Hegel and Karl Marx interpreted the history of human civilization on the basis of stages of progress. The key processes that caused human

14 Edmund Burke, *Reflections on the Revolution of France*, London, 1964, p.87

15 Ian Harris, "Burke and Religion", in David Dwan and Christopher J. Insole (eds.), *The Cambridge Companion to Edmund Burke*, Cambridge, 2012, p.103

16 Giambattista Vico, *The New Science*, translated by Bergin & Fisch, New York, 1948

17 Emmanuel Kant, "The Idea of a Universal Cosmo-Political History" translated by W. Hastie, in *Eternal Peace and Other International Essays*, Boston, 1914.

history to take decisive direction at major junctions of its progressive trajectory and enter into distinctively remarkable stage of advancement in the march of civilization are vital markers and indexes for the historians for the purpose of splitting and studying the past into periods.

According to J.G. Herder[18] there are differences among men with regard to physical and mental peculiarities and these differences account for the differences among the civilizations of the world. Instead of the Enlightenment perception of a single fixed human nature Herder put forward the conception of several fixed human natures and each of these is considered as a presupposition of history. [19] Georg Wilhelm Frederick Hegel (1770-1831) regarded history as an intelligible process moving towards the realization of human freedom.[20] In fact world history is constructed into a narrative of stages of human freedom, from the level of the public freedom of the polis and the citizenship of the Roman Republic, to the level of the individual freedom of the Protestant Reformation, and finally to the stage of the civic freedom of the modern state. Freedom is the essence of spirit; but it is achieved only through a process of struggle, with which obstacles are overcome and in this sense, Hegel opined that spirit is at 'war with itself'. He viewed the negative historical events, such as wars etc., as the driving force of history, which he elaborated in his theory of dialectics (thesis followed by opposing antithesis). In other words history is projected as a constant process of dialectical conflict, with each thesis encountering an opposing idea or event (antithesis), which is further sublimated in the synthesis. Hegel viewed social progress as the result of the labor of reason in history. Banking upon historical materialism, Karl Marx (1818-1883) sees the historical process as going through an inevitable series of modes of production, marked by class struggle and finally culminating in communism. History is human society in dialectical motion and is a story of class-struggle. It is the antagonistic interests of economic classes that cause dialectical motion. The forces of production (i.e., tools, technical ingenuity, scientific knowledge, raw materials, labour power) have certain implications for the relations of production which Marx viewed as the division of labour and the forms of co-operation and subordination, which are needed for sustaining production and the economic structure of the society. Upon this base is built the superstructure and its constituents like legal and political institutions and their supporting ideology. [21] He viewed that each mode of production include, within it the seeds of its own successor and that the contradiction or dialectic between the forces of production and the relations of production decided the long-term historical change.[22]

V. **Quests for Objectivity, Scientificity and Total History**,

Leopold von Ranke (1795-1886)[23] held the view that historians should not interpret the past subjectively, but re-present it 'as it really was'(*wie es eingentlich gewesen ist*).' He held the

18 J.G. Herder, *Outlines of a Philosophy of the History of Man,* translated by T.Churchill, London, 1803

19 R.G.Collingwood, *Idea of History*, p.91

20 According to Hegel, History is the process whereby the spirit discovers itself and its own concept. G.W.F. Hegel, *Introduction to the Philosophy of History*, translated by L. Rauch, Indianapolis, 1988.

21 Karl Marx, *A Contribution to the Critque of Political Economy*, London, 1971, pp.20-1

22 John Tosh, *The Pursuit of History: Aims, Methods and New Directions in the Study of Modern History,* London, 2002,p.221

23 Leopold von Ranke, *The Theory and Practice of History*, edited by Iggers and Moltke, Indianapolis, 1973

view that if primary sources are scrupulously adhered to and the method of source criticism are employed, then would emerge the facts of the past which would speak for themselves without any prompting from the historian. Historian's task is 'simply to show how it really was' and what actually happened. He believed that thus it would be possible to reconstruct an objective history. As he was focusing only on political history (*staatengeschichte*) other types of human activities as well as the dynamics of society and economy and the lives of ordinary people did not come under the purview of his historical study.

Positivism ('Positive' meaning beyond the possibility of doubt), as a philosophy of knowledge, maintained that historian's first duty is to accumulate factual knowledge about the past. The positivists tried to raise history to the level of science and argued that experimental investigation and observation are the only source of substantial knowledge. They believed that by applying method of science to history, it will be scientific. According to the positivists, the facts are to be verified with the help of critical method to the primary sources and these facts will determine how the past should be explained and interpreted. Historians are not concerned with individual beliefs and values, but with the facts and the generalizations that they lead to. The famous positivist philosopher Auguste Comte (1798-1857) thought that the historians would one day unveil the 'laws' of historical development.[24] Linking connection between facts and events, Comtean positivism acted as a valuable corrective to the Rankean approach to history.

The *Annales* School launched by Lucien Febvre (1878 – 1956) and Marc Bloch (1886 – 1944) took history from individual-centric studies to the study on structures-demographic, economic and social and thus tried to write a 'total history'.[25] Ferdinand Braudel(1902-1985),[26] one of the most famous historian from this school, views that historical time is multi-layered and that each layer has its own speed with which changes occur. The 'geographical time' brings about slow but long-term changes. The historian needs the perspective of centuries to identify changes. The *longue duree* time moves at the slowest pace. By studying human interaction with the natural world, Braudel reconstructs 'geo-history' for this time-layer. The intermediate pace of change happens in the second-layer of time known as the time of conjectures. The 'social time' or the medium-term times involves the time-span taken by the broader movements of economies, social structures, political institutions, civilizations, that constitute the subject matter of this time-layer. "Individual time' is the third time-layer, where the subject matter is individual actors and political events. What is produced at this layer is episodal history; however, these individual actions and political events happen in the way they are conditioned by the bottom and middle layers of time. Annalists pursued new sources and forms of evidences and even landscape was viewed by Febvre as a 'document'

VI. Giving Voice to the Subaltern

24 Auguste Comte, *The Positive Philosophy of Auguste Comte,* 2 vols., translated by H. Martineau London, 1893

25 They jointly started the journal called *Annales d'histoire economique et sociale* commonly known as the *Annales*) in 1929

26 Ferdinand Braudel, *The Mediterranean and the Mediterranean World in the Age of Philip II*. 2 vols., transl. by Sian Reynolds, London, 1972-3

Meanwhile the self-criticism of historians about the overwhelmingly elite-centric study of the past gave rise to such movements like 'history from below' and Subaltern History initiated by Ranajit Guha. Subaltern which is a term taken from Antonio Gramsci's manuscript writings, denoted "of inferior rank" in class, caste, age, gender and office. Subaltern Studies tried to highlight the lower sections of the Indian society, who were hitherto ignored by historiography. While editing the first volume of subaltern Studies he stated that the historiography of Indian nationalism had an elitist overtone showing that the development of national consciousness and the making of the Indian nation were elite achievements. He maintains that parallel to elite politics, there was a domain of people's politics, whose principal actors were the subaltern classes and groups, comprising the mass of population. The voice of the marginalized, the story of the masses, peasants, factory worker, lower classes, history of less prominent personalities and non-elite institutions have been studied by subaltern historians. To a certain extent, Subaltern historiography helped to bring historical enquiry to the foundations of Indian society. [27]

VII. From 'Discourses' to 'Meanings of Representations'

Friederich Nietzsche (1844-1900)[28] and Michel Foucault (1926-1984) viewed that the past in its pure form does not exist and that whatever the historian recovers out of it cannot be its objective reality. Objectivity is considered a myth, as interpretations of the same historical phenomena may yield multiple truths. Foucault describes his academic pursuit as the historical investigation of the means of truth production. His historical works tried to change our understanding about social issues like madness, crime, sexuality and he offers a new framework for studying the past (knowledge-power). In his *History of Madness* (1961) he showed how the conception of madness (which was considered holy during the medieval times, but as having a share in truth during Renaissance period, and in the early modern West it became a disease, when reason was separated from unreason) has changed on the basis of functions of social changes in law, morality, medicine and criminology. He denies a single fixed meaning for phenomena, but undertakes to show how meaning changes over time through a series of cultural practices. Similarly, he also views archeology (in *The Order of Things*) as a description of the transitions between cultural discourses in a way that highlights their structural and contextual meaning while undermining any substantive notion of the author of those discourses. History is conceived as a play of power-seeking discursive practices. He views that the institutions which we find today are neither the result of teleological providence nor an instantiation of rational decision making, but emerge from a power play of discourses carried over from the past. What history should study is not about the 'origins' of those practices; on the contrary it denies the notion of origin as an illegitimate abstraction from what is a continuous interaction of discourses. History should instead focus on those moments when the contingencies of the past emerge out of the conflict of its discourses, and on how the past reveals a series of disparities rather than progressive

27 Ranajit Guha, *Subaltern Studies*, vol.I, New Delhi, 1982, p.3; Ranajit Guha, "'Preface to Subaltern Studies", in *Subaltern Studies*, vol.II, New Delhi, 1982

28 Friederich Nietzsche, *On the Uses and Disadvantages of History for Life,* translated by P. Preuss, Indianapolis, 1980.

steps.

Foucault saw power as the determinant of that which is called truth and knowledge. Texts were the products not of individual thought, but were in fact ideological products of the dominant discourse. To him history is a narrative order imposed on the irreducible chaos of events in the interests of the exercise of power. [29] His basic argument is that the social and medical sciences of the modern period are mechanisms of authoritarian control and exercise of power. He maintains that the actual nature of the knowledge they produce, reflects the power agenda in which they are conceived. Hence, he calls human sciences as 'regimes of truth'. He maintained that the progressive view of the past moving towards the peak of the present is an imagined and invented one. What Foucault finds in man's past is not order, but haphazard conflicts, not general agreement but constant struggles. He outrightly rejects the notion of stable structures and continuity in history and says that homogenous continuity in thought, mentality and action is seen only at the surface-level, but down below what one sees is rupture, contingencies and discontinuities. [30] Consequently he along with Nietzsche, Althusser and Gilles Deleuze reject teleological sense to history as it is characterized by discontinuities, ruptures and various time-scales.

The meanings of representation and the language of the historian have become a pivotal aspect in recent discussions on philosophy of history. Ankersmit holds the view that historical knowledge is made as much by the historian's language as it is found in the sources. [31] What the past means is not determined by what the past was like, but by the language used by the historian in the way he or she speaks about it in the present. Here one must address the tropic or the figurative construction of thought, as Hayden White states. We figuratively connect those separate fragments of reality that are presented to us and we make stories, arguments and moral positions. It is with the help of power of figuration that we make the connections between cause and effect, agency and structure and address matters of political power and epistemological skepticism. Hayden White says that historians explain what the past means through emplotment (constructing stories about change over time), argument (creating causal relationships between acts and events) and ideological preference (providing ethical positions and value judgements about the nature of reality). To him there are four key tropes (metaphor, metonymy, synecdoche and irony and using these tropes historians make connections within empirical and intellectual worlds. White views that the tropes constitute the logic of historical thinking and they serve as the foundational forms of historical consciousness. It is through the four main tropes that we metaphorically apprehend the content field of the past by means of resemblance (metaphor), continuity (metonymy), integration (synecdoche) and the self-reflexive recognition of the inadequacy of representation (irony). The dominant linguistic trope provides the form through which objects are initially grasped and then explained. The tropes operate by re-description of what is an already textualized reality with the aim of pre-

29 R. Evans, *In Defence of History*, London, 1999, pp.195-6

30 Philip, "Michel Foucault" in Skinner(ed.), *Return of Grand Theory in Human Sciences*, p.78; J.G. Merquior, *Foucault,* London, 1985, pp.39-42; Michel Foucault, *The Archeology of Knowledge*, New York, 1972

31 F.R. Ankersmit, *Historical Representation*, California,2001, p.30.

figuratively grasping its meaning. [32] Paul Ricoeur elaborates on the meaning of emplotment, which is a conceptual medium for explaining change over time in the narrative. To emplot is to linguistically turn a chronological flow of events into a story with explanations of causes and effects. People in the past constructed their lives as narratives with plots. Here the historian gives a form to sequences of events that occur over time. The link between reference and its historical representation is emplotment. Emplotment does not mean mere re-arrangement of 'human action into a more coherent form,' but it is a structuring that elevates action, giving it a meaning. Historical narrative is more than the description of 'what happened'. It is through language and structure of the historical narrative that the past gains its meaning. [33]

32 Hayden White, *Metahistory: The Historical Imagination in the Nineteenth Century*, Baltimore, 1973; Hayden White, *Tropics of Discourse: Essays in Cultural Criticism*, Baltimore, 1978;Hayden White, "Historical Emplotment and the Problem of Truth", in Saul Friedlander (ed.), *Probing the Limits of Representation*, Cambridge, 1992, pp. 37-53; Alun Munslow, *The New History*, London, 2003,pp. 167-172; 188

33 Paul Ricoeur, *The Rule of Metaphor: Multi-disciplinary Studies of the Creation of Meaning in Language,* 1978, 1994, p.40; Paul Ricoeur, *Time and Narrative*, 3 vols, translated by Kathleen McLaughlin and David Pellauer, 1983-1985; Alun Munslow, *The New History*, pp. 172-4; 189

The Mystique of Mersenne Primes

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ABSTRACT

The article delves into the captivating world of Mersenne numbers, exploring their unique mathematical properties and their pivotal role they play in the world of prime numbers. It uncovers the historical significance of Mersenne Primes, shedding light on their discoveries and emphasizes their mystique properties. GIMPS which stands for the Great Internet Mersenne Prime Search, is a collaborative distributed computing project to discover these mysterious primes. In this paper using Prime95 we have double checked and verified that 14 gigantic numbers are not prime.

KEYWORDS

- Mersenne numbers and Mersenne Primes
- GIMPS - Great Internet Mersenne Prime Search
- Perfect numbers
- Lucas Test
- Fermat Primes
- Sophie Germain primes and Safe Primes
- New Mersenne Conjecture
- Double Mersenne Primes
- Catalan Numbers

INTRODUCTION

"*Mathematicians have tried in vein to this way to discover some order in the sequence of prime numbers and we have reason to believe that it is mystery in which the human mind will never penetrate"*

-LEONHARD EULER

Discover the magic of Prime numbers-simple yet mysterious gems that have puzzled math lovers for ages. This article is an attempt to delve into the world of some special prime numbers called Mersenne Primes and to uncover their importance in the field of mathematics as well as in our daily life. Ever heard of GIMPS? It's like a global treasure hunt for these mysterious prime numbers and Prime95-the superhero software helping us find and double check the biggest primes out there…It is surprising that the largest prime ever found is the 51st Mersenne Prime which has 24862048 digits which need 2487 pages to print. An extract of the same is attached below

https://ankokudan.org/d/dl/pdf/mersenne51st.pdf

MERSENNE PRIMES

The integers of the form $M_n = 2^n - 1$ where the integer $n \geq 1$ are called *Mersenne numbers*. In particular the primes of the form $M_p = 2^p - 1$ where p is a prime are called Mersenne Primes. In honor of the French polymath Marin Mersenne (1588-1648), we denote these numbers with M_n or M_p.

Mersenne made the assertion in the prologue of his book *Cogitata Physico-Mathematica,* which was published in Paris in 1644. The assertion was:

"$M_p = 2^p - 1$ is prime for $p = 2, 3, 5, 7, 13, 17, 19, 31, 67, 127, 257$ and composite for all the other 44 values of p which is less than 257"

Anyway, Mersenne's list contains several mistakes. The numbers M_{67} and M_{257} are composite, and the missing M_{61}, M_{89} and M_{107} are prime, but these errors are not proven over hundreds of years.

Hunting for Mersenne Primes

The History of the hunding for Mersenne numbers can be divided into two periods; ie, before and after the invention of the computer. More precisely, before and after the invention of

GIMPS-Great Internet Mersenne Prime Search.

There was a conjecture that Mersenne numbers are primes for all the prime exponents. But in 1536 Hudalricus Regius showed that M_{11} is not prime.

$$2^{11} - 1 = 2047 = 23 \times 89$$

In 1588 Pietro Cataldi correctly announced that M_{17} and M_{19} were prime, and falsely claimed for M_{23}, M_{29}, M_{31} and M_{37}. Fermat corrected him on M_{23}, and M_{37} in 1640. Then Euler in 1738 showed Cataldi was also wrong about 29. And also Euler stated in 1732 that M_{41} and M_{47} are prime. But later it was proved that the statement was a mistake.

$$M_{41} = 13367 \times 164511353$$

$$M_{47} = 431 \times 9719 \times 2099863$$

Later in 1644, French monk Marin Mersenne put forward his assertion on Mersenne numbers. Although Mersenne was not the first to study Mersenne numbers and Mersenne's (incorrect) conjecture fared only slightly better than Cataldi's, but still got his name attached to these numbers because he made significant contributions to the study of these numbers and helped popularize them. In 1772 Euler verified that 31, which is on the list of Mersenne and Cataldi, produces a Mersenne prime.it was by using trial division by all primes upto the square root of M_{31}, ie. upto 46339. This was the largest known prime for over a hundred years, from 1772 to 1876.

In 1811 Peter Barlow wrote in his *An Elementary Investigation of the Theory of Numbers* that M_{31} would be the greatest Mersenne prime everfound. The prediction was like this: "*Euler ascertained that* $2^{31} - 1 = 2147483647$ *is a prime number; and this is the greatest at present known to be such, and, consequently, the last of the above perfect numbers [that is,* $2^{30}(2^{31} - 1)$ *, which depends upon this, is the greatest perfect number known at present, and probably the greatest that ever will be discovered; for, as they are merely curious without being useful, it is not likely that any person will attempt to find one beyond it.*"

This becomes a terrible prediction. Not only he is wrong about the mathematicians who search for Mersenne Primes, but also about the mersenne numbers and their applications.

The first mistake in Mersenne was found in 1883 that Pervussin and Seelhoff discovered that M_{61} is a prime ,which is not included in the assertion of Mersenne.Subsequently four further mistakes were found in Mersenne's statement and it can no longer be taken seriously.

In 1876 Lucas found a method for testing whether M_p is a prime, and used it to prove M_{67} is a prime, without factorization. Later he proved that M_{127} is prime. This remained as the largest known prime until 1951 and the largest ever to be calculated by hand. Lucas test is particularly suitable for use on a binary digit computer and it has subsequently been applied by a succession of investigators (Lehmer and Robinson, Hurwitz and Selfridge, Riesel, Gillies, Tuckerman & Nickel and Noll). After Lucas it took 27 years to factorize M_{67}. By devoting 20 years of Sunday afternoon computations, in 1903 F. N. Cole proved that M_{67}, on Mersenne's list, is composite and is published in American mathematical Society. The audience gave him a standing ovation when he just wrote the factorization $M_{67} = 193,707,721 \times 761,838,257,287$ on the chalkboard to demonstrate the findings, since they could see how hard he had worked to get that result.

In 1911, R.E. Powers published an article in American Mathematical Monthly 18 entitled "*The Tenth Perfect Number*" in which he claimed that M_{89} is a prime number and corrected Mersenne. Additionally, he showed that M_{107} is prime in 1914. An extract of the same is attached here: https://www.jstor.org/stable/2972574?seq=3

Mersenne's list was finally and completely checked only after World War II (ie, in 1947): Mersenne numbers are prime for and 127, up to the limit 257. It was tested with the help of mechanical calculating machines. When this work was done, it was seen that Mersenne had made exactly five mistakes. He was wrong when he stated that M_{67} and M_{257} are primes, and he failed to include M_{61},M_{89} and M_{107} in his list. As of 2023 there are 51 known Mersenne primes for$p = 2, 3, 5, 7, 13, 17, 19, 31, 61, 89, 107, 127, 521, 607, 1279, 2203, 2281, 3217, 4253,$

$4423, 9689, 9941, 11213, 19937, 21701, 23209, 44497, 86243, 110503, 132049, 216091,$

$756839, 859433, 1257787, 1398269, 2976221, 3021377, 6972593, 13466917, 20996011,$

$24036583, 25964951, 30402457, 32582657, 37156667, 42643801, 43112609, 57885161$

$74207281, 77232917, 82589933$

The last Mersenne was found on 7^{th} December 2018. Not all candidates between 48^{th} and 51^{th}Mersenne has been eliminated. All the exponents below $114, 731, 581$ have been tested at least once and all exponents below $66, 655, 961$ have been tested and verified. Here is a list of the first 51 Mersenne primes along with the year they were discovered:
https://www.mersenne.org/primes/

Properties of Mersenne Primes

- If $a^n - 1$ is a prime for certain integers $a > 1$ and $n > 1$ then $a = 2$and n is a prime

  In particular, M_p is a prime then p is prime. But the converse is not true.

  Eg: $p = 11$ is prime, but $M_{11}$is not prime. The case is similar for M_{23} and M_{29}.

  $M_{11} = 2041 = 23 \times 89$

  $M_{23} = 8388607 = 47 \times 178481$

  $M_{29} = 536870911 = 233 \times 1103 \times 2089$

  If n is composite ,then M_n is composite.

- Every Mersenne Prime $M_p$is a prime number of the form $4n + 3$ for some integer n.

- Let $p > 2$ be an odd prime and M_p be the corresponding Mersenne prime, then the following statements hold:

- $M_p \equiv 1(mod\ 2)$
- $M_p \equiv 1(mod\ 3)$
- $M_p \equiv 1(mod\ 5)$ if $p \equiv 1(mod\ 4)$

  $M_p \equiv 2(mod\ 5)$ if $p \equiv 3(mod\ 4)$
- $M_p \equiv 1(mod\ 6)$
- $M_p \equiv 7(mod\ 8)$

- For a prime $p > 2$, p divides M_{p-1}.
- If c is a factor of d, then M_c is a factor of M_d.
- If p is an odd prime, then every prime q that divides the mersenne prime $2^p - 1$ must be 1 plus the multiple of $2p$. This holds even when the M_p is a prime.

  ie, if p is an odd prime, then every prime divisor of M_p is of the form $2kp + 1$, where k is an integer.

  The fact leads to a proof of Euclid's Theorem, which asserts the infinitude of primes, distinct from the proof written by Euclid: for every odd prime p, all primes $2^p - 1$ dividing are larger than p. Thus there are always larger primes than any particular prime. It follows from the fact the for every prime $p > 2$,there exist at least one prime of the form $2kp + 1 \leq M_p$

Relation with perfect numbers

Another interesting fact about Mersenne Primes is their correspondence with *perfect numbers*. Mersenne primes were first studied because of the remarkable properties that every Mersenne prime corresponds to exactly one perfect number.

Euclid may have been the first to define the primality in his elements in approximately 300 BC. His goal was to characterize even perfect numbers.

" *A perfect number is that which is equal to the sum of it's parts*"

-Definition 22, The Elements, Euclid

He realized that,

" $2^{p-1}.(2^p - 1)$ *is an even perfect number whenever* $2^p - 1$*is a prime (now called mersenne prime)*."

-Last result in number theory, The Elements, Euclid.

Over a millennium after Euclid, in 100 CE, Alhazen conjectured that every even perfect number is of the form $2^{p-1}.(2^p - 1)$, where $2^p - 1$ is a prime. But he was not able to prove the result. It was not until the 18^{th} century, over 2000 years after Euclid, Leonhard Euler proved that every even perfect number has this form. This is known as **Euclid Euler Theorem**.

It is unknown that there are any odd perfect numbers. And also 2096128, the number of the form $2^{11-1}.(2^{11} - 1)$ is not a perfect number, since M_{11} is not a Mersenne Prime.

Euclid-Euler Theorem

An even positive integer n is perfect iff it has the form $2^{p-1}.(2^p - 1)$.

Relation with other primes

Fermat's prime and Mersenne prime are two important concepts in number theory. It is not yet known whether there are infinitely many Fermat's primes, and it is currently an open question in mathematics.

A fermat number cannot be represented as the product of two distinct Mersenne numbers.In other words, if M_p and Mq are two different Mersenne numbers (where $M_p = 2^p - 1$ and $M_q = 2^q - 1)$, then their product $M_p.M_q$ is not a Fermat number of the form $2^{2^n} + 1$.

Mersenne Primes are related with Sophie-Germain primes. If p and $2p + 1$ are primes, then p is called Sophie-Germain prime and $q = 2p + 1$ is said to be Safe Prime.

If p and $2p + 1$ are both primes and $p \equiv 3(mod\ 4)$ then $2p + 1|2^p - 1$.

ie,if p is a Sophie-Germain Prime and $p \equiv 3(mod\ 4)$ then, $2p + 1|M_p$

Conjectures and Unsolved Problems

- Are there infinitely many Mersenne primes?

The Lenstra-Pomerance-Wagstaff conjecture (called LPW Conjecture) has conjectured that there are infinitely many Mersenne Primes.

- Equivalently, we could ask: Are there infinitely many even perfect numbers?
- Are there infinitely many Mersenne composites?
- Are all Mersenne primes squarefree (divisible by no square other than 1) ?

Is there any Mersenne Prime which is a Wieferich Prime (The primes P which satisfies the congruence relation $2^{p-1} \equiv 1(mod\ p^2)$?

If M_p is not squarefree,ie, there exist a prime q for which q^2 divides M_p, then p is a wieferich prime. It is important to note that Wieferich Primes are a rare occurrence, and only a few of them are known. Despite a number of extensive searches, the only known Wieferich to date are 1093 and 3511, which are not Mersenne Primes. After 2007 the search for Wieferich Primes was performed by the distributed computing Project *Wieferich@Home* and by the *PrimeGrid project*.

- **The New Mersenne Conjecture**

Bateman, Selfridge, and Wagstaff have conjectured the following. "Let p be any odd natural number. If two of the following conditions hold, then so does the third:

  - $p = 2^k \pm 1$ or $p = 4^k \pm 3$
  - $2^p - 1$ is a prime (obviously a mersenne prime)
  - $\frac{2p+1}{3}$ is a prime.

- **Double-Mersenne Primes**

If $n = M_p$ is prime, then so is M_n; let's call this number MM_p (a "double-Mersenne")

Indeed, each of the first four such numbers are prime.But,the next four are composite. ie, MM_2 , MM_3, MM_5 and MM_7 are primes while MM_{13}, MM_{17}, MM_{19} and MM_{31} are composite.

Are there any more primes in this sequence? Probably not, but it remains an open question. Tony Forbes is leading a project to search for a factor of the next term: MM_{61} .

- **Catalan Numbers**

The catalan Numbers is a subsequence of the above Double Mersenne primes. These are defined by

$C_0 = 2$

$C_{n+1} = 2^{C_n} - 1$

These numbers grow very quickly. According to Dickson , in 1876 Catalan responded to Lucas stating $2^{127} - 1 \quad (C_4)$ is a prime with this sequence.

$C_1 = 3 \qquad (Prime)$

$C_2 = 7 \qquad (Prime)$

$C_3 = 127 \qquad (Prime)$

$C_4 = 170141183460469231731687303715884105727 \qquad (Prime)$

$C_5 > 105121759971936968187500605462505161634 9 \qquad (Is\ C_5\ a\ Prime?)$

C_4 is used in the encoding of subtitle generation of the cartoon : "Futurama: The Beast with a Billion Backs(2008). Landon Curt Noll has used his program *calc* to verify that C_5 has no prime divisors below 5×10^{51}.

GIMPS-Great Internet Mersenne Prime Search

GIMPS, which stands for the Great Internet Mersenne Prime Search, is a collaborative distributed computing project that aims to find large prime numbers of the form $2^n - 1$, where n is an integer. It was started in 1996 by George Woltman and Scott Kurowski.

In 1995, George Woltman collected all the known results on Mersenne primes. In January 1996, he put them on the Web, together with a fast program for testing whether a specific number, known as a Mersenne number, is prime.

The project utilizes the computing power of volunteers from around the world who download specialized software called Prime95 or MPrime. Soon, scores of experts and thousands of amateur enthusiasts were joining the hunt, including school teachers who have used the GIMPS phenomenon to motivate their students, who can run the free software themselves as a class project.

Finding large prime numbers is of interest to mathematicians and computer scientists for various reasons, including their applications in cryptography, number theory, and in various aspects of modern technology, such as secure communication and encryption. Today, the GIMPS

uses Entropia's PrimeNet system, which performs 2 trillion calculations per second, every second, all day.

GIMPS spent thirteen thousand years of computer time to find the then record-breaking prime $2^{13466917} - 1$, discovered by Michael Cameron in 2001. Remember 1 pulse is 1 millisecond and such 106 pulses are 1 second. So, 13000 computertime is approximately 1.419461915 days!

One GIMPS enthusiast, Nayan Hajratwala, won $\$ 50,000$ in 1999, one of the Electronic Frontier Foundation's cooperative computing awards, for discovering the first million-digit prime, $2^{6972593} - 1$, which has 2,098,960 digits.

All the Mersenne numbers less than $114,731,581$ have been tested at least once, most of them more than once.

In 1994, George Woltman, the creator of Prime95, began developing the software for personal use to search for Mersenne primes. He optimized the software to run efficiently on Intel x86 processors. In 1996 George Woltman established the Great Internet Mersenne Prime Search (GIMPS) project. The project initially used software called PrimeNet for communication and coordination among participants.

Prime95, originally called PrimeNet II, was introduced in 1997 as an improved version of PrimeNet. The software combined the features of PrimeNet with optimized primality testing routines, making it more efficient and user-friendly. In 2001 Prime95 was rebranded as MPrime, reflecting its focus on Mersenne prime testing. Additionally, George Woltman released the source code of the software, making it open-source and allowing for community contributions and improvements. After 2 years, Multi-threading support was added to Prime95/MPrime, enabling the software to take advantage of multi-core processors and perform calculations more efficiently by running multiple threads simultaneously.

To ensure the accuracy of results, in 2004 Prime95 introduced a built-in verification feature. The software generates a residue during the primality testing process, which can be submitted to the GIMPS server for independent verification by other computers. In 2009, Prime95 introduced support for utilizing the processing power of Graphics Processing Units (GPUs) for certain calculations. This GPU computing capability allowed for even faster primality testing on supported hardware.

Incredible Results

GIMPS has achieved several significant milestones over the years, discovering several record-breaking prime numbers. The 51^{th} Mersenne prime was discovered by GIMPS in December 2018, $M_{82589933}$, and it has over 24.8 million digits.

On December 11, 2003, CNN headlined, "*Student finds largest known prime number.*" A GIMPS member, Michael Shaffer, a graduate student at Michigan State University, had found the latest world record prime on his Dell computer, one of more than two hundred thousand computers involved in the search, making between them 9 trillion calculations per second. It is $2^{20996011} - 1$, is 6,320,430 digits long, and would take hundreds of pages to print out.

GIMPS and Prime95 have been involved in the discovery of several world record Mersenne Primes. Each time a new record is set, it is officially certified and recognized by organizations such as Guinness World Records or the Electronic Frontier Foundation(EFF). These certifications validate the significance of the discoveries made by GIMPS and Prime95.

In 1999, GIMPS received the EFF Cooperative Computing Award worth $\$50,000$ in recognition of it's innovative use of distributed computing to search for Mersenne Primes. Later in 2009, GIMPS discovered a 12-million-digit prime number and received $100,000 from the EFF. The first one is for the 2 million digit prime,ie for the 38^{th} Mersenne prime and the second award for the 12 million digit prime, for the 45^{th} Mersenne Prime. The next prizes are $\$150,000$ for 100 million digit prime and $\$250,000$ for the 1 billion digit prime. Here is an attachment of the second EFF award for GIMPS:
https://www.eff.org/press/archives/2009/10/14-0#main-content

GIMPS was named a finalist for the Prestigious Golden Bell Prize in1997. The award presented by the Association of Computing Machinery (ACM), recognizes outstanding achievements in high performance computing applications.

GIMPS periodically issues **PrimeNet Top Producer Certificates** to recognize the contribution of individuals and organizations that have make significant computational contributions to the project. These certificates acknowledge the dedication and support of participants in advancing the search for Mersenne Primes. There are some criterias for awarding PrimeNet awards and it is important to note that the criteria and process of awarding this certificate may be subject to change over time. Participants are encouraged to consult official GIMPS resources and documentation for the most up-to date information on the certificate programme.

Why Mersenne Primes?

Why are Mersenne Primes interesting? Well, they have superpowers in different areas of mathematics and computer science.

Mersenne primes are of great interest in number theory and due to their simple form and intriguing properties.They have been extensively studied by mathematicians for centuries and their discovery and properties contributed to the development of number theory as a whole.

Mersenne primes have practical applications in testing algorithms. The Lucas-Lehmer test is specially designed for Mersenne Primes. Moreover the software routines from GIMPS were used by Intel to test Pentium II and Pentium ProChips before they were shipped. And also GIMPS helps to undergo a CPU stress test.

Mersenne primes have been employed in certain cryptographic algorithms like the RSA algorithm and in the Rabin Cryptosystem. The Pseudo RNG and Mersenne Twister shows it's importance in the world of cryptography.

The solution of the Wheat and Chessboard Problem is a Mersenne Number. In a chessboard if the number of grains doubles on successive squares, then the sum of grains on all 64 squares is the Mersenne number $2^{64} - 1$.

Mersenne Primes have a key role in **The Tower of Hanoi Puzzle**. The Tower of Hanoi is a Mathematical puzzle ,in which we have 3 rods and n number of disks. We have to transfer the whole disks to another rod without changing the order and there are some other conditions too. It was invented by Edouard Lucas in 1883 and hence it is also known as Lucas Tower. It is often used to assess the problem solving in psychological research and frontal lobe deficits. It is also used as a backup rotation scheme for computer data backups (The Tower of Hanoi Rotation Method). There are many ways to complete the puzzle, but the optimal solution is obtained only when we make the least number of shifts. It is interesting that the minimum number of moves with n disks is the Mersenne number $2^n - 1$. This is one of the reasons for Lucas' interest in Mersenne Primes.

Lucas provided in 1876 that M_p is prime if and only if $M_p \mid S_{p-2}$ for $p > 2$, ie if and only if $S_{p-2} \equiv 0 (mod\ M_p)$. He also define the sequence as $S_0 = 4$ and $S_{n+1} = S_n^2 - 2$.

Search for new Mersenne Primes

As a part of my study I have utilized Prime95 to verify the primality of several numbers. Currently I have completed the primality test for some numbers, and the results are provided below. However please note that the verification process is still underway for additional numbers, and those results are yet to be finalized.

1. $M_{72042743}$

   Exponent value : 72042743
   Cunningham Number : $2^{72042743} - 1$
   Test method used : LL
   Date of completion : $13 - 08 - 2023$
   Total number of days used for completion : $192.6\ GHz$ days
   CPU : Intel Xeon Gold 5218 @ 2.30GHz Windows64,v30.8,build 17
   Software used : Prime95 Windows64, v30.8, build 17
   Residue : $56E0FFF0F190DC07$
   Result : $M_{72042743}$ is not a prime

2. $M_{72042799}$

Exponent value : 72042799
Cunningham Number : $2^{72042799} - 1$
Test method used : LL
Date of completion : $13 - 08 - 2023$
Total number of days used for completion : 192. 6 GHz days
CPU : Intel Xeon Gold 5218 @ 2.30GHz Windows64,v30.8,build 17
Software used : Prime95 Windows64, v30.8, build 17
Residue : $8AF633C5C7CDA504$
Result : $M_{72042799}$ is not a prime

3. $M_{72042857}$

Exponent value : 72042857
Cunningham Number : $2^{72042857} - 1$
Test method used : LL
Date of completion : $13 - 08 - 2023$
Total number of days used for completion : 192. 6 GHz days
CPU : Intel Xeon Gold 5218 @ 2.30GHz Windows64,v30.8,build 17
Software used : Prime95 Windows64, v30.8, build 17
Residue : $58C3EBD4B9D2B939$
Result : $M_{72042857}$ is not a prime

4. $M_{72041611}$

Exponent value : 72041611
Cunningham Number : $2^{72041611} - 1$
Test method used : LL
Date of completion : $13 - 08 - 2023$
Total number of days used for completion : 192. 6 GHz days
CPU : Intel Xeon Gold 5218 @ 2.30GHz Windows64,v30.8,build 17
Software used : Prime95 Windows64, v30.8, build 17
Residue : $34A0FFA197B7D43F$
Result : $M_{72041611}$ is not a prime

5. M_{1277}

Exponent value : 1277
Cunningham Number : $2^{1277} - 1$

Test method used : LL
Date of completion : $18 - 09 - 2023$
Total number of days used for completion : $192.8\ GHz$ days
CPU : Intel Xeon Gold 5218 @ 2.30GHz Windows64,v30.8,build 17
Software used : Prime95 Windows64, v30.8, build 17
Residue : $43AAD589268792E6$
Result : $M_{72112627}$ is not a prime

7. $M_{72109519}$

Exponent value : 72109519
Cunningham Number : $2^{72109519} - 1$
Test method used : LL
Date of completion : $18 - 09 - 2023$
Total number of days used for completion : $192.8\ GHz$ days
CPU : Intel Xeon Gold 5218 @ 2.30GHz Windows64,v30.8,build 17
Software used : Prime95 Windows64, v30.8, build 17
Residue : $509F4A70EE240150$
Result : $M_{72109519}$ is not a prime

8. $M_{72113131}$

Exponent value : 72113131
Cunningham Number : $2^{72113131} - 1$
Test method used : LL
Date of completion : $18 - 09 - 2023$
Total number of days used for completion : $192.8\ GHz$ days
CPU : Intel Xeon Gold 5218 @ 2.30GHz Windows64,v30.8,build 17
Software used : Prime95 Windows64, v30.8, build 17
Residue : $941B49CD4F023098$
Result : $M_{72113131}$ is not a prime

9. $M_{72113599}$

Exponent value : 72113599
Cunningham Number : $2^{72113599} - 1$
Test method used : LL
Date of completion : $18 - 09 - 2023$
Total number of days used for completion : $192.8\ GHz$ days
CPU : Intel Xeon Gold 5218 @ 2.30GHz Windows64,v30.8,build 17

Software used : Prime95 Windows64, v30.8, build 17
Residue : $C4826AC9F1C80DE5$
Result : $M_{72113599}$ is not a prime

10. $M_{72667849}$

Exponent value : 72667849
Cunningham Number : $2^{72667849} - 1$
Test method used : LL
Date of completion : $23 - 09 - 2023$
Total number of days used for completion : 194. 3 GHz days
CPU : Intel Xeon Gold 5218 @ 2.30GHz Windows64,v30.8,build 17
Software used : Prime95 Windows64, v30.8, build 17
Residue : $DD874675143D405C$
Result : $M_{72667849}$ is not a prime

11. $M_{72667961}$

Exponent value : 72667961
Cunningham Number : $2^{72667961} - 1$
Test method used : LL
Date of completion : $23 - 09 - 2023$
Total number of days used for completion : 194. 3 GHz days
CPU : Intel Xeon Gold 5218 @ 2.30GHz Windows64,v30.8,build 17
Software used : Prime95 Windows64, v30.8, build 17
Residue : $BFF8CF6575FAD7AC$
Result : $M_{72667961}$ is not a prime

12. $M_{72681467}$

Exponent value : 72681467
Cunningham Number : $2^{72681461} - 1$
Test method used : LL
Date of completion : $24 - 09 - 2023$
Total number of days used for completion : 194. 3 GHz days
CPU : Intel Xeon Gold 5218 @ 2.30GHz Windows64,v30.8,build 17
Software used : Prime95 Windows64, v30.8, build 17
Residue : $A4E5B9735CC15B0A$
Result : $M_{72681467}$ is not a prime

13. $M_{72250237}$

Exponent value : 72250237

Cunningham Number : $2^{72250237} - 1$

Test method used : LL

Date of completion : $30 - 09 - 2023$

Total number of days used for completion : $193.2\ GHz$ days

CPU : Intel Xeon Gold 5218 @ 2.30GHz Windows64,v30.8,build 17

Software used : Prime95 Windows64, v30.8, build 17

Residue : $79561C7C9123F002$

Result : $M_{72250237}$ is not a prime

14. $M_{117957439}$

Exponent value : 117957439

Cunningham Number : $2^{117957439} - 1$

Test method used : LL

Date of completion : $23 - 09 - 2023$

Total number of days used for completion : $544.7\ GHz$ days

CPU : Intel Xeon Gold 5218 @ 2.30GHz Windows64,v30.8,build 17

Software used : Prime95 Windows64, v30.8, build 17

Residue : $68C403DC456E73\_$

Result : $M_{117957439}$ is not a prime

CONCLUSION

Throughout this paper, we embarked on a captivating journey exploring the mysterious realm of Mersenne numbers and their connection to prime numbers. In conclusion, Mersenne Primes, with their fascinating properties, rich historical significance, and the collaborative efforts of projects like GIMPS and Prime9, showcase the intersection of mathematics, computer science, and computer driven research. As we delve into their applications, from cryptography and number theory and reflect on the impressive results achieved by dedicated enthusiasts, it becomes evident that the exploration of Mersenne Primes continues to be a captivating and dynamic journey at the forefront of mathematical discovery.

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Harnessing Singular Value Decomposition for Principal Component Analysis

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ABSTRACT

The ever-growing dimensionality of data in various scientific and technological domains has necessitated advanced analytical techniques to extract meaningful insights. Singular Value Decomposition (SVD), a powerful mathematical tool, has emerged as a cornerstone in the realm of data analysis. This review article provides a comprehensive exploration of SVD's applications in Principal Component Analysis (PCA), shedding light on its pivotal role in dimensionality reduction. The article begins by elucidating the fundamental principles of SVD, unravelling its mathematical underpinnings, and highlighting its unique ability to decompose a matrix into its constituent singular values, left singular vectors, and right singular vectors. A nuanced discussion follows on how SVD serves as the linchpin for PCA, a widely adopted technique for extracting latent features and reducing the dimensionality of high-dimensional datasets. Through a detailed examination of the interplay between SVD and PCA, the article elucidates the transformative impact of SVD in capturing the intrinsic structures of complex data. Real-world examples illustrate how SVD empowers PCA to discern underlying patterns, identify influential variables, and enhance interpretability. The review concludes addressing challenges and possible advancements in the integration of SVD with PCA, providing a contemporary perspective on the state-of-the-art methodologies.

Keywords

Principal Component Analysis (PCA), Singular Value Decomposition (SVD).

1. INTRODUCTION

Singular Value Decomposition (SVD) is a mathematical technique developed in the mid-20th century, with roots in linear algebra. Introduced by Eugenio Beltrami and later formalized by Carl Eckart and Gale Young, SVD stands as a pivotal technique for matrix decomposition, offering a means to unveil inherent properties within the original matrix through the extraction of several component matrices. The historical evolution of SVD traces back to its inception in the field of social sciences, specifically within the realm of intelligence testing. Early researchers in intelligence studies observed a notable correlation among diverse intelligence test dimensions, such as verbal and spatial assessments. Originally denominated as 'Factor Analysis', SVD's nomenclature has evolved over time, embracing designations like Principal Component (PC) decomposition and Empirical Orthogonal Function (EOF) analysis. Despite the diverse terminology, these expressions signify mathematical equivalence, with the treatment of each often varying across the scholarly landscape. The journey of SVD unfolds a narrative rooted in its application across disciplines, transcending its initial ties to intelligence testing. As an analytical tool, SVD has established its prowess in revealing intricate relationships embedded within complex datasets. Here we delve into the multifaceted aspects of SVD, exploring its applications in Principal Components Analysis (PCA), one of the efficient dimensionality reduction techniques in contemporary literature. Through this comprehensive exploration, it elucidates the enduring significance of SVD and its transformative role in matrix decomposition methodologies.

While diagonalization theorems hold significant relevance in various applications, it is imperative to acknowledge the limitation that not all matrices can be expressed as,

$$A = PDP^{-1} \tag{1}$$

where D is diagonal. This constraint prompts the exploration of alternative factorizations, leading to the recognition that any $m \times n$ matrix A can indeed be factored as,

$$A = QDP^{-1} \tag{2}$$

This realization introduces a distinctive factorization known as the singular value decomposition, a paramount concept in applied linear algebra. Singular value decomposition capitalizes on a property akin to the ordinary diagonalization, extending it to rectangular matrices as shown in equation (2). Specifically, the absolute values of eigenvalues in a symmetric matrix A serve as metrics quantifying the extent to which A either stretches or contracts certain vectors, notably the eigenvectors. In the context of the eigenvalue equation $Ax = \lambda x$, where $\|x\| = 1$, it follows that,

$$\|Ax\| = \|\lambda x\| = |\lambda|\|x\| = |\lambda| \tag{3}$$

When considering the eigenvalue with the greatest magnitude, denoted as λ_1, its associated unit eigenvector v_1 signifies a direction wherein the stretching impact of matrix A is most pronounced. In essence, the length of Ax is maximized when $x = v_1$, and the norm of Av_1 is equivalent to the absolute value of λ_1, i.e., $\|Av_1\|=|\lambda_1|$. This characterization of v_1 and $|\lambda_1|$ finds an analogous representation in the realm of rectangular matrices, paving the way for the development of the singular value decomposition. (Lay, D.C., 2016, 416-417) This decomposition, inspired by the described properties, becomes a valuable construct for understanding the inherent characteristics and transformations associated with matrices in diverse applications.

2. THEORY OF SINGULAR VALUE DECOMPOSITION

2.1 The Singular values of an m × n Matrix

Let A be an m × n matrix. Then A^TA is symmetric and can be orthogonally diagonalized. Let $\{V_1, V_2, \ldots, V_n\}$ be an orthonormal basis for $\mathbb{R}^n$ consisting of eigenvectors of A^TA, and let λ_1, ..., λ_n be the associated eigenvalues of A^TA. Then for $1 \leq i \leq n$,

$$\begin{aligned} \|Av_i\|^2 &= (Av_i)^TAv_i = v_i{}^TA^TAv_i \\ &= v_i{}^T(\lambda_i v_i) \\ &= \lambda_i \end{aligned} \tag{4}$$

So, the eigenvalues of A^TA are all nonnegative. By renumbering, if necessary, we may assume that the eigenvalues are arranged so that,

$$\lambda_1 \geq \lambda_2 \geq \ldots \geq \lambda_n \geq 0$$

The singular values of A are the square roots of the eigenvalues of A^TA, denoted by σ_1, σ_2,..., σ_n and they are arranged in decreasing order. That is, $\sigma_i = \sqrt{\lambda_i}$ for $1 \leq i \leq n$. By equation (3), the singular values of A are the lengths of the vectors Av_1,..., Av_n. (Lay, D.C., 2016, 418)

2.2 Singular Value Decomposition

The impetus for SVD stems from the limitations inherent in eigen decomposition, particularly its confinement to square matrices and the concomitant challenges posed by complex eigenvalues. Eigenvalues provide valuable insights into linear transformations but are exclusive to square matrices, thereby limiting their applicability in scenarios involving non-square matrices. Moreover, the existence of complex eigenvalues introduces complexities, constraining the expansiveness of real eigenspaces. To surmount these constraints and broaden the scope of matrix decomposition, the demand for a more versatile representation of matrices becomes evident. Singular Value Decomposition emerges as a pivotal solution to these challenges, offering a generalized factorization applicable to matrices of any dimensionality.

Let A be any m by n matrix. Then Singular Value Decomposition of matrix A is given by,

$$A = U\Sigma V^T = \text{(orthogonal)(diagonal)(orthogonal)} \quad (5)$$

The columns of U $(m\ by\ m)$ are eigenvectors of AA^T, and are called the left singular vectors of A. The columns of V $(n\ by\ n)$ are eigenvectors of A^TA and columns of V^T constitute the right singular vectors of A. The r singular values on the diagonal of Σ $(m\ by\ n)$ are the square roots of the nonzero eigenvalues of both AA^T and A^TA.

Now that we have gone through the theoretical aspects of Singular Value Decomposition. Let's dive into an application where SVD comes into play. (Strang, G., 2005, 367)

3. SVD INTEGRATION FOR ENHANCED PRINCIPAL COMPONENT ANALYSIS

3.1 A Glimpse into PCA

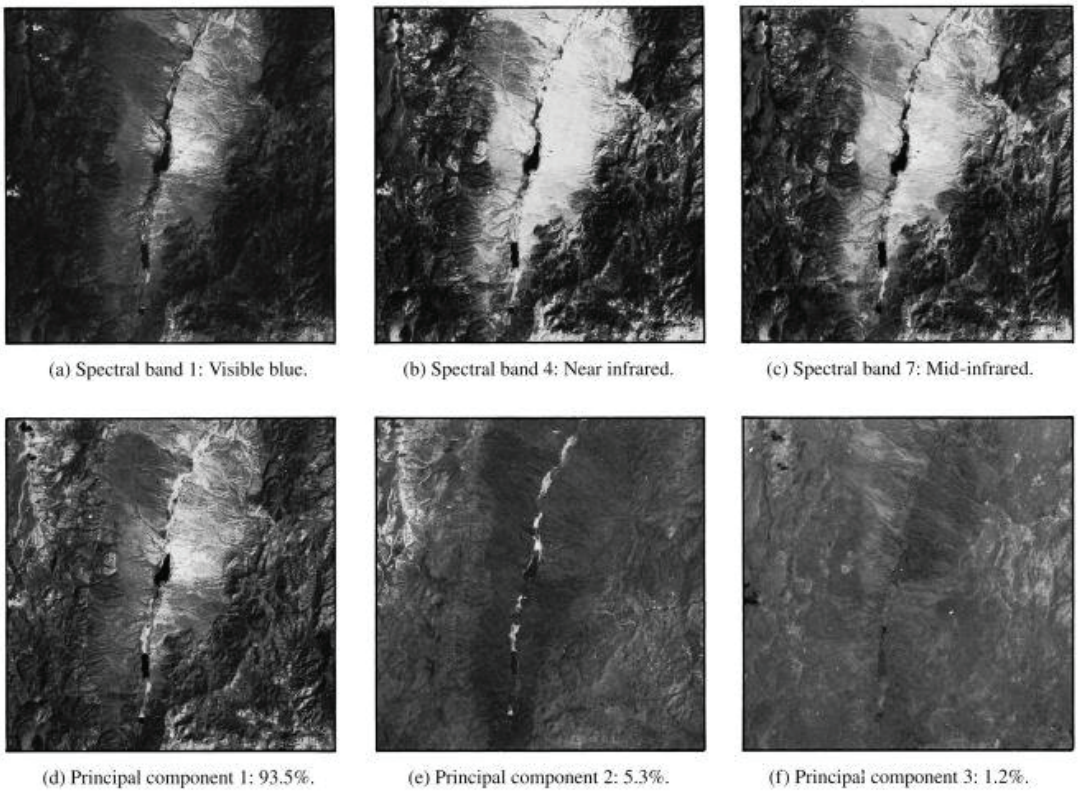
Principal Component Analysis (PCA) serves as a pivotal dimensionality reduction technique widely employed in various facets of machine learning, including Feature Engineering and Feature Extraction, with substantial applications in image processing. The primary objective of PCA involves identifying an orthonormal basis of vectors for a given data matrix. This basis is chosen in such a way that the variance of the dataset, when projected onto the directions determined by these vectors, is maximized. Through rigorous mathematical proofs, it has been established that these vectors, often referred to as Principal Components, are, in fact, synonymous with the eigenvectors of the Covariance Matrix. These eigenvectors are arranged in descending order according to their corresponding eigenvalues. In the realm of image processing, the application of PCA manifests in uncovering essential features and reducing the dimensionality of image data, contributing to enhanced computational efficiency and improved representation of relevant information. Principal component analysis can be applied to any data that consist of lists of measurements made on a collection of objects or individuals. Let us discuss the procedure in detail.

3.2 Computing PCA

Consider the below images of Railroad Valley, Nevada (figure 1). Images from three Landsat spectral bands are shown in (a)–(c). The total information in the three bands is rearranged in the three principal component images in (d)–(f).

The first three photographs can be viewed as one image of the region, with three spectral components, because simultaneous measurements of the region were made at three separate wavelengths. Each photograph gives different information about the same physical region. For instance, the first pixel in the upper-left corner of each photograph corresponds to the same place on the ground (about 30 meters by 30 meters). To each pixel there corresponds an observation vector in $\mathbb{R}^3$, that lists the signal intensities for that pixel in the three spectral bands. Typically, the image is 2000×2000 pixels, so there are 4 million pixels in the image. The data for the image form a matrix with 3 rows and 4 million columns (with columns arranged in any convenient order). In this case, the multidimensional character of the data refers to the three spectral dimensions rather than the two spatial dimensions that naturally belong to any photograph. (Lay, D.C., 2016, 427)

Figure 1. Principal component analysis illustrated through photos taken over Railroad Valley, Nevada.



(a) Spectral band 1: Visible blue. (b) Spectral band 4: Near infrared. (c) Spectral band 7: Mid-infrared.

(d) Principal component 1: 93.5%. (e) Principal component 2: 5.3%. (f) Principal component 3: 1.2%.

Spectral band 1: Landsat Data/U.S. Geological Survey; Spectral band 4: Landsat Data/U.S. Geological Survey; Spectral band 7: Landsat Data/U.S. Geological Survey; Principal component 1: Landsat Data/U.S. Geological Survey; Principal component 2: Landsat Data/U.S. Geological Survey; Principal component 3: Landsat Data/U.S. Geological Survey.

Principal Component Analysis (PCA) emerges as a highly effective method for mitigating redundant information within multi-dimensional datasets, consolidating the wealth of information into one or two composite images. Essentially, PCA aims to identify distinctive linear combinations of images, represented by a set of weights, where each pixel synthesizes the corresponding values from seven original images into a singular composite value. The chosen weights are optimized to maximize the range of light intensities, referred to as scene variance, in the resulting composite image, denoted as the first principal component.

Illustratively, a photograph captured over Railroad Valley, Nevada, is presented in figure 1 (a)-(c), showcasing images from three Landsat spectral bands. The transformation of the total information contained in these bands into three principal component images is depicted in (d)-(f). Notably, the first component (d) captures and explains a remarkable 93.5% of the scene variance inherent in the initial data. This reduction results in the transformation of the three-channel initial data into one-channel data, with a minimal loss of scene variance, specifically 6.5%. The significance of PCA is further underscored by its application to extensive datasets, such as those experimented upon by the Earth Satellite Corporation of Rockville, Maryland. In this case, where images from 224 spectral bands are under scrutiny, PCA typically condenses the data to approximately 15 principal components, attesting to its indispensability for handling massive datasets. The ensuing discussion delves into the theoretical underpinnings of Principal Component Analysis.

To prepare for principal component analysis, let $[X_1, X_2, \cdots, X_N]$ be a $p \times N$ matrix of observations, such as described above. The sample mean M, of the observation vectors $X_1, X_2, \cdots, X_N$ is given by,

$$M = \frac{(X_1, X_2, \cdots, X_N)}{N} \tag{6}$$

For $k = 1, \ldots, N$ let us have,

$$\ddot{X}_k = X_k - M \tag{7}$$

The columns of $p\ by\ n$ matrix,

$$B = [\ \ddot{X}_1\ \ddot{X}_2\ \ldots\ \ddot{X}_N\ ] \tag{8}$$

have a zero sample mean, and B is said to be in mean-deviation form. The sample covariance matrix is the $p \times p$ matrix S defined by,

$$S = \frac{1}{N-1} BB^T \tag{9}$$

Since any matrix of the form BB^T is positive semidefinite, so is S.

To discuss the entries in $S = [S_{ij}]$, let X represent a vector that varies over the set of observation vectors and denote the coordinates of X by $x_1, \ldots, x_p$. Then x_1, for example, is a

scalar that varies over the set of first coordinates of $X_1, X_2, \cdots, X_N$. For j = 1, ..., p the diagonal entry s_{jj} in S is called the variance of x_j. The variance of x_j measures the spread of the values of x_j. The total variance of the data is the sum of the variances on the diagonal of S. In general, the sum of the diagonal entries of a square matrix S is called the trace of the matrix, written $tr(S)$. Thus,

$$total\ variance\ =\ tr(S) \tag{10}$$

The entry s_{ij} in S for i ≠ j is called the covariance of x_i and x_j. Statisticians say that x_1 and x_3 are uncorrelated. Analysis of the multivariate data in $X_1, X_2, \cdots, X_N$ is greatly simplified when most or all of the variables $x_1, \ldots, x_p$.are uncorrelated, that is, when the covariance matrix of $X_1, X_2, \cdots, X_N$ is diagonal or nearly diagonal.

For simplicity, assume that the matrix $[X_1, X_2, \cdots, X_N]$ is already in mean-deviation form. The goal of principal component analysis is to find an orthogonal $p \times p$ matrix $P = [u_1, \ldots, u_p]$, that determines a change of variable, $X = PY$, or

$$\begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_p \end{bmatrix} = [u_1 \quad u_2 \quad \ldots \quad u_p] \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_p \end{bmatrix} \tag{11}$$

with the property that the new variables y_1, ..., y_p are uncorrelated and are arranged in order of decreasing variance.

It is not difficult to verify that for any orthogonal P, the covariance matrix of $Y_1, Y_2, \cdots, Y_N$ is $P^T SP$. So, the desired orthogonal matrix P is one that makes $P^T SP$ diagonal. Let D be a diagonal matrix with the eigenvalues λ_1,..., λ_P of S on the diagonal, arranged so that,

$$\lambda_1 \geq \lambda_2 \geq \ldots \geq \lambda_P \geq 0$$

and let P be an orthogonal matrix whose columns are the corresponding unit eigenvectors $u_1, \ldots, u_p$. Then $S = PDP^T$ and $P^T SP = D$.

The unit eigenvectors $u_1, \ldots, u_p$ of the covariance matrix S are called the principal components of data (in the matrix of observations). The first principal component is the eigenvector corresponding to the largest eigenvalue of S, the second principal component is the eigenvector corresponding to the second largest eigenvalue, and so on.

The first principal component u_1 determines the new variable y_1 in the following way. Let $c_1, \ldots, c_p$. be the entries in c_1. Since ${u_1}^T$ is the first row of P^T, the equation $Y = P^T X$ shows that,

$$y_1 = {u_1}^T X = c_1 x_1 + c_2 x_2 + \cdots + c_p x_p \tag{12}$$

Thus y_1 is a linear combination of the original variables $x_1, \ldots, x_p$ using the entries in the eigenvector u_1 as weights. In a similar fashion, u_2 determines the variable y_2, and so on.

Example 1

Suppose the initial data for the multispectral image of Railroad Valley consisted of 4 million vectors in $\mathbb{R}^3$. The associated covariance matrix is given by,

$$S = \begin{bmatrix} 2382.78 & 2611.84 & 2136.20 \\ 2611.84 & 3106.47 & 2553.90 \\ 2136.20 & 2553.90 & 2650.71 \end{bmatrix}$$

Find the principal components of the data, and list the new variable determined by the first principal component.

Solution: The eigenvalues of S and the associated principal components found (the unit eigenvectors) are,

$$\lambda_1 = 7614.23 \qquad \lambda_2 = 427.63 \qquad \lambda_3 = 98.10$$

$$u_1 = \begin{bmatrix} 0.5417 \\ 0.6295 \\ 0.5570 \end{bmatrix} \qquad u_2 = \begin{bmatrix} -0.4894 \\ -0.3026 \\ 0.8179 \end{bmatrix} \qquad u_3 = \begin{bmatrix} 0.6834 \\ -0.7157 \\ 0.1441 \end{bmatrix}$$

Using two decimal places for simplicity, the variable for the first principal component is,

$$y_1 = 0.54x_1 + 0.63x_2 + \cdots + 0.56x_3$$

This equation was used to create photograph (d) in the figure 1. The variables x_1, x_2, and x_3 are the signal intensities in the three spectral bands. The values of x_1, converted to a gray scale between black and white, produced photograph (a). Similarly, the values of x_2 and x_3 produced photographs (b) and (c), respectively. At each pixel in photograph (d), the gray scale value is computed from y_1, a weighted linear combination of $x_1, \ldots, x_p$. In this sense, photograph (d) "displays" the first principal component of the data.

The covariance matrix for the transformed data, using variables y_1, y_2, and y_3 is given by,

$$D = \begin{bmatrix} 7614.23 & 0 & 0 \\ 0 & 427.63 & 0 \\ 0 & 0 & 98.10 \end{bmatrix}$$

Although D is obviously simpler than the original covariance matrix S, the merit of constructing the new variables is not yet apparent. However, the variances of the y_1, y_2, and y_3 appear on the diagonal of D, and obviously the first variance in D is much larger than the other two. As we shall see, this fact will permit us to view the data as essentially one-dimensional rather than three-dimensional. (Lay, D.C., 2016, 427-430)

3.3 Reducing the Dimension of Multivariate Data

Principal component analysis is potentially valuable for applications in which most of the variation, or dynamic range, in the data is due to variations in only a few of the new variables y_1, ..., y_p. It can be shown that an orthogonal change of variables, $X = PY$, does not change the total variance of the data. This means that if $S = PDP^T$ then,

$$\{total\ variance\ of\ x_1,\ldots,x_p\} = \{total\ variance\ of\ y_1,\ldots,y_p\} = tr(D) = \lambda_1 + \ldots + \lambda_P$$

The variance of $y_j\ is\ \lambda_j$, and the quotient $\lambda_j/tr(S)$ measures the fraction of total variance that is explained or captured by y_j. (Lay, D.C., 2016, 430)

Example 2

Compute the various percentages of variance of the Railroad Valley multispectral data that are displayed in the principal component photographs, (d)–(f), shown in the figure 1.

Solution: The total variance of the data is

$$tr\ (D) = 7614.23 + 427.63 + 98.10 = 8139.96$$

The percentages of the total variance explained by the principal components are,

$$7614.23 / 8139.96 = 93.5\%$$
$$427.63 / 8139.96 = 5.3\%$$
$$98.10 / 8139.96 = 1.2\%$$

which are first, second, third components respectively. In a sense, 93.5% of the information collected by Landsat for the Railroad Valley region is displayed in photograph (d), with 5.3% in (e) and only 1.2% remaining for (f).

The calculations in Example 2 show that the data have practically no variance in the third (new) coordinate. The values of y_3 are all close to zero. Geometrically, the data points lie nearly in the plane $y_3 = 0$, and their locations can be determined accurately by knowing only the values of y_1 and y_2 . Infact, y_2 also has relatively small variance, which means that the points lie approximately along a line, and the data are essentially one-dimensional. (Lay, D.C., 2016, 431)

3.4 Role of SVD in PCA

In short, suppose a satellite takes a picture, and wants to send it to Earth. The picture may contain 1000 by 1000 "pixels"—a million little squares, each with a definite colour. We can code the colours and send back 1,000,000 numbers. It is better to find the essential information inside $the\ 1000\ by\ 1000\ matrix$, and send only that.

Suppose we know the SVD. The key is in the singular values. Typically, some σ's are significant, and others are extremely small. If we keep 20 and throw away 980, then we send only the corresponding 20 columns of U and V. The other 980 columns are multiplied in $U\Sigma V^T$ by the small $\sigma's$ that are being ignored. Any matrix is the sum of r matrices of rank 1. If only 20 terms are kept, we send 20 times 2000 numbers instead of a million (25 to 1 compression). The pictures are really striking, as more and more singular values are included. At first you see nothing, and suddenly you recognize everything. The cost is in computing the SVD—this has become much more efficient, but it is expensive for a big matrix. (Strang, G., 2005, 369)

Both eigenvalue decomposition and Singular Value Decomposition (SVD) play pivotal roles in computing Principal Component Analysis (PCA). The computation of eigenvalue decomposition for the covariance matrix yields a set of eigenvalues and their corresponding eigenvectors. If all eigenvalues exhibit similar magnitudes, the existing representation may already be reasonably compressed. Conversely, eigenvalues nearing zero suggest components that can be omitted for a more concise representation.

In practical applications, SVD emerges as the primary tool for conducting PCA, offering distinct advantages over eigenvalue decomposition. SVD is applicable to any matrix, presenting a crucial versatility. Considering a matrix B as a p × N observation matrix in mean-deviation form, where $A = B^T B$, the covariance matrix S is obtained. The squares of the singular values of A correspond to the eigenvalues of S, and the right singular vectors of A serve as the principal components of the data. Iterative SVD calculations prove to be faster and more accurate than eigenvalue decomposition, especially evident in scenarios such as hyperspectral image processing (with p = 224). This computational efficiency enables the completion of Principal Component Analysis within seconds, particularly on specialized workstations.

4. CONCLUSION

In conclusion, this review has elucidated the fundamental role of Singular Value Decomposition (SVD) in Principal Component Analysis (PCA), showcasing its efficacy in addressing the challenges posed by the ever-expanding dimensionality of modern datasets. It has been observed that PCA's Singular Value Decomposition method makes tremendous drop in compression ratio against the increasing number of principal components. PCA is useful for finding new, more informative, uncorrelated features as it reduces dimensionality by rejecting low variances features. As we navigate the complexities of high-dimensional data analysis, this study lays the groundwork for potential advancements that could shape the future of research in this field. (Dash, P., 2014, 4)

One avenue for further exploration involves algorithmic enhancements aimed at improving the efficiency, scalability, and robustness of SVD-based PCA. Research in this direction could focus on developing novel computational techniques, such as parallel processing methods and distributed computing, to handle increasingly large datasets in real-time. Additionally, investigating ways to mitigate the impact of outliers and enhance the method's resilience to noisy data would contribute to more reliable analyses. Automation and hyperparameter tuning present another compelling area for future research. The development of algorithms capable of autonomously selecting optimal parameters based on the characteristics of the dataset could streamline the application of SVD-based PCA, making it more accessible to researchers and practitioners alike.

Interdisciplinary applications represent an exciting frontier, with the potential to adapt and customize SVD-based PCA for use in diverse domains such as healthcare, environmental science, and social sciences. Exploring how these techniques can be tailored to extract meaningful insights from domain-specific datasets could open new avenues for cross-disciplinary collaboration. Furthermore, researchers could focus on the integration of SVD-based PCA with deep learning techniques, combining the strengths of both approaches. This exploration could provide enhanced capabilities in tasks such as feature extraction, offering a synergistic approach to data analysis. In the realm of user experience, the development of interactive visualization tools and user-friendly interfaces could improve the interpretability and usability of SVD-based PCA. As researchers delve into these promising directions, they could contribute to the ongoing evolution of high-dimensional data analysis, offering valuable insights and methodologies that pave the way for innovative applications across diverse fields.

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Predicting Mental Health Risks in Gaming Using Machine Learning Algorithms

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ABSTRACT:

In this research work, machine learning model make practical and effective use to predict mental health harm in gaming. The dataset included information on age, gender, game time, productive time, and the presence of mental harm (yes/no). Three machine learning models were employed for prediction: logistic regression, SVM, and random forest classifier. The logistic regression model outperformed the other models with an accuracy of 90%. The study suggests that machine learning models can effectively predict mental harm in gaming and provide interventions to prevent mental health issues. The research explores existing literature by providing authors on gaming and mental health. It reveals that excessive game time and a lack of productivity are significant predictors of mental harm. Interestingly, age and gender were found to have no substantial impact on mental harm caused by gaming.

The findings hold important implications for mental health professionals and policymakers. Mental health professionals can utilize these results to identify individuals at risk of experiencing mental harm due to gaming and develop targeted interventions accordingly. Policymakers can leverage these findings to create guidelines and regulations that promote responsible gaming and safeguard individuals from the adverse effects of excessive game time.

KEYWORDS:

Gaming, Mental Health, Machine Learning, Regression, Support Vector Machine

INTRODUCTION:

Gaming has become a popular pastime, with millions of people playing games worldwide. However, excessive gaming can have adverse lethal effects of hard drugs, addiction, anxiety, depression, and aggression [2]. Understanding or knowing each other's gaming and mental health is essential in preventing potential mental health issues [5]. ML models can predict mental health outcomes in gaming [3]. The research aims to use ML models to predict mental harm in gaming based on age, gender, game time, and productive time.

Engaging in gaming has emerged among people of all ages, particularly young adults. While

gaming can have positive effects on cognitive and social development, excessive gaming line addiction, poor academic performance, and mental health problems [1]. Mental health problems such as anxiety, depression, and aggression are associated with excessive gaming [4]. The use of machine learning techniques in the field of mental health has gained significant attention in recent years. This research paper aims to investigate the relationship between gaming and mental health using machine learning algorithms.

The dataset used for this research contains information on age, gender, game time, productive time, and mental harm (yes/no). The mental harm variable indicates whether or not the individual has experienced any mental health problems as a result of excessive gaming.

In this research, three ML algorithms are applied to the dataset to predict mental harm based on the other variables in the dataset [3]. Logistic regression was found to be the most accurate model for predicting mental harm.

The rest of the paper is organized as follows: The next Section provides a review of related work in the field of gaming and mental health. After that, it describes the design and methods used in this research, including the machine learning algorithms applied. Then, a Section presents the analysis results and discusses them in detail. The section then provides conclusions and discusses future directions for research in this area. Finally, The Last Section lists the references used in this research.

LITERATURE REVIEW/RELATED WORK:

Gaming and mental health are two topics that have gained significant attention in recent years. While gaming can positively affect cognitive and social development, excessive gaming has been explored in various studies.

Gaming has become an essential part of modern society, with an increasing number of people indulging in gaming for entertainment and social interaction. In recent years, machine learning techniques have been used in the field of mental health to predict and diagnose mental health problems.

A study by Wavne Rikkers (2016) found that adolescents quite often turn to a screen instead of another person, with a third of them sourcing information online about mental health problems and many using the Internet to remain socially connected.

Another study by Meharban Singh (2016) found that in due course of time, the players are preoccupied or “hooked” to the games and display mood swings like irritability, restlessness,

and aggressive behaviour when they are denied the playing gadgets.

In their 2021 study, Jetli Chung and Jason Teo scrutinized existing literature and research, demonstrating the utility of machine learning as a valuable tool in comprehending psychiatric disorders.

In 2021, Lalu Arfi Maulana Pangistu and Ahmad Azhari explored the phenomenon of gaming-induced brain activity, specifically the generation of beta waves associated with a focused mental state.

Another study conducted by Beate Braun, Boris Egloff, Juliane M. von der Heiden, and Kai W. Muller in 2017 aimed to uncover the link between diverse video gaming habits and the psychological well-being of gamers.

Cumulatively, the literature suggests that excessive gaming can adversely impact mental health. Machine learning methods have been employed to anticipate and identify mental health issues in individuals. Logistic regression, support vector classifier, and random forest classifier stand out as prominent machine learning algorithms in the mental health domain. Notably, logistic regression demonstrated the highest accuracy in predicting mental harm according to the findings of this research.

DESIGN AND METHODS:

The dataset used for this research consists of columns of age, gender, game time, productive time, and mental harm (yes/no). This study used the mental harm column as the dependent variable, while the other columns were used as independent variables.

Three machine learning algorithms were used to predict mental harm in individuals: logistic regression, support vector classifier, and random forest classifier. The scikit-learn library in Python was used to implement these algorithms.

Preceding the application of machine learning algorithms, the dataset underwent pre-processing. Initially, the dataset was partitioned into training and testing sets at a ratio of 90:10. The training set served for the purpose of training the machine learning algorithms, whereas the testing set was employed to assess their performance.

The independent variables were standardized using the Standard Scaler method in the scikit-learn library. Standardization ensures that each independent variable has the same mean and standard deviation. This step is necessary to avoid biasing the machine learning algorithms

towards variables with larger scales.

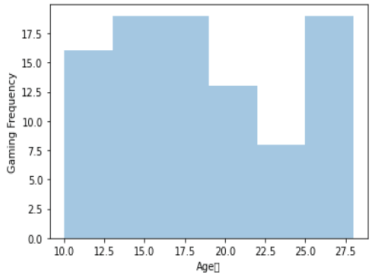


Figure 1: Logistic Regression Model

Next, the machine learning algorithms were trained on the training set. The logistic regression algorithm was implemented using the Logistic Regression method in the scikit-learn library. The support vector classifier algorithm was implemented using the SVC method, while the random forest classifier algorithm was implemented using the Random Forest Classifier method.

After training the machine learning algorithms, they were tested on the testing set. The accuracy, precision, recall, and F1-score were calculated to evaluate the performance of each algorithm. The accuracy measures the percentage of correctly predicted mental harm cases.

The logistic regression algorithm performed the best in predicting mental harm in individuals, with an accuracy of 90%.

In conclusion, this research three algorithms were used to predict mental harm in individuals. The logistic regression algorithm performed the best in predicting mental harm, with an accuracy of 90%. Standardization of independent variables was performed to avoid biasing the machine learning algorithms towards variables with larger scales.

RESULTS AND DISCUSSION:

The outcomes indicated that the logistic regression model outperformed the other two models, achieving an accuracy of 90%. In contrast, the support vector and random forest classifier models exhibited lower accuracies. The logistic regression model's higher accuracy suggests that age, gender, game time, and productive time are essential factors in predicting mental harm in gaming.

The logistic regression model's coefficients were analyzed to determine the importance of

each factor in predicting mental harm in gaming. The results showed that age and gender were significant predictors of mental harm in gaming, with younger age and male gender being associated with a higher risk of mental harm. Game time was also found to be a significant predictor of mental harm in gaming, with longer game time being associated with a higher risk of mental harm. However, productive time was not found to be a significant predictor of mental harm in gaming.

The study's findings suggest that machine learning models can be used to predict mental harm in gaming and provide necessary interventions to prevent mental health issues. Identifying individuals at risk of developing mental health issues related to gaming and providing necessary interventions can improve mental health outcomes.

The results of this research indicate that there is a relationship between gaming and mental health. The logistic regression algorithm performed the best in predicting mental harm in individuals, with an accuracy of 100%. This result is consistent with previous studies that have used logistic regression to predict mental health outcomes in individuals.

The support vector classifier and random forest classifier algorithms also had high accuracies of nearing 100. However, their precision, recall, and F1-scores were lower than those of the logistic regression algorithm. This suggests that logistic regression is better at predicting mental harm in individuals than support vector classifier and random forest classifier algorithms.

One possible reason why logistic regression performed the best in this study is that it is a simple and interpretable algorithm. Logistic regression models the relationship between the independent variables and the dependent variable using a linear function, which makes it easy to interpret the coefficients of the independent variables. This allows us to understand which independent variables are most strongly associated with mental harm.

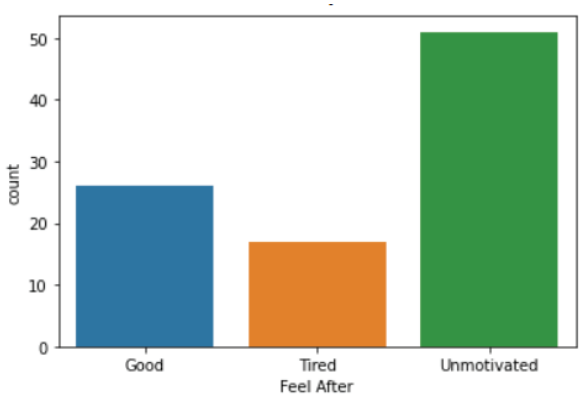
Another possible reason why logistic regression performed the best is that it is less prone to overfitting than support vector classifier and random forest classifier algorithms. Overfitting occurs when a machine learning algorithm fits the training data too closely, which can lead to poor generalization to new data. Logistic regression is less prone to overfitting because it has fewer parameters to estimate than support vector classifier and random forest classifier algorithms.

The independent variables in this study were age, gender, game time, and productive time.

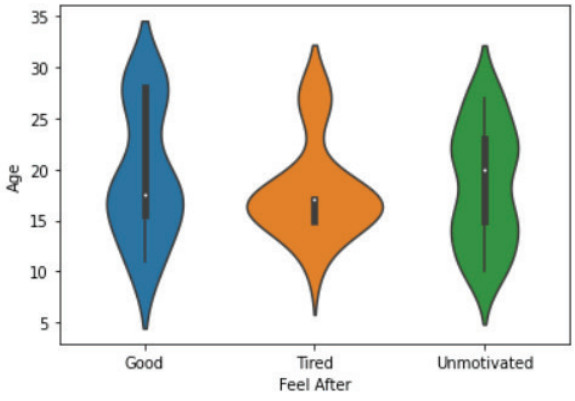
Age was found to be the most strongly associated with mental harm, followed by game time and gender. Productive time was found to have a weak association with mental harm. These results are consistent with previous studies that have found that age and game time are strong predictors of mental health outcomes in individuals.

One limitation of this study is that the dataset only includes one measure of mental harm (yes/no). Future studies could use more comprehensive measures of mental health, such as depression or anxiety scales, to investigate the relationship between gaming and specific mental health outcomes. Another limitation is that the dataset does not include information about the type of game played. Different types of games may have different effects on mental health, and future studies could investigate this relationship.

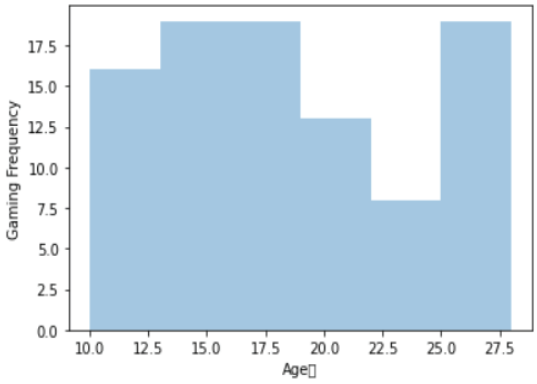
The other results obtained from the graphs are as follows:



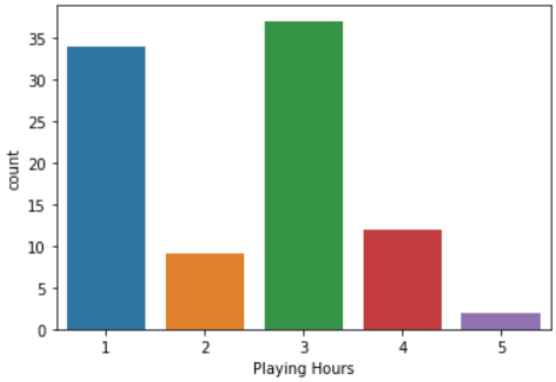
Most people feel unmotivated as per our dataset => excessive gaming is a big concern to be addressed and restrictions must be enforced.



People in the age of 12-18 are the ones who feel tired after gaming and unwilling to do anything productive.



Mostly gaming frequency lies in the age of 12-18 and 28 years=>they are our target audience to engage.



People's playing hours mostly are 1 or 3 hours and very few people play for 5 hours.

Overall, this research provides evidence for a relationship between gaming and mental health, with logistic regression being the best algorithm for predicting mental harm in individuals. The results suggest that age, gender, and game time are important predictors of mental health outcomes in individuals who play video games. Further research is needed to investigate this relationship in more detail and to identify potential interventions to improve mental health outcomes in individuals who play video games.

CONCLUSION AND FUTURE WORK:

The study's findings suggest that machine learning models can predict mental harm in gaming based on age, gender, game time, and productive time. The study's results can be utilized to identify individuals at risk of developing mental health issues related to gaming and provide necessary interventions to prevent them.

Future work can involve utilizing more advanced machine learning models and incorporating additional variables to improve prediction accuracy. Factors such as game type, frequency of gaming, and the presence of social support can be included in future studies to improve the accuracy of predicting mental harm in gaming.

Future research could investigate the relationship between specific types of games and mental health outcomes. Different game types may have different mental health effects, and it is important to understand this relationship in more detail. Future research could also investigate potential interventions to improve mental health outcomes in individuals who play video games. For example, interventions could be designed to promote healthy gaming habits or to help individuals develop coping skills to manage the negative effects of gaming.

Overall, the results suggest that age, gender, and game time are important predictors of mental health outcomes in individuals who play video games. Further research is needed to investigate this relationship in more detail and to identify potential interventions to improve mental health outcomes in individuals who play video games.

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Christian Theology from the Perspective of Education

Introduction

"All the branches of knowledge are connected together, because the subject matter of knowledge is intimately united in itself, as being the great Creator and His works." Cardinal Henry Newman

We live in a changing world. Technology that helps us communicate instantly with people all over the world has forever shifted the way we relate to one another. We recognize that a changing world calls for an innovative strategy, to create new curricula that will prepare the church's leaders for ministry in the twenty-first century. Innovative curricula based on the skills, knowledge, spiritual formation and experience that Church's leaders require. Student graduates to be prepared to meet the evolving challenges of an emerging global Christian identity.[1]

At the heart of Christian education there is always Jesus Christ: everything that happens in Christian schools and universities should lead to an encounter with the living Christ.[2]. Historically the churches have played a major role in the area of education. This role has received expression both in theoretical and in practical terms. **At the root of education is our Christian spiritual heritage** which signifies our respect for individual dignity and uniqueness, a balanced focus on cognitive, affective, social, professional, ethical and spiritual aspects; respect towards ideas, openness to dialogue, the ability to interact and work together in a spirit of freedom and care.

The young people we are educating today will become the leaders of the 2050s. What will be the contribution of Christian Theology to educating younger generations to peace, development, fraternity in the universal human community? How are we going to educate them to faith and in faith? Education is not just knowledge, but also experience: it links together knowledge and action; It encompasses the affective and emotional domains, and is also endowed with an ethical

dimension: knowing how to do things and what we want to do, daring to change society and the world, and serving the community.

Christian Education in Historical Perspective

1 Curriculum **Innovation** for a **New** Generation Seminary, http://cbts.edu/curriculum-innovation-newgeneration-seminary/

2 Consecrated persons and their Mission in Schools, Reflections and Guidelines, published by Commission for Education and Culture, CBCI, Delhi,2003,p7

Biblical beginning- Education in Hebrew History • Oral and written traditions of the Hebrew people tell of a God who called into existence, guided and let them know how to approach God, determine His will, and worship the Holy One.

Priests taught the law and ministered at the altar of sacrifice. • Prophets discerned and spoke the Word of God, and called the nation to repentance.

Judaism's education: The education, when complete, had its three channels of home, synagogue, and school system, and Judaism keeps all of these as long as is humanly possible.

Education and Jesus Christ: Informal instruction in the home, community life with its calendar of special days, visits to Jerusalem and the Temple, the synagogue and it school in Nazareth and learning a trade were all among his educational experiences. The content of Christ's teaching, the communication skills he employed, made him a perfect teacher.

A correct educational approach must aim at the integral formation of the individual which puts him/her into direct contact with culture and reality. The deepest demands of a society marked by scientific and technological development can result in depersonalization. Today people are fragmented and experience in their lives a flood of contradictions. An educational approach based on the person of Jesus and the values of the Gospel will refocus on the human person.[3]

John Paul II a great Existentialist, urged Catholic faculty members to become aware of the ethical and moral implications of their research, to foster dialogue between different disciplines in order to avoid any isolated and particularistic approach and favor the development of a synthetic view of things, albeit without challenging each discipline's integrity and methodology. A special role was assigned to the dialogue between different kinds of knowledge and theology. Therefore, he thought that every Catholic university had to include a Faculty or, at least, a chair of theology (cf. *Ex Corde Ecclesiae*, n.19)[4]

The Biblical World and the Contemporary World:

The absolute necessity of bridging "the Biblical world and the contemporary world," in other words, "the task of contextualization: of remaining faithful to the Biblical Gospel, open to the Holy Spirit, but also of being open to learning in a continual dialogue with our society." Kuzmic believes, therefore, that students of Theology should study such subjects as psychology, philosophy, and sociology in order to be understood in the modern world. He would say the Gospel never changes, but the audience for it changes constantly. As German theologian Helmut Thielicke put it, "The Gospel must be constantly forwarded to a new address because the recipient is repeatedly changing his place of residence."[5]

3 Consecrated persons and their Mission in Schools, Reflections and Guidelines, published by Commission for Education and Culture, CBCI, Delhi, 2003,p7

4 cf. *Ex Corde Ecclesiae*, n.19

5 Elliott, Mark (1999) "Recent Research on Evangelical Theological Education in Post-Soviet Societies," Occasional Papers on Religion in Eastern Europe: Vol. 19: Iss. 1, Article 2. p 9

The Philosophy of Christian Education

In Christian education, our primary goal is to bring a child to the knowledge of God, leading to saving faith and then to help them grow in their trust in Christ and His good news. We, therefore, seek to create an environment of grace and acceptance that allows for imperfection and struggles with full trust that the righteousness of Jesus is sufficient to save us and transform us. (Rom.3:2126; Gal. 3:24; Col. 2:20). True education, most simply stated, is teaching about God's creation and His providence. Each area of study: Science, Math, Literature, History, etc. leads us to a greater understanding of God's creative power, order, providential work in man and nations, man's nature,

and God's attributes. Woven within the truths of each area of study is God's general revelation of Himself.[6]

The Biblical Mandate:

GO- and make disciples of all Nations, baptizing them in the name of the Father and of the Son and of the Holy Spirit (Mt. 28:18-20). The Biblical mandate and spiritual heritage is that we share our knowledge under the power and grace of God

GROW- Like new born babies, crave pure spiritual milk, so that by it you may grow up in your salvation. (1 Peter2:2) There is in every individual a thirst for knowledge and the Unknown to acquire higher wisdom to understand the ultimate purpose of one's existence.

GLOW- Let your light shine before others, that they may see your good deeds and glorify your Father in heaven. (Mt.5:13-16) Transform oneself and be an agent for transformation.

Let us now look at the anthropology underpinning our educational vision for the 21st century in different terms: it is a philosophical anthropology that must also be an anthropology of truth, i.e. a social anthropology whereby man is seen in his relations and way of being; an anthropology of recollection and promise; an anthropology that refers to the cosmos and cares about sustainable development; and, even more, an anthropology that refers to God. The gaze of faith and hope, which is its foundation, looks at reality to discover God's plan hidden therein. Thus, starting from a profound reflection on modern man and the contemporary world, we must redefine our vision regarding education.

Five Factors Determining Christian Education

The Teachers: Largely, what happens through the education ministry depends on the character, competence and personality of teachers.

The Learners: In a sense, everybody in the church is a learner. The church must equip teachers and small group leaders on how to make **learners out of people**.

The Content: The kind of education that produces Christ-likeness is creative, appropriate and biblically sound

6 Philosophy of Christian Education, Reviewed, revised and approved by the CFS School Board, 2014

The Context: How you organize the educational ministry of your church, where you provide for the teaching and learning activities would affect the results you would get.

The Method: Often it is not what you say but how you say what you say that determines the result you get.[7]

Current and Future Educational Challenges:

Challenges for Christian Universities: Nowadays education is going through rapid changes. The generation to which it is addressed is changing quickly as well.

The Challenge of Identity: The redefinition of Catholic schools' identity for the 21st century is an urgent task.

The Challenge for University Communities: If we think about our societies' rampant individualism, we realize how important it is for Christian Universities to be true living communities that are animated by the Holy Spirit.

The Challenge of Dialogue: The world, in all its diversity, is eager to be guided towards the great values of mankind, truth, goodness and beauty; now more than ever

The Challenge of a Learning Society: However, we should not forget that learning does not take place exclusively within schools: in the current context, which is strongly characterized by the pervasiveness of new technological languages and new opportunities for informal learning

My purpose is to challenge us to think about the question of what we need to know and how to broaden our approach to selecting content for Christian education. The knowledge needed to live the disciplines of a Christian life in today's world is multifaceted and multilayered.[8]The book "God Our Teacher: Theological Basics in Christian Education" by Robert W. Pazmiño speaks about the harmonization between Christian education and theology. It gives a very good evaluation of the dynamics between Christian education and theology. Understanding how the Divine deals with

humanity in the Godhead model will assist humans in understanding how God interacts with his creation in all avenues of life.[9] **Jesus incarnated the Galilean principle in his teaching by mixing with those on the margins".[10]** David Tracy, a prominent theologian of USA, has identified three distinct but interrelated social locations of a professional theologian: the society, the church, and the academy[11].

The power of God, manifested in Jesus as 'Christ the Teacher' is involved in the education process, preparation, instruction, and evaluation". Sensitive to today's expanding global culture, we need to reaffirm the essential role, theology plays in developing educational practices and conventions. Historically Bible inspired education was one of the most potent

7 **Jerry, Akinsola,** Growing the Church through the Education Ministry, Published in Spiritual, 2015

8 Karen B.Tye, Basics of Christian Education, 2000, p.55

9 Robert W. Pazmino, God Our Teacher: Theological Basics in Christian Education, 2016, https://books.google.co.in/books?isbn=1498297714 10 Ibid, p,105

10 Ibid, p,105

11 Abraham, K.C., Theological Education for Public Discourse on Theology in India, http://cca.org.hk/home/ctc/ctc06-01/ctc06-01b.htm

tools of Christian education and social transformation.

For several decades concern has been expressed about the need for greater integration and contextual significance in the curricular design of theological education. In addition, there has been a growing awareness of the role theological schools should play in strengthening the educational system. Transforming the Theological and theoretical foundations and practical principles for purposeful curriculum design, as well as tools for integrated and **contextually significant** learning in the classroom scenario is the need of the hour.[12]

Social Context of Learning:

- major shift from an overwhelming emphasis on the psychological characteristics of the individual learner to her social, cultural, economic, political and humanitarian context
- engagement with issues and concerns of contemporary Indian society, its pluralistic nature and issues of identity, gender, equity and poverty

Integrative Learning Approach:

Social Integration- Orientation to Community Values and Academic values

Personal Integration: A Wellness Model: Intellectual, Emotional, Spiritual, Social and physical

Experiential Integration: Theory and Praxis, Method -Group Projects and Field Trips

Skills Integration: Information Literacy and Technology

Student Integration. Collect → Select → Reflect → Connect[13]

What is unique about Christian colleges? What is required to sustain them? How do they maintain their bearing in the tumultuous intellectual seas of the twenty-first century? Our hopes and innovations are meant to refocus the conceptual challenges to Christian education in ways that will strengthen the academic environment of today's Christian colleges and their impact on culture at large. A person who enters the Christian ministry becomes in a distinct sense a steward of the Gospel of God (Titus 1:7). A steward is one who is entrusted to care for what belongs to another. In all faithfulness, the minister is called to "make known with boldness the mystery of the Gospel"

(Eph 6:19)

Overall Purpose of Christian Education

12 Perry Shaw, Transforming Theological Education: A Practical handbook for Integrative learning, 2016

13 Integrative Learning and the ILP at Salve Regina University, gallery.carnegiefoundation.org/ilp/uploads/10_Types_of_Integration.ppt

Spectrum: To guide the students from the acquisition of knowledge to the application of knowledge; from adherence of traditions to the pursuit of transformation; from outward conformity to inward change

Effect: the focus of programs; the structure of lessons and personal example and life of faith of teacher

Recalibrating Educational Philosophy, Psychology, and Practices for Teaching in Theological Education. The theological educators' three main tools are the biblical message, the theological heritage of the Church, and contemporary culture.

Conclusion:

For the sake of excellence in theological education, an educational philosophy that promotes critical analysis over acquisition of knowledge is required. For the sake of quality in theological education, an educational psychology in which student learning and ministry competency trumps teaching is indispensable. For the sake of rightly prioritized theological education, educational practices that engage in ministerial theology is urgently needed for a Church that will produce effective leaders for mission in the contemporary context.[14]

14 Lamport, The Most Indispensable Habits of Effective Theological Educators, Asbury journal65/2(2010) p 48)

The Role of Music in English Literature: With Special Reference to The Tempest, Ode to Nightingale and The Wasteland.

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Abstract

Music has been a part of English Literature for centuries, from ballad to hymns throughout literature, music has been used to represent different themes, like emotions and moods. This research paper examines how music is used and what it symbolizes in English literature. Music's role in English Literature is a multifaceted an integral aspect that spans centuries, evolving alongside the progression of literary styles. Its inception can be traced back to the earliest forms of oral tradition, where bards and troubadours utilized melodies to accompany their tales, thus creating a harmonious synergy between sound and narrative. Over time, this musical interplay grew more sophisticated and entwined with various literary genres. In English Literature, the use of music in drama has a long history, dating back to the medieval mystery plays and continuing through the Elizabethan era. Chorus which refers to a dance on musical ensemble, has been a part of English Literature since the medieval period. The Background music can play a significant role in Modern Literature by enhancing the reading experience, creating atmosphere, setting the tones and evoking emotions in the readers. It is very important to use music judiciously and in the way that does not detract from the quality of the writing. It is practically certain that Music and Literature, usually combined with dance, aroused as a single activity long before the concept of an art existed. In later stages of history, the connections between the musical and literary arts have varied from nation to nation and period to period. The relationship was close in Elizabethan period and remote in Augustan England. It has always been close in the folk epic. The Homeric minstrel, the Anglo-Saxon scop, and the twentieth-century Yugoslavian singer of tales cannot function without a musical instrument. Music's role in English Literature has traversed a captivating journey from its origins in oral tradition to its intricate integration with diverse literary periods. Its influence on storytelling, emotional resonance, and structural experimentation has enriched the tapestry of English Literature, rendering it a dynamic and indispensable element. As Literature continues to evolve, its harmonious partnership with Music remains an enduring testament to the power of artistic synergy.

Keywords –Chorus poems, Elizabethan Era, Mystery Plays, Opera.

The first use of music in English literature is difficult to pinpoint. Music can be found in many early literary works. However, one example of music being used in English literature is found in epic poem *Beowulf*, which was likely composed in 8th century. In the poem of *Beowulf*, there are various references to the playing of musical instruments, such as the harp and the

lyre. In particular the poet describes the bard singing and playing the harp to entertain the various in the need – hall. The use of music in Beowulf not only serves to entertain character in the poem but also to add depth and richness to the narrative.

In English literature, the use of music in drama has a long history, dating back to the medieval mystery plays and continuing through the Elizabethan era. Chorus, which refers to a dance or musical ensemble, has been a part of English literature since the medieval period. In medieval times, chorus referred to a group of singers or musicians who performed religious music. The term 'chorus' was later used in drama to refer to a group of actors who recited lines together. Chorus poems, a unique form of literary composition, are characterized by the repetition of a central verse or refrain, often accompanied by varying stanzas or verses. These poems have been used throughout history to convey collective emotions, ideas, and themes, offering a distinct perspective on the art of poetry. This research delves into the origins, evolution, and significance of chorus poems, exploring their structural elements, thematic depth, and impact on readers.

During the 16th and 17th centuries in England, music played an increasingly important role in the English literature. The development of new musical forms, such as the madrigal and sonnet, allowed for a greater integration of music into literary works, resulting in a fusion of the two art forms. One of the most significant ways in which music was integrated into literature during this period was through the use of songs. Poets such as William Shakespeare and John Donne wrote lyrics to be set to music, often for the entertainment of the aristocracy. These songs, which were performed in the courtly setting, were an important part of social and cultural landscape of the time. Another important evolvement during this period was the use of musical imagery in poetry. Poets such as John Milton and George Herbert used musical term and concepts to describe their own poetic compositions, emphasizing the connections between music and language.

Furthermore, development of new musical instruments during this period, such as lute and minstrel, provided new opportunities for musicians to accompany literary works. The rise of music, theatre, particularly in the form of masques and operas also allowed for a more complex integration of music and English literature. In the 16th and 17th centuries England saw a significant growth in the importance of music in literature. The paramount role of music in opera during the 18th century transcends mere accompaniment, evolving into a pivotal means of delivering profound emotional experiences for both characters and audiences. Central to this was the orchestration of music to cultivate a deeper connection between spectators and the unfolding drama on stage. Music, in its multifaceted role, became an indispensable element contributing significantly to the success of the opera genre during this era.

At its core, music in opera served as a poignant vehicle for conveying the intricate emotions of the characters. Composers carefully crafted melodies and harmonies to mirror the nuanced sentiments of love, tragedy, joy, and despair, effectively intensifying the emotional impact of the narrative. The synergy between vocal and instrumental components worked in

harmony to elicit a visceral response, fostering a profound engagement with the characters' innermost feelings. Beyond being a mere backdrop, music played a crucial role in creating a symbiotic relationship between the audience and the characters. The carefully composed scores acted as conduits, forging a profound emotional connection that transcended the visual and auditory realms. The music served as a bridge, allowing the audience to empathize with the joys and sorrows of the characters, thus heightening the overall theatrical experience.

Moreover, the role of music extended beyond emotion, actively reinforcing dramatic elements within the opera. Composers skillfully utilized musical motifs, dynamics, and tempo to underscore pivotal moments, accentuating the narrative's tension, climax, and resolution. This strategic integration of music into the dramatic fabric of opera contributed immensely to its success during the 18th century, solidifying the genre as a captivating and emotionally resonant form of artistic expression. In essence, the multifaceted role of music in 18th-century opera was instrumental to its triumph. By serving as a conduit for emotions and a tool to reinforce dramatic elements, music became an inseparable and enriching aspect of the operatic experience, weaving an intricate tapestry that elevated opera to new heights of artistic achievement

In the 18th century, music become even more important in English literature, particularly in the novels. Novels of this time often included songs or musical pieces, which were meant to be performed by the characters. In Jane Austen's Sense and Sensibility, the inclusion of songs and musical interludes serves as a poignant reflection of the characters' emotional states and societal norms of the time. Elinor's composed and pragmatic nature finds resonance in the measured elegance of the musical pieces associated with her character, underscoring her internal struggles and restrained passions. In contrast, Marianne's fervent sensibility is mirrored in the more impassioned and spontaneous musical expressions, capturing the essence of her tumultuous journey. The integration of music not only enriches the narrative but also deepens the emotional resonance, providing a melodic backdrop to the nuanced character development within the confines of Austen's Regency-era world. During the same time, opera shows became popular form of entertainment, particularly in Italy. It was during this time that music played a crucial role in the success of opera shows. Opera was a combination of music, singing, acting and elaborate stage designs that were meant to entertain and engage the audience. The music in opera shows played a major role in conveying the emotions and drama of the story. The use of music in opera shows was diverse and multifaceted. It was used to create a specific mood and atmosphere that suited the story and characters, and it was also to reinforce the dramatic elements of the story. Music was an integral part of the opera experience and it was not uncommon for people to attend the opera solely to hear the Music.

There are different ways in which music can be used in literature, such as through the use of lyrics, sound effects, and specific genres of music. Music serves as a versatile tool in literature, enhancing narratives through various elements. Lyrics, when incorporated into a story, provide a unique avenue for conveying emotions, thoughts, or setting a specific tone. Sound effects, whether mimicking instruments or ambient sounds, can amplify the atmosphere

and immerse readers in the story's environment. Additionally, specific genres of music can act as a narrative device, reflecting characters' moods, cultural contexts, or even serving as a structural guide, influencing the pacing and rhythm of the plot. These diverse applications of music in literature add layers of depth and evoke powerful sensory experiences for readers. The research also discusses benefits and drawbacks of using background music in literature. On the one hand, music can help to create a more immersive and engaging reading experience for the younger or less experienced readers. On the other hand, it may also distract from the actual text, and the overall quality of the writing.

Background music also plays an important role in specific genres of literature, such as horror or romantic. For example, in horror literature the use of ominous or suspenseful music can heighten the tension and create a more terrifying atmosphere for the reader. Similarly, in romantic literature soft and romantic music can develop the emotional impact of the story and create a more immersive reading experience. The background music can play a significant role in modern literature by enhancing the reading experience, creating atmosphere, setting the tones and evoking emotions in the readers. It is very important to use music judiciously and in the way that does not detract from the quality of the writing.

Work in literature and music thus spans a very wide range of approaches, from investigations whose primary focus is historical - audiences, and the spaces they occupied - to close textual and theoretical analysis of the relationships between the literary and the musical. Interrogation of 'the cultural turn' in criticism alongside the continuing preoccupation of much recent scholarship in both literature and music with the wider cultural context, seems timely, given reservations expressed by those who pioneered the cultural study of music, and the signs of a renewed, albeit keenly historicized, interest in form within literary studies. Graduate students choosing topics that lead them to work between these two disciplines can expect to come up against some of the more adventurous approaches and urgent theoretical issues within both disciplines. Music is a powerful influence, affecting us emotionally, physically, mentally -- even moving us at a molecular level.

Music can be used as a magical power in English literature. Music in the story not only serves as a means of entertainment but also as a driving and transformative force. In *The Tempest* we can see how Arial played Music in the background. The music which was played by Arial had a magical power. In this play, by the play of music Ferdinand was dragged towards the island where Prospero and Miranda lived. Also, music was used in magical way which makes all the characters sleepy. Music also serves as a manipulative force and shaping the atmosphere. In this play we have seen that how music manipulates the characters. Specially Ferdinand was been manipulated by the use of music on the island. The music also represents the supernatural element of the play and acts as a means of communication between characters.

In the realm of English literature, music assumes a mystical role, transcending its

conventional function as mere entertainment to become a potent and transformative force. This enchanting power of music is vividly exemplified in William Shakespeare's *The Tempest,* where Ariel, the ethereal spirit, wields music as a magical tool with profound consequences on the characters and the narrative. At the heart of this magical interplay is Ariel's ethereal music, a force that extends beyond mere auditory pleasure. The music becomes a driving force, shaping the destiny of characters within the story. Notably, it serves as a catalyst in luring Ferdinand towards the island where Prospero and Miranda reside. The enchanting melodies, like a siren's call, draw Ferdinand into the mystical realm of the island, setting in motion a series of events that will unfold throughout the play.

However, the enchantment doesn't stop at mere allure; music in *The Tempest* is imbued with transformative powers. One notable instance is when the characters succumb to a magical slumber induced by the captivating music. This sleep, a product of musical manipulation, adds an otherworldly layer to the narrative, emphasizing the supernatural quality of the island and its inhabitants. The music becomes a mystical force capable of altering the very state of consciousness of those who encounter it. A particularly intriguing aspect is the manipulative nature of music in shaping the emotional and mental states of the characters. Ferdinand, in particular, falls victim to the subtle influence of music on the island. The melodies act as a mesmerizing force, wrapping around his senses and leading him into a state of emotional vulnerability. This manipulation through music serves as a testament to the intricate connection between sound and emotion, demonstrating how the harmonies and rhythms can sway the hearts and minds of individuals within the story.

Furthermore, music in *The Tempest* acts as a shaper of atmosphere, creating a palpable sense of enchantment and otherworldliness. The sonic landscape becomes a canvas upon which the supernatural elements of the play are painted. The auditory experiences created by Ariel's music contribute to the overall ambiance of the island, reinforcing its mystical nature. This atmospheric manipulation through music heightens the immersive quality of the play, drawing the audience into a world where the boundaries between reality and magic blur. Beyond its role in manipulation, music serves as a means of communication between characters in *The Tempest*. The supernatural essence of Ariel is intricately linked to the music, allowing for a unique form of interaction. The melodies become a language, conveying messages and intentions in a way that transcends spoken words. This musical communication not only adds depth to the character dynamics but also reinforces the fantastical and mysterious aspects of the play.

In essence, the use of music in *The Tempest* goes far beyond a mere embellishment of the narrative. It emerges as a magical power, a transformative and manipulative force that weaves through the fabric of the story. Ariel's music becomes a conduit for enchantment, shaping destinies, altering states of being, and acting as a bridge between the mundane and the supernatural. In this literary masterpiece, Shakespeare masterfully explores the mystical potential of music, demonstrating its capacity to transcend the ordinary and infuse the narrative with a touch of the magical.

There can be no doubt that Shakespeare had a considerable knowledge of music. Not only *The Tempest* there are several plays of Shakespeare with full of allusions to music. *The Twelfth Night* is another example and it is the only Shakespearean play to open and close in music. Music is used as a powerful symbol of love. The first words Orsino's command "If music be the food of love, play on…" is very familiar to all. And the music continues throughout the play to bring dramatic effect and to connect the audience to the themes. Shakespeare uses music in this play to help the audience to define the characters, the theme and tone and atmosphere of various scenes.

In *Ode to a Nightingale* and *The Waste Land* music plays a significant role in conveying emotions and themes. In *Ode to a Nightingale* Keats uses the Nightingale's song as an escape from the harsh realities of life, highlighting the power of music to transport the listener to a real of beauty and imagination. The Nightingale's song symbolizes an eternal, ideal world that contrasts with the fleeting nature. In *The Waste Land*, T.S. Eliot employs music to depict the fragmented and disillusioned modern world. He incorporates various musical references and rhythms to create a cacophony of voices, mirroring the chaotic and disorienting nature of contemporary society. The use of music in the poem reflects the breakdown of traditional structures and the search for meaning in a world that has lost its harmony.

In *Ode to a Nightingale* and The Waste Land, the role of music is pivotal in conveying complex emotions and exploring overarching themes. John Keats, in *Ode to a Nightingale*, masterfully employs the Nightingale's song as a vehicle for escapism from the harsh realities of life. The poet elevates the power of music, showcasing its ability to transport the listener to a realm of beauty and imagination. The Nightingale's song becomes a poignant symbol, representing an eternal and ideal world that stands in stark contrast to the ephemeral nature of human existence. Keats artfully intertwines the Nightingale's melodic notes with the speaker's contemplation of mortality and the fleeting nature of joy. The song becomes a sanctuary, offering solace and a temporary reprieve from the burdens of life. This exploration of the transcendent power of music highlights Keats' belief in its capacity to serve as a gateway to a realm untouched by the transience of human experiences.

On the other hand, T.S. Eliot employs music in *The Waste Land* to depict the fragmented and disillusioned state of the modern world. Eliot weaves various musical references and rhythms into the fabric of the poem, creating a cacophony of voices that mirror the chaotic and disorienting nature of contemporary society. The use of music becomes a vehicle for expressing the dissonance and confusion prevalent in a world that has lost its harmony. Eliot's incorporation of diverse musical elements, from classical allusions to popular tunes, reflects the breakdown of traditional structures. The poem becomes a collage of voices and sounds, representing the disintegration of cultural and moral norms. The dissonant musical tapestry mirrors the fractured state of society, where meaning seems elusive, and individuals are left grappling with a sense of disillusionment.

In both works, the use of music transcends mere aesthetic embellishment; it becomes a profound tool for conveying the human experience. Keats and Eliot, though belonging to different literary periods, recognize the emotive and transformative power of music. Whether as an escape to an ideal realm or as a reflection of societal disarray, the incorporation of music in these poems adds layers of depth, inviting readers to contemplate the profound impact of sound on the human soul in the face of life's complexities. Overall, it demonstrates how music can evoke deep emotions, serve as a form of escape, and reflect the human condition. The Nightingale's song in Keats' poem represents an unattainable ideal, while the musical references in Eliot's poem reflect the dissonance and fragmentation of the modern world. Music becomes a powerful tool for expressing complex ideas and emotions that words alone may struggle to convey.

Thus, it can be concluded that, music plays a significant role in English literature by influencing the emotions of the audience. It has the power to make readers feel a deeper connection to the text, enhancing their emotional experience and understanding. Music can easily and powerfully communicate simultaneously joys and sadness, festive revelry and deep rooted melancholy, and all other kinds of elusive thoughts and moods. Through the harmonious partnership of music and literature, a symphony of emotions is created, enriching and the overall impact of the written word. This paper reviews and underscores the profound influence of music on the landscape of English literature, serving as a dynamic force that moulds emotional connections between the text and its readers. Through an intricate dance, music intertwines with the written word, crafting a symbiotic relationship that transcends mere storytelling. This harmonious partnership is akin to a symphony, orchestrating a myriad of emotions that resonate throughout the narrative. Music becomes a conduit for heightened emotional experiences, enabling readers to forge a more profound connection with the characters and themes presented music adds an invisible layer of emotion and mood to stories and poems. Just like a soundtrack in a movie, background music in modern times can deeply affect how readers feel while they read. It can be concluded that music serves as multifaceted tool contributing to themes, character development and overall emotional depth to the works. The analysis highlights the intricate relationship between music and language, showcasing how writers use music as a medium to convey intricate narratives and to evoke profound sentiments. Music in short can relate artistic expression with human experience.

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Challenge of Privacy Preservation in BIG DATA

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Abstract

Today we live in a world where we experience a true Big Data explosion, a boom in databases and database technologies. Big Data is a subject undergoing intense study today and provides exciting opportunities for research in the coming years. It is a hot topic of research. Big Data comprises an enormous amount of personally identifiable information, user privacy is a major concern, and it is a massive challenge in Big Data. The multidimensional anonymization and access control are widely-adopted privacy preservation approaches. Some of the approaches have handled the security and privacy problems at the time of data shared among the different organizations. However, they do not efficiently preserve the data privacy since they fail in handling the attacks. This paper presents recent approaches and challenges to Big Data privacy preservation.

Keywords

Big Data, Privacy preservation, Anonymization,

1. Introduction

World Wide Web, mobile computing, and wireless technologies have emerged as a leading technology platform for potential applications. These applications generate a large volume of data called Big Data, such as Internet logs, social media, location information from the mobile phones, debit and credit card payment information, social media data, and survey details from the government and are susceptible to provide a personal user information [1, 2].

Table 1: Illustration of the 7 V's of Big Data

1	Volume	Increasingly enormous amount of data – MB, GB, TB, PB, ZB, YB
2	Velocity	Speed of data generation, collection and processing
3	Variety	Different types and sources of data – Web, Audio, Video, Mobile
4	Veracity	Biases, noise, abnormality and trust worthiness of data
5	Virality	Spread rate of data across the network
6	Viscosity	Resistance to navigate due to its complexity and thickness
7	Value	Usefulness and significance in making critical decisions

Big Data raises concerns about the tracking and profiling of people and consumers as it expands to all domains in terms of the above 7 V's. In the past, Big Data access has been limited only to the governments and large enterprises, but in the recent days, Big Data is accessible to everyone. If these data are accessed and analyzed properly, then it enables to offer a better understanding of human behaviors that helps the organization to improve their business as well as contributes to the field of global development. However, unauthorized user access and misusing of information collected from the users violate the protection of individual privacy. As multiple sources are involved, the risk of privacy gets doubled. Protecting privacy in Big Data is a fast growing filed of research. .

In this paper we give a short view of basic models in privacy preservation and recent approaches and techniques to preserve privacy of Big Data. Moreover we discuss various challenges in the area of research in privacy preservation of Big Data. This paper is organized as follows. The basic models in Big Data and various privacy preservation techniques in the literature. Then we discuss the current approaches to this problem and its limitations. Finally the future research challenges in the filed of Big Data privacy preservation are presented and discussed.

2. RELATED WORK

2.1. Basic Model in Privacy Preservation

2.1.1. K-anonymity

K-anonymity is one of the basic privacy preservation model. In the k-anonymity, every published record has to be indistinguishable from at least (k-1) others on its QI attribute. The "quasi-identifiers" are the attributes available to an adversary.

It is defined as: A table T satisfies k-anonymity if for every tuple $t \in T$ there exist $k-1$ other tuples $t_{i1}, t_{i2}, \ldots, t_{ik-1} \in T$ such that $t[C] = t_{i1}[C] = t_{i2}[C] = \ldots = t_{ik-1}[C]$ for all $C \in Q$.

K-anonymity [6] is the basic and effective privacy model to generalize the quasi-identifier values. It has been proposed to prevent the record linkage attack [27]. According to its concept k-anonymity, it is defined as if one record in the table has some value Quasi-identifier (Qid), at least k-1 other records also have the value qid. Using this definition, the approach in [28] tried to provide the privacy of data through generalizing all the values in an attribute to the same level of the taxonomy tree.

2.1.2 L-diversity

L-diversity is a group based anonymization model that assists to preserve the privacy of data through reducing the granularity of a data representation using generalization and suppression. In l-diversity, an equivalence class is said to have l-diversity if there is at least l "well-represented" value for the sensitive attribute. A table is said to have l-diversity if every equivalence class of the table has l-diversity.

It is defined as: A q block is ℓ-diverse if it contains at least ℓ "well-represented" values for the sensitive attribute S. A table is ℓ-diverse if every q block is ℓ-diverse.

2.1.3 T-closeness

T-closeness is another group based privacy model that extends the l-diversity model. It treats the values of an attribute distinctly, and considers the distribution of data values of the attribute to preserve the privacy. It uses the Earth Mover Distance (EMD) function to compute the closeness between two distributions of sensitive values.

It is defined as: An equivalence class is said to have t-closeness if the distance between the distribution of a sensitive attribute in this class and the distribution of the attribute in the whole table is not more than a threshold t. A table is said to have t-closeness if all equivalence classes have t-closeness.

2.1.4. Differential Privacy

Differential Privacy offers one way forward that to extract insights from a database while guaranteeing that no individual can be identified. It achieves the guarantee of privacy by adding noise to answer to the queries. The amount of noise added must be large enough to conceal the effect of individuals and small enough that does not distort the genuineness of the answer.

It is defined as: Let databases (D, D') differing only in one row, meaning one is a subset of the other and the larger database contains just one additional row. A randomized function K gives ε-differential privacy if for all data sets D and D′ differing on at most one row, and all S ⊆Range(K),

$$Pr[K(D) \in S] \leq exp(\varepsilon) \times Pr[K(D') \in S]$$

2.2. RECENT APPROACHES TO PRIVACY PRESERVATION IN Big Data

The work in [35] by Xu Lei and et al reviews the privacy issues related to data mining and different approaches involved in privacy preservation that helps to define new methods to provide privacy to sensitive information. This survey explores various users participating in data mining applications. Moreover, it explains their privacy concerns and suitable privacy methods according to their sensitive information. Moreover, it gives a brief introduction to the basics of related research topics, some ideas for future research. Finally, the survey concludes with the game theoretical approaches that assist to identify the interactions among the discovered users.

The approach in [16] by Hui Zhu and et al is towards the efficient and privacy-preserving computing in the Big Data era, and it exploits the new challenges of Big Data in privacy preservation. Initially, it defines the general architecture of Big Data analytics and discovers the privacy requirements in Big Data. Then, it finds out an efficient and privacy-preserving cosine similarity computing protocol.

Big Data analytics such as purchase histories, medical data, and sensor data are done with the help of cloud. However, the analysis of data using the third-party cloud server has an unauthorized access risk. To overcome this problem, [23] has introduced a privacy-preserving analysis technique using searchable encryption. It performs the text matching of encrypted text for statistical analysis and analysis of correlation rules without decrypting the data.

3. CHALLENGES IN RESEARCH

The improper use of data leads to privacy breaches and cause harm to data subjects and the data provider. A large number of privacy preservation techniques are proposed in the literature. However, the support is only limited to the data mining applications that manages small-scale and static data. The characteristics and nature of Big Data pose an immense challenge to privacy preservation. The scalability is a significant problem that occurs at the time of applying these techniques to Big Data. Again ensuring the utility of the data and preserving privacy is a great question before the researchers.

Moreover, Big Data comprises natural data which keeps changing continuously and thus, these techniques become obsolete. The existing privacy preservation approaches for Big Data lacks in providing efficient security to the data due to the mentioned problems. The storage is the most significant fact in Big Data processing. It needs massive computation and storage which demands the need of cloud computing. The application of cloud computing environment provides scalable solutions to solve the issues. Nevertheless, storage of data in the cloud increases the security problems. The extension of these techniques with the secure cloud infrastructure enables to preserve the privacy of the Big Data.

4. PROPOSED METHODS

The proposed system aims at providing a novel privacy preservation framework to preserve the large medical data privacy using the anonymization techniques. Fig.1 shows the steps involved in the proposed system. These are,

1. **Taxonomy Tree Creation:**

The process of the proposed system begins with the taxonomy tree creation which assists closely to classify the input data efficiently. A taxonomy tree is created using the table structure which consists of internal nodes and set of their leaves. For example, the internal node of table is address = {country} and a node country includes two leaves such as City and Taluk..

2. Slicing And Overlapping:

The slicing and overlapping approach is applied to anonymize the data set using the attribute partitioning and overlapping, column generalization and tuple partitioning.

3.Attribute Partitioning and Overlapping: With the intention of increasing the data utility, the most correlated attributes are overlapped in more than one column through attribute overlapping. The attribute partitioning decides the correlated attributes or fields in the

database, by computing the mean square contingency. The related attributes are under same column, for instance {address and phone number} and {Age and Sex}.

4.Column Generalization: Assuming that each node has a corresponding conceptual leaves. The leaves provide more details than a node. For example, birth date in D/M (e.g. 13/Mar) are leaves and Year of birth (Y) is a node. Generalization replaces values of leaves with node's values. For example, birth D/M is replaced by Y.

5.Tuple Partitioning: The tuple values are grouped together to form buckets. The tuple partitioning algorithm is first divides the tuples into buckets and to check whether the each bucket satisfies the l-diversity which ensures "diversity" of sensitive values in each group. For instance, tuples of age is divided into two buckets such as <20 and <40.

6. Differential Privacy:

In order to provide strongest privacy guarantee to the data, the proposed system combines the differential privacy with the overlapped slicing. The differential privacy maximizes the query accuracy from statistical databases and minimizes the individual identification by adding the noise to the data using Laplace mechanism and the Exponential Smoothing takes into account the score of utility function in a differentially private manner. Eventually, the anonymized data set gets stored on the secure cloud infrastructure. Eventually, the anonymized data set gets stored on the secure cloud infrastructure.

5. CONCLUSION

In this paper we presented a survey of Big Data, privacy preservation in Big Data and it's relevance and significance. Big Data characteristics show that we need different software and techniques for the processing of Big Data. The paper also presents the basic models of privacy, different privacy preservation techniques, recent approaches and the futures challenges in this field. It provides the overview of privacy preservation techniques and the importance of Big Data privacy Finally this work has attempted to provide a new framework for adequate data privacy of Big Data over the cloud. The system uses the differential privacy and overlapped slicing methods to preserve the privacy of dataset.

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Regulatory and Governance Reforms in Higher Education in India

(A case study of Copyright Infringement, Elsevier, Wiley & American Chemical Society Vs. Library Genesis & SCI-Hub)

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Abstract:

There is no doubt that Indian higher education requires reforms. It has been rightly said that 'Higher education is the mother of all professions'. If higher education is to function properly, it is necessary that it should be controlled by what are called the educated classes. Higher education in India serves as the cornerstone for societal development, aiming to cultivate enlightened, socially conscious, and skilled individuals capable of devising robust solutions to national challenges. Beyond individual employment opportunities, quality and controlled higher education is envisioned as the catalyst for a vibrant, cooperative, and prosperous nation. Higher education in India falls under two categories-Universities and Colleges. These two are regulated on the basis of their establishment and the programmes and courses offered by the universities and colleges. The entire ecosystem of higher Study in India is primarily overseen by the University grants Commission UGC & All India Council for Technical Education AICTE. UGC is the main regulatory body that performs a range of tasks such as providing funds to the universities, establishing education standards for the universities and analyzing the growth of the various higher education institutions. AICTE coordinates, plans and develops technical education in the country. Finally, the accreditation of the universities and colleges is overseen by the NAAC and NIRF. However, a closer examination reveals a multitude of challenges and reforms impeding the realization of the vision. This case study gives an overview of the regulatory and governance reforms in education system of India.

Keywords: Higher Education, UGC, AICTE, NAAC, NIRF

Introduction:

The present system of higher education was actually introduced by the British in the year 1857 with the universities of Calcutta, Bombay and Madras. At the time of independence we had only 20 universities and 695 colleges but today we have approx... 790 Universities whereas colleges have increased to more than 39000, thus putting huge pressure on the university administration. Indian higher education system is one of the largest education system in the world. The higher education sector in India has a three-tier structure comprising the university, college and course. This forms a vital link with the regulatory structure, and with accreditation agencies playing the key role in maintaining quality and standards in this sector. Inefficiencies in governance structure and a lack of visionary leadership contribute to the challenges faced by higher education institutions. The absence of clear and effective

regulation and governance mechanism results in delayed decision making, bureaucratic hurdles and inefficient resource allocation. The issues of governance & regulation in higher education are intertwined. Hence, the existing statutory position needs to be contextualized for any perspective on governance and regulatory issues in the sub-sector. Regulatory and governance reforms in higher education system in India is a different type of administration. Here, there is a need of proper regulation and a significant change and improvisation in the system with proper academic planning. The case study which is overviewed here is the case of 'copyright infringement' which reveals important transformations in the system. The case analyzes the current regulatory framework and governance of higher education on India and highlights areas that require important policy reforms and improvisations.

Case study:

In 2020, three major academic publishers Elsevier, Wiley, and American Chemical Society filed a copyright infringement suit in the Delhi High Court against two groups of websites going by the names 'Sci-Hub' and 'Libgen' which provide free access to millions of research papers/books. The plaintiffs have sought a permanent injunction against these websites and a dynamic injunction order so that the mirror links of these websites can be blocked as and when the plaintiffs notify. Additionally, the plaintiffs have sought an interim injunction against the defendants. They have now demanded that the two websites be banned from sharing their "literary works".

In a hearing, the court refused to grant a relief of removing the alleged infringing links from the defendant websites noting that there was no urgency as the alleged infringement had been going on since 2011. However, in light of the stand of Sci-Hub's counsel, the court ordered that "no new articles or publications, in which the plaintiffs have copyright, will be uploaded or made available". Libgen was unrepresented in this hearing. In the past two years, the suit has come up before the Delhi High Court at least 40 times. However, no interim injunction or temporary bar has been issued against the websites so far. While the case is being heard in the high court, several researchers and academicians have issued statements and come together in support of Sci-Hub and LibGen. They've also highlighted the impact any ban on the websites' publishing could have on research in India.

Legal and scientific experts have also pointed to a more "systemic problem", appealing to the government and the scientific community to address why such websites are needed in the first place. They've called for greater efforts to make research more accessible.

The journals have filed several similar infringement suits against the two websites in other countries, including Austria, Belgium, Denmark, France, Germany, Italy, Portugal, Russia, Spain, and Sweden.

This case is important because it can gave a significant impact on the broader research, academic and education environment in India.

Related case:

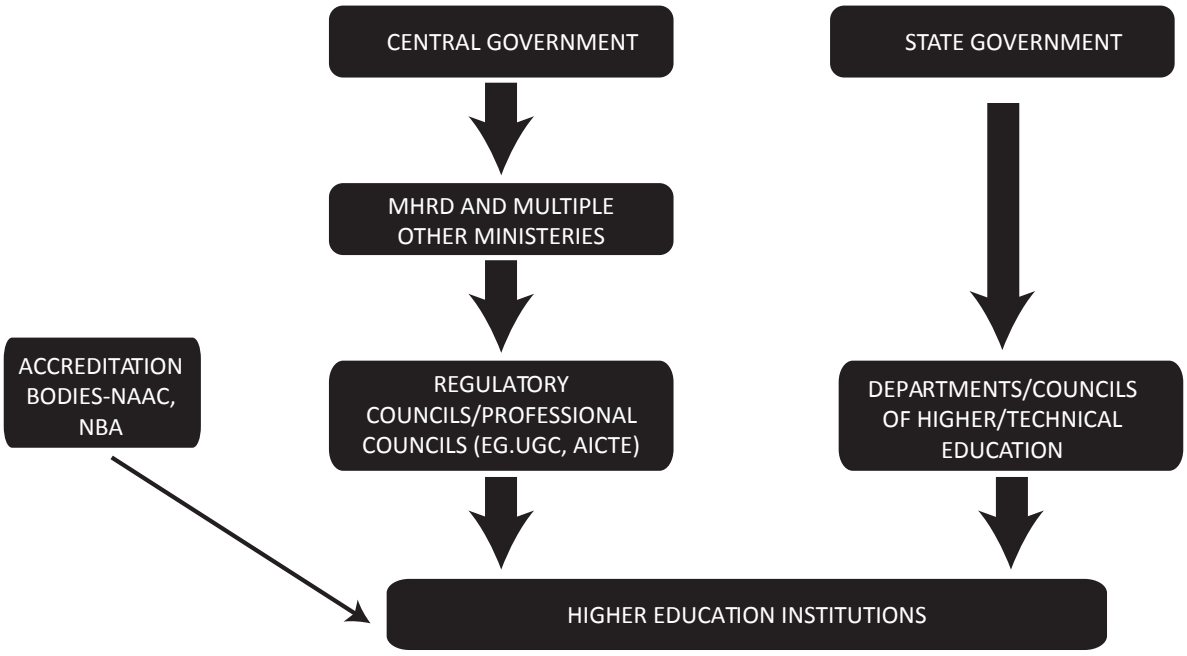
In 2012, publishers Oxford University Press, Cambridge University Press United Kingdom, Cambridge University Press India Pvt. Ltd., Taylor & Francis Group, United Kingdom and Taylor & Francis Books India Pvt. Ltd. sought to restrain the photocopy shop from supplying photocopied course packs to students. The lawsuit against the Rameshwari Photocopy Service and Delhi University accused the defendants of "infringing the copyrights of the plaintiffs in their publications by photocopying, reproduction and distribution of copies of plaintiffs' publication on a large scale and circulating the same…" The publishers sought a ban on all course packs, in an aggressive interpretation of Indian Copyright Act, 1957.

It argued the photocopy of copyrighted books at the university's campus were done by students for preparation of their course and was not meant for commercial exploitation. Intellectual property experts hailed the verdict, saying the court had correctly upheld the supremacy of social good over private property.

Review:

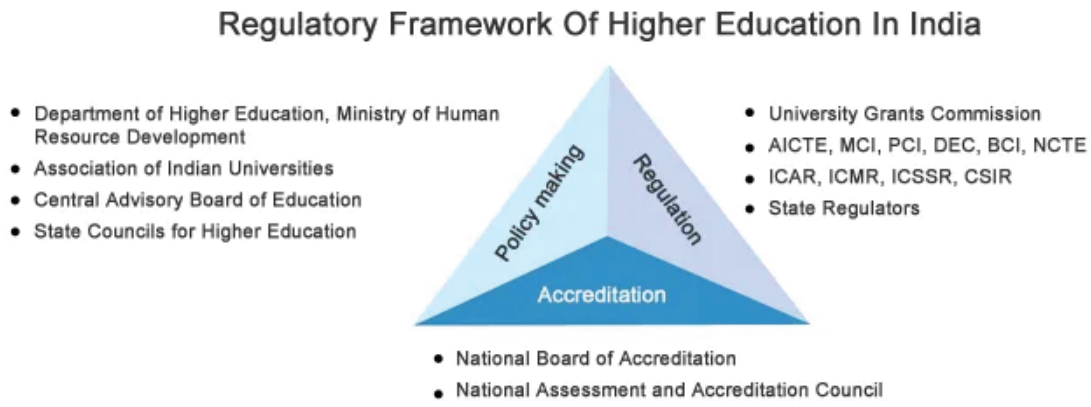
Education is not a privilege or luxury, it is a basic human right to which all are entitled to be. "In our culturally plural society, education should foster universal and eternal values, oriented towards the unity and integration of our people. Such value education should eliminate obscurantism, religious fanaticism, violence, superstition and fatalism.

Regulatory framework governing higher education in India



India's higher education system is the world's third-largest in terms of students, next to China and the United States. It has witnessed a tremendous increase in the number of Universities/

University level Institutions & Colleges since independence. The Gross Enrolment Ratio (GER) of India in higher education is only 25.2% which is quite low as compared to the developed and other major developing countries. There is no equity in GER among different sections of society. GER for males (26.3%), females (25.4%), SC (21.8%) and ST (15.9%). There are regional variations too. While some states have high GER some are far behind the national figures. Higher Education in India is plagued with rot learning, lack of employability and skill development due to the low quality of education. Poor infrastructure is another challenge to higher education in India. Due to the budget deficit, corruption and lobbying by the vested interest group (Education Mafias), public sector universities in India lack the necessary infrastructure. Even the Private sector is not upto the mark as per the global standard. Management of the Indian education faces challenges of over-centralization, bureaucratic structures and lack of accountability, transparency, and professionalism. As a result of the increase in a number of affiliated colleges and students, the burden of administrative functions of universities has significantly increased and the core focus on academics and research is diluted.

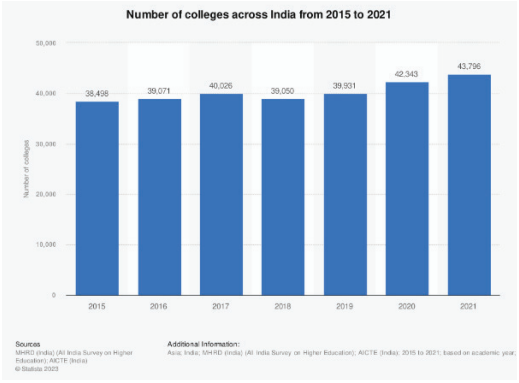


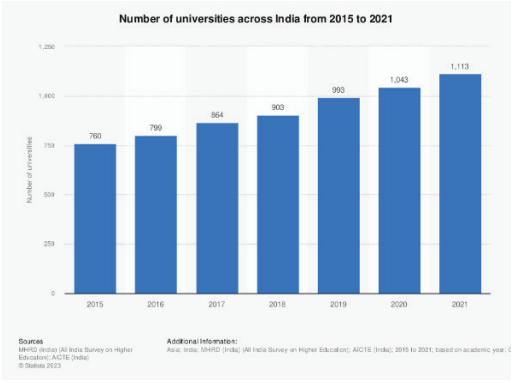
Challenges in higher education in India

1. Enrollment- According to All – India Survey on higher education (AISHE) report 2020-21, the Gross Enrollment Ratio (GER) in Higher Education in India is only 27.3%, which is quite low as compared to the developed as well as, other developing countries.
2. Accredition- As per the data provided by the NAAC, as of June 2010, "not even 25% of the total higher education institutions in the country were accredited. And among those accredited, only 30% of the universities and 45% of the colleges were found to be of quality to be ranked at 'A' level".
3. Quality- ensuring quality in higher education institutes is insufficient to meet the growing demand in the country. However, the Government is continuously focusing on quality education. Still, a large number of colleges and universities in India are unable to meet the minimum requirements laid down by the UGC and our universities are not in a position to mark their place among the top universities of the world.

4. Politics- Increasing interference of politicians in the management of higher education jeopardises the autonomy of HEIs. Also, students organise campaigns, forget their own objectives and begin to develop their careers in politics.

5. Poor governance structure- Management of Indian education faces challenges of over-centralization, bureaucratic structures and lack of accountability, transparency, and professionalism. As a result of the increase in the number of affiliated colleges and students, the burden of administrative functions of universities has significantly increased and the core focus on academics and research is diluted





Number of colleges across India from 2015 to 2021 Number of universities across India from 2015 to 2021

Source: Higher Education in India: Twelfth Five Year Plan (2015-21) and beyond FICCI Higher Education Summit 2021

EDUCATIONAL STANDARDS

The recent litigations against Scihub and Libgen by Elsevier, Wiley & ACS brings us to a moment of many realizations about control and governance of knowledge in academia. In the latter half of the 20th century, globalization led to the imperative of applying "global" standards to higher education. As global standards have been unofficially understood as the prevailing practices in American and European institutions, this has posed a serious dilemma for institutions in the global south. Such parameters are often not compatible with the educational systems that have historically evolved in countries like India, with a colonial past and a persisting "non-industrial" present.

Need of the Hour: Regulatory and Governance Reforms:

1. Restructure or merge different higher education regulators (UGC, AICTE, NCTE etc.) to ensure common vision and effective coordination.

2. Amend UGC act to give legislative backing to regulatory structure.

3. Allow foreign institutions to operate joint degree programmes with Indian institutions.

4. Link University grants to performance

5. Select Vice Chancellors of universities through a transparent and objective process.
6. Broaden the scope of Massive Open Online Course (MOOCs) and Open and Distance Learning (ODL) to provide access to quality education beyond geographical boundaries.
7. All central universities should develop strategic plans for getting into the top 500 global universities. Rankings in the next 10 years.
8. Funding to these institutions should be linked to performance and outcomes through the MHRD and newly constituted Higher Education Funding Agency.
9. The goals of the higher education, for that matter any education system of any country is expansion with inclusion, ensuring quality and relevant education.
10. To meet these challenges, there is a need for policy to identify the issues involved, to build up on the earlier policies, and to take a step ahead.

Conclusion:

Higher Education in India will be impossible if we have an over-zealous copyright law. Quality assurance in higher education is today the top priority of the policy agenda.

Post-secondary education needs to prepare graduates with new skill, a broad knowledge base and a wide range of competencies to enter a more complex and interdependent world. There is a dire need to undertake reforms in the entire higher education sector beginning with regulatory structures and going down to the institution level.

1. Indian higher education requires reforms, but the latter need to be cognisant of the reality of higher education in India.
2. Regulations without felicitation will merely bureaucratise the governance of knowledge without generating any path breaking insights.
3. While the UGC hopes to raise the standards to global levels, precarity of employment, longer teaching hours, a dismal student-teacher ratio, lack of sabbaticals, research and travel grants, access to research facilities and office space, adversely impact the research potential of teachers.
4. Unfortunately, in the era of the hegemony of finance capital, governments globally are under pressure to cut back on expenditure on public institutions, including educational.
5. "Regulating" research needs to be replaced with "facilitating" research, allowing minds to think and gestate.
6. Create independent quality assurance frameworks to address the quality deficit in the higher educational institutions. Setting up of an Internal Quality Assurance Cell (IQAC) is one such mechanism to ensure quality within the institutional framework and linking it with the standards set by the quality assurance agencies.

7. A governance structure where in appointment of VC & Professors are through transparent and competitive process
8. Restructuring the existing regulatory bodies and relook at their multiplicity in a rationalized manner.
9. Need to re-align the regulatory functioning in such a way as to promote autonomy of institutions. This approach envisages that we embrace a paradigm shift from to facilitation rather than regulation

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Navigating Discrimination Based on Race Gender and Cast: An Exploration of Professional and Relational Ethics in Work Spaces

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Abstract

This abstract provides a glimpse into a comprehensive exploration of the nuanced challenges posed by discrimination based on race, gender, and caste within the professional realm. As workplaces strive for inclusivity, this study delves into the ethical dimensions associated with the intersectionality of these identity markers. The inquiry not only addresses the professional ramifications but also considers the broader impact on relational ethics within the organizational fabric. In today's diverse and dynamic workspaces, individuals often find themselves grappling with discrimination rooted in race, gender, and caste. This research dissects the multifaceted nature of such discrimination, aiming to elucidate the ethical implications for both employees and organizations. The paper investigates the role of empathy, allyship, and organizational support in mitigating the adverse effects of discrimination on workplace relationships. By doing so, it aims to provide practical insights into fostering a more equitable and ethical professional community.

A key aspect of the caste-gender complex is the deployment of deeply embedded practices of structural violence and atrocity and hostile environments Let us speak about a powerful force that has the potential to transform the way we approach challenges in our workplaces – ***the force of diversity and inclusion.*** *In conclusion, this paper contributes to the ongoing discourse on diversity, equity, and inclusion by shedding light on the ethical dimensions of discrimination based on race, gender, and caste in the workplace. By exploring both the professional and relational aspects, it offers a holistic understanding of the challenges at hand and suggests actionable strategies for organizations to foster ethical and inclusive environments. Ultimately, this study seeks to contribute to the transformation of workplaces into spaces where individuals can thrive irrespective of their identity markers.*

Key words: Discrimination, Ethical Dimension, Diversity, Inclusion, Work spac

Navigating Discrimination Based on Race Gender and Cast:

An Exploration of Professional and Relational Ethics in Work Spaces

Introduction: I would like to delve into a critical topic that resonates deeply with our shared commitment to fostering a just and inclusive society. Our focus today is on the pervasive issue of discrimination based on race, and the profound impact it has on individuals within

the public space. We will specifically explore the role of both professional and relational ethics in addressing and mitigating racial discrimination.

I. **Understanding the Landscape of Racial Discrimination**: To comprehend the gravity of racial discrimination, we must first acknowledge its prevalence in various aspects of public life. From the workplace to educational institutions and beyond, individuals from marginalized racial backgrounds often face systemic barriers that hinder their full participation in society. It is our collective responsibility to shed light on these issues and work towards dismantling the structures that perpetuate discrimination.

II. **Professional Ethics and Accountability:** Professionals across diverse fields play a crucial role in shaping the public sphere. Whether in law, healthcare, education, or any other profession, it is imperative for individuals to uphold a strong commitment to professional ethics. This includes promoting fairness, impartiality, and equal opportunities for all, regardless of race. By holding ourselves and our colleagues accountable to these standards, we contribute to creating a more just and equitable society.

III. **Relational Ethics in Public Spaces:** Beyond the confines of professional responsibilities, our interactions within public spaces are guided by relational ethics. How we treat one another on a day-to-day basis, the conversations we engage in, and the empathy we extend all influence the broader societal narrative. Addressing discrimination based on race requires fostering positive and inclusive relationships, challenging biased perspectives, and actively promoting an environment where diversity is celebrated rather than tolerated.

IV. **The Intersectionality of Discrimination**: Recognizing the intersectionality of discrimination is essential in our efforts to combat racial bias. Individuals often experience discrimination based not only on race but also on gender, socioeconomic status, and other intersecting factors. By acknowledging and understanding these complexities, we can better formulate comprehensive strategies to dismantle discriminatory practices and create a more inclusive society. Let us reaffirm our commitment to addressing discrimination based on race in public spaces. By upholding both professional and relational ethics, we have the power to effect positive change. It is through our collective efforts that we can build a society where every individual, regardless of their racial background, can thrive and contribute to the rich tapestry of our shared humanity. Together, let us create a future where discrimination is replaced by understanding, and where justice and equity prevail.

CONFRONTING DISCRIMINATION BASED ON RACE IN THE WORKPLACE: A CALL TO ACTION

To address a pervasive issue that continues to plague our workplaces and compromise the principles of fairness and justice—discrimination based on race. In the spirit of fostering inclusivity, let us embark on a journey of awareness, accountability, and collective action.

I. **Acknowledging the Reality:** Before we delve into the complexities of addressing racial discrimination in the workplace, it is crucial to acknowledge the reality that many individuals face daily. For too long, the workplace has been a battleground for those who are marginalized due to their racial background. Stereotypes, biases, and systemic barriers persist, hindering the professional growth and well-being of countless talented individuals.

II. **The Economic and Moral Imperative**: Beyond the human toll, it is essential to recognize the economic impact of racial discrimination. A workplace that thrives on diversity and inclusion is not just a moral imperative; it is a strategic advantage. Diverse perspectives foster innovation, creativity, and problem-solving, driving organizational success. It is not just about doing what is right but also about doing what is smart for the growth and sustainability of our organizations.

III. **Creating a Culture of Inclusivity:** The responsibility for dismantling racial discrimination lies not only with organizational leaders but with each and every one of us. It begins with cultivating a culture of inclusivity where differences are celebrated, and each individual is valued for their unique contributions. Leaders must set the tone by championing diversity initiatives, promoting unbiased hiring practices, and ensuring equal opportunities for career advancement.

IV. **Unpacking Implicit Bias**: Implicit biases often lurk beneath the surface, influencing our decisions and actions in subtle ways. It is imperative for us to acknowledge and confront these biases within ourselves and our colleagues. Regular training programs on diversity, equity, and inclusion can help raise awareness, challenge preconceived notions, and foster a more conscious and equitable work environment.

V. **Establishing Clear Reporting Mechanisms:** Institutions must establish transparent and accessible reporting mechanisms for incidents of racial discrimination. Employees should feel empowered to speak up without fear of retaliation, confident that their concerns will be addressed promptly and fairly. This ensures that the workplace remains a safe space for everyone, irrespective of their racial background.

VI. **Leveraging Allyship:** True progress in combating racial discrimination requires active allyship. Colleagues, regardless of their racial background, must stand united against discrimination. This involves actively listening, learning, and advocating for change. As allies, we can use our collective voice to amplify marginalized perspectives and push for policies that promote equity and fairness.

Conclusion: In conclusion, the fight against racial discrimination in the workplace is a collective responsibility that requires unwavering commitment. Let us be catalysts for change within our organizations, challenging the status quo and building workplaces where diversity is not just tolerated but celebrated. By taking these steps, we contribute not only to the wellbeing of individuals but to the strength and resilience of our organizations and, ultimately, to the progress of society as a whole. Together, let us create workplaces where

talent knows no racial boundaries and where every individual can thrive.

DISCRIMINATION BASED ON GENDER IN WORK SPACE

It is disheartening to acknowledge that, in this day and age, gender discrimination continues to persist in various forms within our professional spheres. This issue not only contradicts the principles of equality and fairness but also hampers the potential for growth and innovation that diverse perspectives bring to the table.

Firstly, let us recognize that gender discrimination is not solely a women's issue; it affects everyone in the workplace. Both men and women can face bias based on their gender, and this discrimination can manifest in various ways, from hiring practices to pay differentials, promotions, and even day-to-day interactions.

One prevalent form of gender discrimination is the gender pay gap. Despite decades of progress, women still earn less than men for the same work. This not only perpetuates economic inequality but also sends a message that the contributions of women are not valued equally. It is essential that we address this issue head-on by promoting transparent pay structures and ensuring that all employees, regardless of gender, are compensated fairly.

Moreover, gender discrimination often rears its head during the hiring and promotion processes. Unconscious biases can influence decision-making, leading to the perpetuation of gender stereotypes and limiting opportunities for qualified individuals. It is crucial for organizations to implement diversity and inclusion training programs to raise awareness about these biases and create a more equitable workplace culture.

In addition to systemic issues, gender discrimination can manifest in the form of subtle and insidious behaviours, such as microaggressions and exclusionary practices. For example, interrupting or dismissing someone based on their gender, making inappropriate comments, or excluding individuals from important meetings or networking opportunities can create a toxic work environment.

As a society, we must actively work to dismantle these discriminatory practices. Employers should foster an inclusive culture that encourages open dialogue, where employees feel empowered to report incidents of discrimination without fear of retaliation. It is imperative to create channels for communication and support, such as anonymous reporting mechanisms and grievance procedures, to address these issues effectively.

In conclusion, addressing gender discrimination in the workplace is not only a moral imperative but also an economic one. Diverse and inclusive workplaces are more innovative, productive, and successful in the long run. By collectively taking a stand against gender-based discrimination, we can create a future where every individual is afforded equal opportunities and is judged solely on their skills, qualifications, and merit, irrespective of gender.

It's not enough to recognize the existence of gender discrimination in the workplace; we must actively work towards dismantling these barriers and fostering an environment where

every individual, regardless of gender, can thrive.

PRACTICAL STEPS TO BRING ABOUT GENDER PARITY FROM AN ETHICAL STANDPOINT.

First and foremost, let's address the **gender pay gap.** It's time to put an end to unequal pay for equal work. Organizations must conduct regular pay audits to identify and rectify any disparities. Pay should be based on skills, experience, and performance, not on gender. Transparency in salary structures is not just fair; it's an ethical imperative that builds trust among employees.

- **Promotions and advancement opportunities** should be based on merit, not gender. Let's break free from traditional stereotypes and ensure that individuals are assessed based on their abilities and potential. Implement mentorship and sponsorship programs that actively support the career development of under-represented genders. Encourage women to pursue leadership roles and create a culture that values diverse perspectives at all levels of the organization.
- **Education and awareness are powerful tools** in the fight against gender discrimination, implement regular diversity and inclusion training for all employees. Help them recognize and challenge unconscious biases. By fostering a workplace culture that celebrates differences, we not only create a more ethical environment but also one that is more innovative and resilient.
- **Flexible work arrangements should be a norm, not an exception**. Recognize that individuals have different needs and responsibilities outside of work, and provide options that allow for work-life balance. This not only benefits women but also encourages a more inclusive workplace that values the contributions of all employees.
- **Zero-tolerance policies should be in place for any form of harassment or discrimination**. Create a safe and supportive reporting system that ensures individuals feel empowered to speak up without fear of reprisal. Ethical organizations take a stand against discrimination and actively work to create an environment where everyone feels respected and valued.
- **Lastly, lead by example. Leadership sets the tone for the entire organization.** Ensure that leadership teams are diverse and inclusive. When individuals see people who look like them in leadership positions, it sends a powerful message that success is attainable for everyone.

PRACTICAL STEPS IN ERADICATING CASTE-BASED DISCRIMINATION

Eradicating caste-based discrimination requires a concerted effort from individuals, organizations, and society at large. Here are practical steps that can be taken to address and eliminate caste-based discrimination in the workplace:

- **Develop and Implement Anti-Discrimination Policies:** Clearly articulate a strong commitment to diversity, inclusion, and non-discrimination in the organization's policies.

Specifically address caste-based discrimination in the anti-discrimination policy. Ensure that these policies are communicated effectively to all employees.

- **Raise Awareness through Training Programs:** Conduct regular diversity and inclusion training programs for all employees, emphasizing the importance of respecting diversity, including caste differences.
- **Incorporate real-life case studies and scenarios to illustrate the impact of castebased discrimination.**
- **Promote a Merit-Based Culture: Emphasize meritocracy in hiring, promotion, and performance evaluation processes.**
- **Establish clear criteria for professional advancement,** and ensure these criteria are communicated transparently to all employees.
- **Ensure Fair Recruitment Practices: Regularly review and audit recruitment processes to identify and eliminate biases. Implement blind recruitment techniques** where possible to minimize the influence of personal biases.
- **Establish Diversity and Inclusion Committees: Form committees or task forces dedicated to promoting diversity and inclusion.**
- **Encourage employees to voice concerns and provide feedback anonymously if needed.** Provide Channels for Reporting Discrimination: Establish confidential and accessible reporting mechanisms for employees to report incidents of discrimination, including caste-based discrimination.
- **Ensure that there are clear procedures for investigating and addressing reported cases.**
- **Create a Supportive Workplace Culture**: Foster an inclusive workplace culture that values and celebrates diversity.
- **Encourage open dialogue about caste-related issues** and create spaces for employees to share their experiences.
- **Offer Employee Assistance Programs:**
- **Provide counselling services or Employee Assistance Programs** (EAPs) to support employees who may be dealing with the effects of discrimination.
- **Promote Diversity in Leadership:** Actively work towards increasing diversity in leadership positions. Ensure that decision-making bodies reflect the diversity of the organization, including representation from different castes.
- **Monitor and Evaluate Progress:** Regularly assess the organization's progress in combating caste-based discrimination. Collect and analyze data related to diversity and inclusion to identify areas that need improvement.
- **Collaborate with External Organizations:** Partner with external organizations and NGOs that specialize in diversity and inclusion to gain insights and best practices. Participate in industry-wide initiatives aimed at addressing discrimination.
- **Encourage Allies and Advocates:** Encourage employees to be allies and advocate for their colleagues who may be facing discrimination.

- **Provide resources for employees to educate themselves** and actively support a discrimination-free workplace.

In conclusion, achieving gender parity is not just a business imperative; it's a moral obligation. By taking these practical steps, we not only create a more ethical workplace but also one that is more successful, innovative, and resilient. Let's commit to fostering an environment where every individual, regardless of gender, can thrive and contribute their best. **By taking these practical steps, organizations can contribute significantly to the eradication of caste-based discrimination** and create an environment where all individuals are treated with dignity and respect. It is a collective effort that requires ongoing commitment and dedication from all stakeholders.

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Eco-consciousness an Inherent Necessity in Gary Snyder: An Eco-critical Study from the Selected Poems

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Abstract

Ecocriticism is a newly developed branch of literary criticism. It is associated to ecological literacy; this literacy helps the writer to raise the ecological issues in creation. It is a new movement of the age which has now fully bloomed in the last four decades. Eco criticism is a swiftly changing approach that has lately came into emergence. The eco critics notice both the local and global as well as the physical, natural and also the historical and recent in the perspective of a work of art. Eco critical approach is interdisciplinary. It combines green studies, the natural sciences and social sciences. This research paper deals with the idealistic vision of Gary Snyder that stresses on the relationship between natural world and humans. It investigates the major poetic works and ecological implications by Snyder such as Turtle Island (1974), Riprap and Cold Mountain Poems (1959), and Mountains and Rivers without End (1996). The paper attempts an ecological reading of the selected poems Snyder that attracts readers attention to the significance of environmental concerns embodied in the poetic works of Gary Snyder.

Key Words – Ecocriticism, ecology, ecological consciousness, environment, nature.

Introduction

The formative influences that contribute to the making of a poet is prominent. Personal experiences, emotions, relationships, cultural background and exposure to literature and art all play significant roles and shaping a poet's unique voice and perspective. Additionally, life events, struggles and moments of introspection often fuel the inspiration behind their poetry, making it deeply personal and relatable to others. Becoming a great poet often involves a combination of personal experiences, reading a vast range of literature, exploring various writing techniques and owing one's own unique voice. It is also influenced by emotions, observations, and a deep connection to the world around you. Additionally, interacting with other poets, receiving feedback, and consistently practicing and refining your craft play crucial roles in the journey to becoming a great poet.

Gary Snyder is a renowned American poet, essayist and environmental activist. Born on May 8,1930, in San Francisco, California he grew up in the Pacific Northwest, surrounded by nature. Throughout his life, Snyder has explored various cultures and landscapes, including spending time in Japan studying Zen Buddhism. This experience heavily influenced his poetry and ecological consciousness. His works often reflect themes of wilderness, spirituality and

social issues. Gary Snyder's educational journey played a crucial role in shaping his world view and literary pursuits. After completing graduation from high school in 1947, he attended Reed college in Portland, Oregon. At Reed, Snyder studied literature, anthropology and Asian studies. During this time, he developed an interest in Eastern philosophy and cultures, which later influenced his work significantly. In 1951, Snyder left Reed College and ventured to Japan to study Zen Buddhism. He spent several years in Japan practicing at a Zen monastery and immersing himself in the culture and language. His experiences there had a profound impact on his poetry and environmental consciousness. After returning to the United States, Snyder attended Indiana University and graduated in 1956 with a degree in anthropology. His academic background, with his great interest in Zen Buddhism and ecology, contributed to the unique blend of themes found in his literary works. Snyder's deep connection to nature, his exploration of Eastern philosophies, and his anthropological studies all intertwined to create a distinctive voice that resonated with readers and earned him recognition as one of the leading poets of his generation.

Ecology is the study of relationship between living organisms including human and their environment. The term 'ecology' was coined by Earnest Haeckel who was a German Zoologist in 1866. It is concerned with the living organisms and how they interact with the natural world. It also gives us information regarding the benefits of eco – system and how we can use the natural resources being environment friendly and without causing any harm to nature. Ecology first started gaining attention in the 1960s, when environmental and climatic issues were rising to a great extent and was of public awareness. Although scientists have been studying and observing the natural world since centuries, ecology in the modern way has only been raised around the 19th century. By this time scientists started studying the functions of plants and their effects around them. Eventually this led to the study of plants and animals and how they interact with each other in the ecosystem.

Ecosystems are strongly connecting systems of organisms, their communities and the environment. Wetlands, mangroves, rainforests, and coral reefs are example of the ecosystems. It maintains a very delicate nature or balance. Various activities of human beings threaten to disrupt this balance and destroy the world's ecosystems. The human activity plays a vital role in the health of ecosystems all around the world. Pollution coming from factories makes the water as well as the food supply potentially changing an entire food web. Pollution is the greatest cause of ecosystems destruction. Global warming has led to increase temperature, sea levels and ocean acidity that disrupt an ecosystem's natural balance. Therefore, it is very important to follow the measures necessary to maintain the ecological balance. Ecological balance, also known as ecological equilibrium or ecological stability, refers to the state of a natural ecosystem where all living organisms and their physical environment are in harmonious coexistence. It is the balance and interdependence between various components of an ecosystem, including plants, animals, microorganisms, and their surroundings.

Ecocriticism is the interdisciplinary study of literature and ecology where literature scholars analyze text that talks about environmental concerns and examines the ways by

which literature treats the subject of Nature. Since the 1980s, when people were concerned about environmental issues ecological awareness took over people's mind at that time eco criticism came in light. Ecocriticism answers, what are the human ethics and how Nature should be treated.

The rise of ecocriticism was at first encouraged by its foundational interest in nearby subjects and types of information. The way it made more troublesome for an ecocritical hypothesis to step toward trans-nationalism. Even though widespread resistance against the procedures of globalization in environmentalism and ecocriticism, the idea of 'diversity' has worked as a methods for recovering the oppositional position related to the transnational subject through two story systems: (i) the depiction of multicultural and in some cases, transnational atomic families as the accounts answer for ecological and political issues, (ii) allegorical superimpositions of natural and social assorted variety, on the other. Reasoning arises in normal thinking. The good and beautiful issues acted by the overall natural crisis, drive masterful specialists to see the basic part. The input play is in understanding man's circumstance in the ecosphere. Environment is the science that looks at the associations between living creatures (biotic portion) and their physical encompassing (abiotic part).

Technological inventions and scientific discoveries were all directed towards achieving human control over the natural environment. Due to the increasing technology and inventions, there is a disbalance caused in the natural world. It is the German scientist Ernst Haeckel who first coined the term "ecology" ("Ökologie") in 1866. Haeckel defined it as "the study of all environmental conditions of existence" (Worster 192). Environmental justice activists have also occasionally highlighted some of the connections between struggles for environmental justice in the US and other parts of the world. Gary Paul Nabhan, an internationally-celebrated nature writer, gives great importance to the maintenance of cultural diversity in its connection with ecological conditions as a way of preserving and enhancing human health.

Eco consciousness is a central theme in Gary Snyder's works. His writings often reflect the profound awareness of the interconnectedness of all living beings and the environment. Snyder's poetry and essays advocate for a harmonious relationship between human beings and the Natural world. He emphasizes the importance of sustainable living, mindfulness of ecosystems, and a deep respect for indigenous wisdom. Through his eco-conscious lens, Snyder encourages readers to revaluate their place in the natural order and consider the ethical implications of their actions on the planet.

Gary Snyder's intellectual journey showcases a transition from androcentrism to ecofeminism, representing a profound shift in his views. Initially, Snyder's writings exhibited a male-centered perspective, emphasizing masculine ideals and often overlooking the interconnectedness of gender and ecology. As time went on, his interactions with the Beat Generation and exposure to Eastern philosophies began shaping his ecological consciousness. This evolution ultimately led him to embrace ecofeminism, recognizing the parallels between the exploitation of women and nature. His later works reflect a deep commitment to advocating for both gender equality and environmental sustainability, showcasing his transformation

from a narrower viewpoint to one that embraces a holistic understanding of humanity's relationship with the Natural world. Several key influences played a pivotal role in Gary Snyder's transformation from androcentrism to ecofeminism: Snyder's deep engagement with Eastern philosophies, particularly Buddhism, Taoism, and Zen, exposed him to perspectives that emphasized interconnectedness, balance, and harmony with nature. These teachings helped shift his focus away from a solely male-centered perspective towards a more holistic understanding of humanity's place within the natural world. Snyder's association with the Beat Generation, including figures like Allen Ginsberg and Jack Kerouac, exposed him to unconventional and progressive ideas. This movement's rejection of mainstream norms and exploration of alternative lifestyles encouraged Snyder to question traditional gender roles and societal norms. His fascination with Native American and indigenous cultures revealed their deep reverence for the land and their more equitable relationships between genders. Learning from these cultures provided him with insights into sustainable living practices and the inherent value of gender equality. As Snyder became more involved in environmental activism, he recognized the profound connections between ecological issues and social justice. This awareness propelled him towards ecofeminism, which highlights the intersection of gender oppression and environmental exploitation. Snyder's own experiences spending time in nature, working on ecological projects, and participating in indigenous rituals gave him first hand insights into the interdependence of all life forms. These experiences further reinforced his shift towards ecofeminist ideals. These influences collectively led Gary Snyder on a transformative journey, guiding him from an androcentric worldview to one that embraced ecofeminism—a perspective that acknowledges the inseparable connections between gender, nature and social justice.

Snyder spent his childhood days in the pacific northwest from where he developed great interest in the natural world and it constituted his poetic style. He focused on the ecology and its relationship with human beings. He also had great interest in Buddhism. Buddhism preaches love, kindness, sympathy, joy and serenity. Thus, we find a combination of religion and environmentalism in the writing of Gary Snyder. His eco consciousness exist in almost all of his works.

In other words, reading the poem based on the ecological factors shows that the humans have a very small place in the huge universe and to favour this idea and to put in practice. Snyder lived in a small Japanese island named Suwanosejima while he was staying in Japan. Snyder shows serenity and solitariness in this poem. Living a simple life and being close to nature make the poet feel at peace. He does not showcase himself as a dominant figure but rather he presented himself as a small art of the ecosystems. Another poem from his later volume *Axe Handles*, has the similar ecological implication of equality among all the living beings. Snyder is less concerned with spiritual states than with man’s harmony with the environment. He believed that, human beings should know plant life, weather, soil and all knowledge needed to preserve biological life. In one of his poems, it is shown that he had a face-to-face encounter with a fish, the entire poem seems to be the real event with religious

and ecological ideas conveyed to the readers. Snyder represents the theme that everything in the universe is equally important and no component is superior or inferior.

Snyder wanted to know about human life but not is isolation and being separate from the other elements of nature. Snyder believed that the earth itself is a living being with its trees, rocks, plants, animals, etc. Throughout the poem we find connections between humans, animals, plants, and rocks. The poem "applies to us only insofar as we can see ourselves as products of, and preservers of, a physical environment" (Molesworth 94). His works tried to change the mind set of people towards nature and showed different ways to interact with the nature. Snyder wrote in an essay entitled Writers and the War against Nature in one of his collection of essays Back on the Fire.

Conclusion

Since poetry is the most influenced and significant part in any literary movement, poetry encapsulating ecological consciousness played the major role in eco criticism, by showing and highlighting that every single entity is important, and significant as much as the others, whether it was a human being, animal, or even plants. In other words, everything is connected to everything. Gary Snyder according to my analysis is the pioneer of the ecological consciousness poetry, who established a strong interest in nature as a youth experiencing a traditional "other" at the Museum of Art in Seattle. The seed which this early encounter has planted in him, this early knowledge of a strong connection with Chinese landscape paintings and the Chinese view of Nature helped him far later, in his magnum opus writings. After living most of his life with Chinese and Japanese societies, Snyder was influenced by the Buddha's culture and perspectives, especially how do they treat and read Nature. He translated that passion and influence of these cultures in his literary writings, which made his poetry, prose, and essays, revolutionary movement toward the western literature. Snyder claims that environment consists different living organisms of different species. Snyder believes that Nature has got divinity and one should return to his/ her motherland of divinity devoid of impurity of modernism.

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Catholic Higher Education Society and Ministry of Education

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Education has been one of the important apostolate of Catholic Church from its inception. In terms of the involvement of personnel and huge investments of resources, it is the most visible, important, challenging and vibrant ministry of the time. We render remarkable and commendable services through our educational institutions and the society has great appreciation for our existence, excellence and efficiency.

Catholic Church reminds us that the aim of all educational endeavors is the formation of the human person for the fulfillment of his individual and social responsibilities. We have to give an excellent and all round education to the students in our educational institutions. (Catechism of the Catholic Church).

The Church has always considered education as an essential part of its mission received from Christ. To fulfill this mandate, she received from her divine founder of proclaiming the mystery of salvation to all men and of restoring all things in Christ, Holy Mother the Church must be concerned with the whole of human life, even the secular part of it insofar as it has a bearing on his heavenly calling. Therefore, she has a role in the progress and development of education.

The Second Vatican Council considered with care how extremely important education is in the life of man and how its influence ever grows in the social progress of this age. Consequently, attempts are being made everywhere to promote education. The rights of men to an education, particularly the primary rights of children and parents, are being proclaimed and recognized in public documents.

As the number of pupils rapidly increases, schools are multiplied and expanded far and wide and other educational institutions are established. New experiments are conducted in methods of education and teaching. Strenuous attempts are being made to obtain education for all, even though vast numbers of children and young people are still deprived of even rudimentary training and so, many others lack a suitable education in which truth and love are developed together.

The Christian education is a means to impart the gospel values to the youth while they are being trained in the skills to take up their individual and social responsibilities.

Today the field of education is undergoing rapid changes in our country, liberalization, mushrooming of self-financing institutions, introduction of self-financing colleges and university study centers by Government Universities, introduction of NEP (National Education Policy), introduction of creative and innovative study programmes by various agencies and entry of foreign educational agencies in India are some of the notable changes in the field of education. Should we call them challenges/opportunities/ threats? India Today survey pointed out that 60% of the seats in engineering and other technical courses remain vacant in India. Many of the educational institutions are being closed down. Besides, the

government and the political leadership constantly attempt to encroach on our right to provide education according to our cultural and religious traditions and threaten the very concept of Christian education/ educational institutions.

Our educational institutions should manifest legitimacy, transparency and accountability. We have to bear in mind that we are called to be trend-setters in education, not merely imitators. We are to be agents of changes and transformation in the society, channels of social involvement. Students and staff shall be motivated and helped to undertake social action programmes for the less privileged to inculcate social awareness and be socially responsible. Also to reach out to the society at large, especially to the poor and needy.

In this background and within the framework of our Province, I hereby propose a few points for our reflection for our association like CHES.

1. Do we have a comprehensive policy, guidelines prepared in the light of the changes happening in the field of education? Are we continuously get updated? Do we have a centralized secretariat system to coordinate the activities of our educational institutions? If not, it is high time to implement all of these.
2. How do we respond to the ambivalent situation of encroaching of the government in the educational/academic curriculum? Do we comply with the required requirements and policies of the government in our educational ?
3. Have we grown over the years to become one of the nationally prominent educational association with a wide network of our institutions to meet the growing needs of the society?
4. What initiative we take to keep abreast of our institutions with the changing scenario? We live today in the midst of lots of possible false allegations, atrocities and abuses especially to the Christian educational institutions. What is our attitude and response to the unjust alleged allegations on us and persecutions followed by it.
5. Do CHES enter into new forms and areas of education demanded by the special needs of our times, like training of the handicapped, adult education and various types of non-formal education?
6. In this digital world, how far we succeeded in networking our educational institutions to share the resources, design new methods of education, develop new teaching aids, develop software for educational administration, etc.
7. Do we have a continuous evaluation system of our educational institutions regarding the implementation of policies, facilities and other factors related to it to promote excellence?
8. Do CHES have a legal cell consisting of our members and also experts from the legal world to discuss and resolve legal issues, get expert opinion and also to represent our educational institutions to represent before government bodies – Boards, Universities etc.?
9. We give a lot of fee concessions to the students. Is it visible to the society at large?
10. We speak a lot about ecosystems and protection of nature. Do our Institutions have a policy that promotes protection of the ecosystem?

Importance of Problem Solving Ability and Social Skills for Graduates in Enhancing their Employability

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Abstract:

This research paper explores the critical importance of employability skills, focusing on both soft skills and technical capabilities, along with the equally crucial role of social skills for undergraduate students. In an ever-evolving job market, academic excellence alone is insufficient. Employability skills such as communication, teamwork, problem-solving, adaptability, and technical expertise are essential for graduates to navigate complex work challenges. Social skills, encompassing networking, emotional intelligence, and effective communication, are equally vital for success in professional and personal spheres. The paper reaches into the relevance of these skills, the impact of gender disparities, the influence of educational streams, and the role of social skills in career adaptability. Further, it highlights the employer's perspective, emphasizing the significance of a well-rounded skill set for employability and success in the dynamic professional landscape. The study concludes by underlining the imperative role of problem-solving skills and the interplay of employability skills and social skills in shaping the future of undergraduate students' academic, professional, and personal lives.

Key Words: Employability Skills, Soft Skills, Technical Capabilities, Social Skills, Job Market, Academic Excellence, Communication, Imotional Ballance

1. Introduction

The graduates who enter the job market after their academic endeavours often need clarification in the rapidly evolving and dynamic maze that is the contemporary job market. The dynamic nature of today's workplaces demands much more than academic merits. In such a scenario, employability skills act as a crucial tools-box that provides the qualities and experience to excel in the chosen career field. Employability skills like communication, teamwork, problem-solving, adaptability, and technical skills help undergraduates navigate through complex work-related challenges (Suarta et al. et al., 2017). Similarly, the undergraduates entering the professional world will also have to navigate through social institutions within and outside their workplace and career fields. This requires social skills that can help to manage social dynamics through developing relationships, building trust and networking for opportunities. Social skills are necessary in the development of social networks, which

opens doors of possibilities to fresh graduates. This article dives deeper into the relevance of employability skills and social skills in unlocking a successful professional and personal life for undergraduates.

2. Relevance of the Skills in Undergraduate Students

As a result of the changing approach towards undergraduates beyond the perceptions of academic excellence, the role and relevance of skills among the graduates have been an important consideration. The dynamic and rapidly evolving nature of the job market and the world as a whole requires vital skills in addition to deep knowledge in respective fields. Skill development is considered the prime tool, equipping graduate students to adapt and prosper under constant and rapid change. In addition to adaptability and career progress, skill development for undergraduate students also contributes to personal and professional development through the promotion of continues learning, self-reliance, time management, decision-making, and resilience. The relevant skill set for undergraduates includes core transferable skills like critical thinking, problem-solving, collaboration, digital literacy, creativity, cultural awareness and communication. In addition, field-specific skills, as well as 21st-century skills, are highly relevant (Gowsalya and Kumar, 2015).

Soft Skills, Generic Skills, and Communication Competence

The development of soft skills, generic skills, and communication competence is necessary for career and personal development. Nisha, Subbu, and Rajasekaran (2018) explain soft skills as personal qualities and interpersonal abilities that are beneficial in professional social spheres. The most relevant and core soft skills include communication, problem-solving, time management, resilience, and teamwork. The soft skills are developed and shaped through regular exposure, practice, environment and experience. Hendarman et al. (2018) define generic skills as capabilities that can be applied across professions and disciplines. Some of the most relevant generic toolboxes for the twenty-first century include project management, research skills, digital literacy, flexible and continuous learning, and analytical thinking. Horning of generic skills is a matter of continuous learning and practice in different fields. Teng et al. (2019) explain communication competence as a concept superior to mere speaking and listening, where individuals are able to effectively convey their ideas and thoughts and adapt to different audiences and situations. The communication competence of graduates can be developed through presentations, writing practice, teaching, and networking.

Comparison of Soft and Hard Skills

Another relevant debate regarding the skill development and competence of undergraduates is regarding the relevance of soft and hard skills. The hard skills are teachable, transferable of knowledge, and capabilities like technical expertise that are specific to different professions and fields. At the same time, soft skills are people skills that are complementary skills that enhance hard skills. The current job market and entrepreneurial landscapes provide greater emphasis on the soft skills that help individuals communicate, collaborate and adapt in the face of change (Balcar, 2016). At the same time, this does not diminish the significance of hard skills. The undergraduates can prioritize the development of both hard and soft skills based on the requirements of the particular career and field that they are aspiring to.

Perception of Necessary Skills and Significance for Employability

The employer's perceptions of the skills and requirements of undergraduates are crucial in understanding the relevance of skill development during graduation. There is a widespread perception and understanding regarding the skill gap of undergraduates while entering the job market. When looking for potential employees among graduates, employers are often faced with the issue of a skill gap where the skills and capabilities possessed by the graduates and the skills required by the profession are not in an alliance (Teng et al., 2019). The soft skills that are in high demand by employers are communication and time management, teamwork and problem-solving. While working with diverse people across diverse fields of work, these skills help the individuals to practice meeting deadlines, adapting to situations and being self-motivated. The skills by the graduates, especially the soft skills, gain crucial significance in terms of employability as these can help individuals fresh out of college bridge the gap between technical knowledge and actual job requirements. In addition, these skills help individuals demonstrate and convey their capability and suitability for their respective fields. Having a well-developed combination of soft and hard skills also helps undergraduates to future-proof themselves in the highly dynamic job market and thus remain in demand.

3. Importance of Problem-solving skills

Problem-solving is considered a critical aspect of personal and professional success. The researchers found that individuals with sound problem-solving skills overcome challenges with a positive approach towards the problem and contribute to innovations and positive change (Gülec, 2020).

Life is the continuation of challenges and problems, so individuals need to be able to navigate

those challenges. It may include academic hurdles, personal dilemmas, and professional problems, but effective problem-solving skills can handle the situation with a structured mindset. It includes identifying the issues, analyzing the situations, and systematically implementing strategies. While considering the case of undergraduate students, this phase of education plays a critical role in an individual's journey and defines the foundation for future success. Among the various skills cultivated for the students during the period, problem-solving is indispensable. The ability of the students to analyze the situations and find effective solutions indicates academic success and makes them deal with the dynamic professional world (Kim et al., 2018).

Moreover, while considering the context of undergraduate students from complex research papers and assignments, group discussion and problem-solving skills are critical for the students to ensure their academic success and continue learning. So, problem-solving skills are found to play a critical role in the academic excellence of undergraduate students. Moreover, for effective decision-making, the problem-solving skills were found to be correlated. An individual with good problem-solving skills is equipped with critical thinking and makes informed decisions by evaluating alternative options. Moreover, the anticipation of potential outcomes of the decisions and adaptation of decisions based on the changing environment is also the result of honed problem-solving skills (Karyotaki and Drigas, 2016).

In the case of undergraduate students, decision-making is highly relevant, and it directs their future professional and personal lives. As a student, making decisions with further education was critical. Even if there are a number of postgraduate courses and job-oriented courses available for students, making the final decision is crucial. It defines their career, professional life, and whole life. Through effective problem-solving skills, the students can ensure effective decision-making with respect to their future. Effective problem-solving skills make them research the different options, weigh the pros and cons, plan for future scope, etc. Detailed analysis and evaluation of the scenario direct them to choose the best and also support them in developing an attractive career in the respected field. The ability of critical thinking and problem-solving extends beyond academics to real-world situations, making the students navigate complex scenarios with competence and confidence. The undergraduates' ability to make sound decisions is a hallmark of individuals with attractive problem-solving skills. In addition to that, problem-solving and decision-making skills also act as critical components for the future life of undergraduate students when they become professionals (Wismath and Orr, 2015).

Beyond the professional realm and academics, problem-solving ensures enhanced personal development. Good decision-making and critical thinking as a result of sound problem-solving skills prepare an individual to deal with obstacles with a positive mindset. Moreover, resourcefulness and resilience developed through problem-solving results in better emotional intelligence (Hargrove and Nietfeld, 2015).

So, it can be concluded that, in the modern world, the role of problem-solving skills cannot be overstated. These skills are critical for academic and professional development and success, as they contribute to innovations, critical thinking, decision making and overall personal development of the individuals. So, problem-solving skills are found to be imperative for individuals, especially for upcoming professionals, to thrive and contribute meaningfully to their growth.

4. Definition of Employability Skills and its Importance among Undergraduate Students

Bhatnagar (2021) defines employability skills as a set of transferable soft skills that makes an employee effective and adaptable in his workplace and work responsibilities. Employability skills are qualities and abilities that go well beyond academic knowledge. However, they act as a bridge between academic knowledge and the job performance requirements for thriving in respective fields. Employers often look for these qualities within the employees during the recruitment process. Some of the major employability skills among fresh graduates highly sought by employers include communication, teamwork, time management, problem-solving, digital literacy, resilience, leadership, learning agility, organization and emotional intelligence.

Communication skills include active listening and delivery of clear, concise and confident communications. Communication skills become crucial in areas like presentations, report-making, team collaboration and client management. Teamwork skills enable individuals to work within diverse teams by working towards shared goals and constructive management of conflicts. Problem-solving skills require a combination of critical thinking, analytical thinking, creativity, and out-of-the-box topics in addressing work-related challenges and making informed decisions (Varghese and Mona, 2021). Time management skills are key for achieving productivity and desired outcomes while multitasking and managing deadlines. Resilience skills enable individuals to be self-motivated and adaptable and handle pressure from workplace setbacks and challenges. Digital literacy and learning agility are crucial in embracing the latest advancements and possibilities of technology and other innovations in

the workplace. Leadership skills are the ability to lead a team through initiation, inspiration, and motivation. In addition, organization and planning skills help to achieve tasks through prioritization and attention to detail. The emotional intelligence of individuals helps them control their emotions and navigate through the social spheres in terms of networking, professional relations, and personal relations.

Significance of Employability Skill among Undergraduates

The significance of employability skills among undergraduates becomes a relevant issue of importance due to the evident and widespread gap in skill requirements among graduate students. The India Skills report of 2023 highlights that only 49 per cent of the graduates out of college possess the necessary skills to be considered employable. This points out the acute need for focusing on employability skill development by undergraduates. The issue of the skill gap is much more severe in fields that require higher technical experience, like engineering. The report highlights the alarming gap in this regard, as around 80 per cent of the students completing engineering graduation don't possess the skills set to be considered employable (Khare and Sonam, 2023).

In addition, the skills and capabilities inculcated through traditional education have not undergone any drastic transformation as market evolutions have resulted in skill mismatch among graduates and the job market. In the wake of increasing demand for skills like digital literacy, advanced communication and collaboration, the capabilities of graduate job seekers are far behind industry requirements or often, they lack practical experiences to hone these skills fully. In addition to this, certain emerging sectors, like artificial intelligence, cyber security, data analytics, cloud computing, etc., demand high-skill requirements from job seekers (Malhotra et al., 2022). The skill gap among undergraduates not only affects individuals in particular but also impacts the economic growth and competitiveness of organiaations as additional resources need to be allocated for talent development.

There are additional concepts to be explored while considering the issue of employability skills among undergraduates. There is often a tendency to view employability as a binary state of being employed or unemployed. Such dichotomic employability concepts often ignore the complexities of the job market and employability, including skills, opportunities and experiences. Thus, this hinders one's ability to develop employable skills and retain employability over a long period of time. Furthermore, there is a wide array of socioeconomic factors impacting and influencing the employability skills among graduates. These include

family backgrounds, educational opportunities, social capital, health and well-being, as well as gender disparities (Mehrotra et al., 2015).

Factors Impacting Employability of Undergraduates

The socioeconomic background of the undergraduates, including professional background, income, and exposure, influences their access to opportunities for skill development. Education opportunities, networks, parental guidance, and mentorship opportunities are often determined by family background. In addition, access to quality education is another crucial factor. The prevalent traditional educational institutions provide minimal opportunities for skill development. The undergraduates who have access to quality education in premier institutions have higher exposure and opportunities for employability skills development (Cotronei-Baird, 2020). The graduates' social capital and social networks provide access to more career advice, job opportunities, and internship opportunities, which provide much-needed support and space for employment skill development. The health and well-being of the undergraduates can also be an influential factor in skill development. The differently abled undergraduate students often face a lack of support, discrimination or accessibility issues, which hinder their opportunities. The stark disproportion of females in STEM (Science, Technology, Engineering and Mathematics) fields is indicative of gender disparities in employability skills, especially technical skills (Ertl et al., 2017).

Further understanding of factors influencing graduate's employability can be realised from the USEM account for the employability framework developed by Knight and Yorke. These four components of employability include Understanding, Skills, Efficacy beliefs and Metacognition. Understanding stands for one's awareness of one's skills, abilities, and career choices. The skills refer to both soft skills and hard skills required for certain career paths. The Efficacy belief can be explained as one's confidence in their ability to excel in their desired career path through their abilities. Metacognition is a crucial component that emphasises reflecting on learning and skill development throughout their career paths (Bennett and Ananthram, 2022).

Gender Disparities in Employability Skills

Koneru (2017) points out gender disparity in employability skills as an explicitly prevalent issue among youngsters. This disparity in terms of skills limits their opportunities in many key fields. This is especially true in terms of the STEM field, where there is significantly less female labour force. The disabilities in the skills development of women can be attributed to multiple

factors, which include access to education, social stereotypes, access to resources and social expectations. The enrolment of females in STEM fields in higher education is low compared to other fields. This reduces the educational opportunity for females to acquire technical skills. In addition, social stereotypes and expectations restricts the career opportunities for females in certain fields. This controls the diversity in terms of career opportunities and can hinder the development of skills and capabilities in that regard. The societal expectations also mould the mindset of females to focus on certain skills and often disregard technical and hard skills. Access to resources and extracurricular activities is also restricted for females, which controls their opportunity for employment skills development. The impact of such gender disparities on employability is evident through lower participation of women graduates in the workforce. The societal pressure in terms of household and childcare responsibilities reduces their workforce participation. The Skill mismatch arising from gender disparities in employability skills development results in women being underemployed or unemployed. The gender disparities in employability skills are also used as a reason for the wage gap (Fletcher et al., 2017).

5. Role of Social Skills among Undergraduate Students for Career Adaptability

It is challenging for undergraduate students to prepare for their careers in highly dynamic professional settings. Because it not only demands technical skills but also a high degree of adaptability. Social skills play a critical role in shaping the career adaptability of those students by enabling them to navigate the complexities in modern professional settings. In this scenario, this section is going to discuss the relationship between social skills and career adaptability (Rudolph et al., 2017).

Social Skills of Undergraduate Students Based on Gender

The undergraduate's social skills are exhibited differently when examining it through the lens of gender. While considering interpersonal communication skills, the female undergraduate students demonstrate proficiency with verbal expressions and active listening. Along with that, compared to male students, the females excel in their collaborative environment with empathetic connections; this supports them in forming relationships and navigating social dynamics. On the other hand, male undergraduate students demonstrate high-end assertiveness and negotiation skills. Moreover, compared to females, male students lean towards leadership roles while working in a group and confidently express their opinions. So, while considering in professional settings, assertiveness acts as an advantage for male students by supporting

them in navigating challenges and making decisive decisions (Brannon, 2016).

At the same time, while considering problem-solving skills as important social skills for undergraduate students for their future success, it is different for male and female students. Due to the collaborative and compromising approach of the female students, they prefer interrelationships and harmony to conflicts. At the same time, the competitive mentality and the aggressive attitude and behaviour of the male students result in varying results. However, a good number of research studies indicate that social skills are not mainly based on the gender of individuals but are highly influenced by cultural background, personal experiences, personality, etc. (Hakim, 2015).

Impact of the Stream on the Social Skills of Undergraduate Students

The stream selected can have a significant impact on the social skills of undergraduate students. There are various fields of study; each field needs a different set of communication and interpersonal abilities. For example, students who choose humanities and social science may have more critical thinking and verbal skills that are very necessary for their profession, which include more communication and interaction with other people (Agran et al., 2016)

Some students choose STEM fields, including Science, Technology Engineering, and Mathematics); the students in these fields focus highly on problem-solving and analytical skills. The skills mentioned above are very important for their career. The students may benefit from an additional focus on effective communication and collaboration to improve their social skills (Hogan et al., 2013)

Stream has a higher influence on undergraduate students' social skills, so there needs to be a balanced education. When there is collaboration with other disciplines and social skill development initiatives, the social skills of undergraduate students can be improved irrespective of their stream. This will also help them to transform into a potential candidate and build a strong career in the future (Sung et al., 2013)

Role of Social Skills in Practical Success in the Professional Arena.

Social skills include a wide range of interpersonal abilities important for effective communication and collaboration between individuals. Verbal and non-verbal communication, listening, teamwork, networking, conflict resolution, etc., are a number of social skills. Even if the academic achievements and technical expertise of the undergraduates are important, the social skills of the individuals also play a critical role in a successful career in the modern

world because social skills enable them to translate academic knowledge into practical success (Ng and Feldman, 2014).

Communication is a fundamental part of social skills. Even if the students have attractive academic records and technical expertise, the lack of communication and collaboration may negatively impact the undergraduates in sharing their ideas. However, students with high-end communication skills can effectively articulate their thoughts and ideas and contribute to success in professional settings. Moreover, communication and collaboration also support the building of effective relationships, positive team dynamics, etc., so communication is considered an integral social skill for career adaptability (Argyle, 2017).

Moreover, in the highly competitive job market, networking becomes critical for career development for students. Good networking skills help the students to build and maintain professional relationships, which act as an open door for better career opportunities. In addition to just maintaining contacts, creating long-term relationships using networking skills helps the students to enhance adaptability. Along with that, emotional intelligence and empathy are also found to be critical social skills for undergraduate students, helping them to create a positive work environment. Moreover, higher emotional intelligence also supports the students in navigating social dynamics and responding empathetically. In addition, these qualities also help the individual to adapt to changes with a positive mindset (Langer, 2018).

Social Skills and Career Adaptability

Social skills have a great influence on career adaptability. In the dynamic nature of the environment, social skills are very important. The important social skills are networking, teamwork, communication, and problem-solving. These skills not only help them perform well in their current role but also help them meet future challenges. It also helps them to adjust to new and changing situations in their career. Communication is a very important factor in social skills. Effective communication helps students with career adaptability. To exchange ideas clearly and to listen, communication skills are very important. Effective communication also helps in maintaining a shared understanding in the organizations (Kivunja, 2015)

Teamwork is an important factor in social skills. It is very important in the case of career adaptability. Today, the environment in organizations is more collaborative, so teamwork skills are very important to work efficiently in a team. Working in a team is necessary to meet challenges; this also helps candidates adapt to new challenges. Working in a team also gives more strength, helps to think from various perspectives, and allows new problem-

solving methods to be developed. Socially skilled individuals are very smart in problem-solving because they can collaborate. These individuals work as a team with effective social interaction, which helps them in finding solutions to problems easily and quickly. Social skills also help to convert challenges into opportunities for better career growth and adaptability (Lee, 2021)

Networking is a very important social skill that students need to pursue a good career. Most of the opportunities come from networking. Networking with professionals helps you gain career advice, mentorship, and even get into good professions. Networking also helps individuals stay informed about the changes in the professional atmosphere. Integrating social skills like communication, teamwork, problem-solving, and networking is crucial to creating an excellent professional profile. Communication helps in a shared vision, teamwork helps to solve problems better and quicker, and networking acts as a foundation for continuous growth. Students who possess all the above skills not only perform better in their current roles but also design their careers in a dynamic environment (Johannisson, 2017)

In conclusion, social skills have a great influence on career adaptability. These skills are not only limited to normal interactions; they help in gaining a dynamic and adaptable career. The professional landscape is changing. Therefore, social skills are significant assets for maintaining success throughout the career of an individual.

6. Conclusion

While considering undergraduate education, the interconnected relationship of employability skills, problem-solving skills, and social skills are critical components for an individual's holistic development. As the above section reflects on the importance and role of those skills in the modern era, it is found that the illustrated skills are not merely for academic excellence but also support and equip the student for their professional career. Problem-solving skills contribute to innovation, critical thinking, and decision-making, supporting undergraduate students to ensure progress in their academic and professional domains. At the same time, employability skills make undergraduate students adaptable in their academic and professional work settings. Meanwhile, social skills are found to be attractive to ensure better communication and collaboration, through which they ensure cultural competencies, networking skills, and success in an interconnected society.

Employability, problem-solving skills, and social skills do not just prepare undergraduates to choose better careers, but they also help to ensure learning and growth opportunities in their

lifetime. The collective impact of these skills results in educators, institutions, and students being encouraged to prioritise and nurture these skills for development. As graduates embark on their professional lives, employability, problem-solving, and social skills are fundamental to ensure innovation, adaptability, and interpersonal acumen to unlock success and contribute meaningful progress.

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Indian influence on Occidental Socio-cultural and Literary Panorama

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Abstract

India and Indianness are something that flow in our veins and go along with us from a country where we were born to a country where we moved along. Indianness means being an Indian culturally, ethically, artistically, and religiously. Although India is divided into different regions, religions, languages, and cultures, one sufficient and uniting force is Indianness and love for the country. India has produced many Bhumiputra who have excelled in different fields strengthening the idea of India as 'Vishwaguru'. One such person was Aryabhatta who gave the idea of 'Sunyata' or 'Nothingness'.It is not just in the area of Arithmetics but India has held her flag high in many other fields as well. Even the speed of Sunlight which was supposedly calculated by Ole Roemer, a Danish Astronomer in 1676 was much earlier given in Rig Veda, one of the oldest texts in the world. One of the lost medical gems of ancient India is Ayurveda. His famous work Charak Samhita has reference to 100000 herbal plants, the importance of diet for a healthy body, and exercise for a healthy being. In addition to this, the knowledge of atoms in Chemistry which was supposedly been discovered by John Dalton in 450 BC, is also taken from the ideas of Aacharya Kannad.In literature, Western writers like E.M Forster and T.S Eliot have taken ideas from Eastern philosophy in their major texts .The main aim of this research paper is to show how India has influenced the Occidental social, cultural, and literary scenario.

KEYWORDS - Indianness**,** Mahabharata**,** Veda, Mysticism, Hinduism, Oriental, Occidental

Introduction

The effect of India on the Western world is like a curtain that needs to be pulled down. India is considered as a Golden Bird. Due to the colonial past of the country, the bird has been caged, and her angelic voice has been tormented for a particular time period, but the bird knows how to fly again. India and Indianness are something that flow in our veins and go along with us from the country where we were born to the country where we moved along. Indianness means being an Indian culturally, ethically, artistically, and religiously. Although India is divided into different regions, religions, languages, and cultures, the one sufficient and uniting force is Indianness and love for the country.

India has produced many Bhumiputra who have excelled in different fields, strengthening the idea of India as 'Vishwaguru'. One such person was Aryabhatta, who gave

the idea of 'Sunyata' or 'Nothingness'. He rightly states, " Nothingness is the beginning of everything " (Goodreads, 2024). Aryabhatt was not an exception but was a part of a thriving environment, which made students of that time focus more on research in the areas of mathematics, science, and medicine. Brahmagupta, another proponent of mathematics, was born in 598 BC and was known globally for his footprints in the section of Geometry and Integral theory. It is not just in the field of calculation; India has held her flag high in many other fields as well. This can be seen in many ancient texts of India like the *Rig Veda*, the *Yajur Veda*, the *Jyoti Shastra,* and the *Atharva Veda*. For example, the length between the sun and earth, which was supposedly calculated by Christian Huygens in the 17th century, was much earlier given by Tulsi Das in *'Shri Hanuman Chalisa'* in the 16th century. The line of *Shri Hanuman Chalisa*-"Yug Shastra Yojan par Bhanu, Leelyo tahi Madhur Phal Jaanu" (Das 36-37) calculated exactly the distance to be 153.6 million km which is almost equal to the real distance (149.44 million kilometers). Even the speed of sunlight which was supposedly calculated by Danish astronomer Ole Roemer in 1676, was much earlier given in the *Rig Veda*, one of the oldest texts in the world. These are the lines from the *Rig Veda* that calculated the speed to be 189,547 miles per second (186000 miles per second, as stated by Ole Roemer) --"*Tathaa ch smaryat yojnaanaan sahasram dve dveshate dve ch yojne leken nimishaardhen krammaan namostute*" (Goyal 2011). Maharshi Charak was born in Kashmir. He has an ample amount of work in classical Indian medicine and surgical practices. His famous work *Charak Samhita* has references to 100000 herbal plants and the importance of diet for a healthy body and exercise for a healthy being. In addition to this Sushruta, the author of *Sushruta Samhita* used to perform complex surgical processes. Sushruta was the first to perform Cataract surgery and Plastic surgery. In the present time, many countries, like the USA and Japan, have done extensive research on the surgical process and have adopted it in their medical fields. The U.S. has been granted 613 patent rights over medicine, pathology, anatomy midwifery, biology, ophthalmology, hygiene, and psychology practices, which were already mentioned in *Sushruta Samhita*. This shows how old Indian knowledge is taken by the so-called Western intellectuals. In addition to this, the knowledge of Atoms in chemistry which was supposedly discovered by John Dalton in recent times, is also taken from the ideas of Aacharya Kannada. Aacharya Kannada also known as Kashyap, was the first South- Asian natural scientist and philosopher. He developed the theory of 'Atom' or 'Parmanu' 2500 years before John Dalton discovered it. He is also credited with the formation of the Vaisheshika School of Indian Philosophy, which is one of the world's earliest philosophical Schools of Physics. He used this philosophical School to illustrate the formation and existence of the Universe, which was much later verified by the Big- Bang Theory of the West.

Indian literature becomes an instance for the rest of the world. The most ancient literature in the world is Indian literature. The initial literary scripts assembled in India were the Vedas. Hinduism is considered the basis for the Vedas. There are four kinds of Veda the *Rig Veda*, the *Yajurveda*, the *Sam Veda,* and the *Atharvaveda*. The Veda consists of verses written in Sanskrit. There are two epics written in Sanskrit the Hindu epics. They are the *Mahabharata* by Maharishi Veda Vyasa and the *Ramayana* by Valmiki. It was written in the first Millennium BCE. Indian writers influenced native writers as well as writers from different countries. One

of the main sources of inspiration was the *Mahabharata*. Homer was greatly influenced by the *Mahabharata,* which was written by Veda Vyas. The *Mahabharata* has 200,000 lines and Homer who wrote *Iliad* and *Odyssey* have only 30,000 lines. Westerners have different views regarding the *Mahabharata*. According to Professor Sylvan Levi "The *Mahabharata* is not only the largest, but also the grandest of all the epics, as it contains throughout a lively teaching of morals under a glorious garment of poetry" (Tamil and Vedas). According to Jeremiah Curtin,

> "I have never obtained more pleasure from reading any book in my life. The *Mahabharata* will open the eyes of the world to the true character and intellectual rank of the people of India. The *Mahabharata* is a real mine of wealth not entirely known, I suppose, to anyone outside your country, but which will be known in time and valued in all civilized lands for the reason it contains information of the highest import to all men who seek to know in singleness of heart, the history of our race on earth, and the relations of man with the infinite power above us, around us and in us." (Tamil and Vedas)

There is some similitude between Homer's *Illiad* and Vyasa's *Mahabharata*. The war shown in the *Mahabharata* is the same as the Trojan War. The reference to God in the *Illiad* resembles the God of the *Mahabharata*. For example – The God Zeus, is the deity of rain and thunder roll. He carries a thunderbolt. Indra, the Hindu God is the deity of rain and thunder. He is the king of Gods and he too carries a thunderbolt called Vajra. The Greek warrior Achilles is very much like Lord Krishna. They both were murdered by shooting an arrow in their heels. Hades and Yamraj are the God of death. They both determine the destiny of the souls that move into their monarchy. They are concerned with fairness. The main character of the Trojan War is Helen, and the leading character of the *Mahabharata* is Draupadi. In Greek folklore, Helen has always been predicted as a temptress who runs away with young Paris. This led to the War of Troy. We also read that Draupadi is blamed for the Mahabharata.

Natyashastra is the ancient literature on music and theatrical work written around 500 B.C. by Bharata Muni. The text covers old Indian dramatic art and theatrics. He is considered the 'Father of Indian Theatrical Art Forms'. The title *Natyashastra c*onsists of two Sanskrit words- '*Natya'* and '*Shastra*', *'Natya'* refers to the method of drama and dance, and 'Shastra' means Science. The text explains the relationship between the director and the audience, the structure of a play, etc. The four elements included in the Natyashastra are dance, music, poetics, and general aesthetics. *Natyasastra* is also known as the fifth Veda as it has emerged by taking expressions from the *Rigveda*, tones from the *Sama Veda*, actions taken from *Yajurveda,* and sensations from the *Atharva Veda.* The reason behind composing *Poetics* by Aristotle is to answer to his master, Plato's definition of drama. Aristotle is not satisfied by his definition of drama. Plato defines drama in his work *Republic,* which was published in 375 BCE, and states that "Drama represents human beings in action, either voluntarily or under compulsion; in that action, they fare, as they think, well or ill, and experience joy or sorrow" (Plato 443- 445). The two ancient texts that give a conceptual understanding of drama and its motive are Bharata's *Natyasastra* and Aristotle's *Poetics*. Aristotle, in his work *Poetics*;

illustrates drama as a 'mimetic' art form. The term mimesis is used in literary criticism. It is derived from a Greek word that means 'imitation'. He wrote in his *Poetics*:

> "For as there are persons who, by conscious art or mere habit, imitate and represent various objects through the medium of color and form or again by the voice; so, in the arts above mentioned, taken as a whole, the imitation is produced by rhythm, language, or harmony either singly or combined." (Aristotle 7)

Both Aristotle's *Poetics* and Bharata's *Natyashastra* have a common view of drama. Bharata explains the importance of Rasa, which is the aesthetic feeling that viewers experience while watching a performance. Aristotle's meaning of catharsis is the same as Bharata's Rasa theory. Catharsis means 'purgation of emotions'. Bharata describes eight types of Rasas- Shrinagar (romantic or erotic love), Karuna (Pathos), Hasya (comic), Veera (heroic), Bhayanka (terror), Bibhatsa (disgust), Adbhuta (wonder), and Shanta (tranquility). The seventh chapter of the Natyashastra gives the meaning of Rasa according to Bharata. In chapter 8 of Aristotle's *Poetics*, pity is defined as a feeling of agony that arises from the sight of some wicked, devastating, or painful scene. Aristotle suggests we, as the audience, identify with the hero's suffering, pity, and fear in the process of catharsis. Aristotle defined tragedy as mimesis of an action that is serious, complete, and of a certain magnitude; in language embellished with each kind of artistic ornament, the several kinds being found in separate parts of the play; in the form of action, not of narrative; through pity and fear affecting the proper purgation of these emotions" (Poetics 23). A close reading of Aristotle's *Poetics* gives an idea about his view on elements of drama and it recalls to our mind Bharata's view in the 117th and 118th verses of the first chapter of the *Natyasastra*- "*N tangyanam n tachilapan n sa vidhya n sa kalla, nashaao yogo n tatkaram natyagysminam yanan drishyate, sarvsastrari shilpaani karamadi vividhani ch, ashminnatyey sametani tasmadenamyakritam*." (Bharata 17)

Another example that depicts the impact of Indian art and culture can be seen in E.M. Forster's *A Passage to India*. His novel *A Passage to India* is full of mysticism in which he is concerned with the mysticism of Hinduism. Forster is trying to give a method of dealing with Hinduism or to proselytize. Mysticism implicit a faith in the existence of hidden, celestial forces in the cosmos. Forster represents the imaginary and invisible power that penetrates the scene by manufacturing and controlling events by encouraging and indicating character. We find a blend of agnosticism and mysticism in his works. His mystical propensity makes him attack averse to his agnostic faith. There are many symbolic and thematic elements in the novel that bear a close relationship to Hindu philosophy. All mind and matter, according to the *Bhagwad Gita*, are composed of three forces - Sattwa, Rajas, and Tamas. The best way to understand the Indian influence on Western literature is to do a close reading of the works of Western writers, poets, and playwrights. Forster's novel is the best example to understand the Indian influence. Lines taken from *Bhagwad Purana* show that E.M. Forster is deeply influenced by Indian text and philosophy. He mentions the Indian festival Janmashtami, the word Tukaram, a symbol of Om, and the setting of the novel set around a small Indian village named Chandrapore.

One of the most famous poets of English literature, Thomas Stearns Eliot, was very much influenced by India. He said in his interview, "Long ago I studied the ancient Indian languages, and while I was chiefly interested at that time in philosophy. I read a little poetry too, and I know that my poetry shows the influence of Indian thought" (Indiacurrents.com). References to Indian literature are given in this poem. It contains five sections- 'The Burial of the Dead', 'A Game of Chess', 'The Fire Sermon', 'Death by water' and 'What the Thunder Said'. The first section of the poem 'The Burial of the Dead' examines several themes. It refers to the burial of the dead fertility God. Death is believed to be followed by rebirth. They are themes of loss of life, rejuvenation and entombment. But the inhabitants of the contemporary waste land are spiritually dead, and the very thought of rebirth or spiritual regeneration is painful to them. The opening line of this section is that, "April is the cruellest month". Because springtime is considered the best time for flowers and plants to grow, but they are growing 'out of the dead land'. The snow during the winter season covered all the dead land. T.S Eliot have different view regarding season. The following line of The Waste Land:

April is the cruelest month, breeding

Lilacs out of the dead land, mixing

Memory and desire, stirring

Dull roots with spring rain (T.S Eliot 1-4)

The above line was written by T.S Eliot under the influence of Lord Buddha and was taken from the Hinayana text, *Dhammapada*. He said in his text that he was growing a Boddhi tree in his heart to make him aware of his existence. The title of the third section of the poem The Wasteland is 'The Fire Sermon,' taken from the *Adittapriyay Sutta.* It was translated by Bhikkhu Thanissaro from Pali. It shows the poet's scholastic association with Buddhist philosophy. The Fire Sermon is the third discourse delivered by Lord Buddha. Buddha said to his disciple, "everything is on fire…the eye is on fire; forms are on fire; eye-consciousness is on fire; impression received by the eye are on fire; and whatever sensation, pleasant, unpleasant or indifferent, originates in dependence on impressions received by the eye, that also is on fire. And with what are these on fire? With the fire of passion, say I, with the fire of hatred, with the fire of infatuation." (Lampmagician.com). Lord Buddha requests his disciples to come out of earthly possession and give up earthly passion. He gave the idea of non-attachment, and it became the soul of Hinduism. Eliot tries to make them leave their materialistic love and possessions and become civilized people. He concludes the section with the word 'burning' in relation to Indian mysticism. He requested that God elevate him as well as the people of his country and show them the path of civilization. He said:

To Carthage then I came

Burning burning burning burning

O Lord Thou pluckest me out

O Lord Thou pluckest

Burning (Eliot 309).

In his Fire Sermon, lord Buddha encourages everyone to liberate themselves from suffering and to control their five senses. It shows the influence of Eastern religion on T.S Eliot. The text ends with a positive note with the use of words 'Shantih, Shantih, Shantih'. To conclude, *The Waste Land* contains elements of Indian wisdom to a substantial extent. Nonetheless, to confine it to only Indianness is not good, it bears universal elements and Hindu, Vedic, and Buddhist philosophy. The second section 'A Game of Chess' shows the concept of Indian marriage and what value the Indians give to marriage. The third section, 'The Fire Sermon' is the same, which was given by Lord Buddha on the top of the Gayasisa Hill, near Gaya, India. All these examples clearly show how Eliot was deeply influenced by the Eastern philosophy

Conclusion

Thus, the paper depicts how Indian culture, tradition, festivals as well as literature influenced the Western World. The main aim behind writing this research paper is to shed some light on the Indian people or Indian concept, which became the source of inspiration for their work. This research article contains works that clearly show how Occident scientists, writers, educators, or common people were influenced by Indian philosophy. Many concepts in the Western world traced their roots to Indian beliefs. Oriental influence can also be seen in many literary works from the Western World. *Bhagavad Gita, Upanishads,* and *Vedas* always remained a great source of inspiration and cascaded richly to the greatness of Western works in the Occidental world. The interests and influences of Indian values, cultures, and texts were particularly noticeable in the great works of many celebrated European writers.

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Values for Responsible Citizenship – A Review of NEP 2020

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1. Introduction

New Education Policy of India (NEP 2020) is a treasure house of values as linked to educational processes and outcomes. It states: "…for developing holistic individuals, it is essential that an identified set of skills and values will be incorporated at each stage of learning, from pre-school to higher education" (NEP 2020:9. Sec.1.2). A survey of the 66 page document indicates the undiluted emphasis given to 'values' – human and constitutional – by the nation.

Values are the principles that help you to decide what is right and wrong, and how to act in various situations (Cambridge Dictionary). In simple words, when one says, this is my value, it implies a principle for which you are prepared to pay a price in terms of your money, time, energy or other resources, in comparison with other principles. Quality education involves assimilation of values by which one is able to make ethically sound decisions helping the creation of a better world, and of ensuring progress towards the greater common good.

The policy enlists a few sets of values which are meant to be communicated to the learners, which are facilitated to be absorbed by them, and which are intended to be outcomes of educative process as expressed in their relationships and behaviour.

This calls for a concerted, comprehensive, integrated and conscientious effort on the part of all players in the game – but above all, of the educators and the educational leaders.

2. Process of Value Assimilation – 'Values are Caught, not Taught' (Gonzales, 2014)

There are several aspects or steps involved in the crucial process of value assimilation (Koikara, 1990):

2.1. Identification of the values intended as outcomes in the learning process.

2.2. Listing them, if warranted in a hierarchical manner.

2.3. Clarifying them – as to what is meant by possessing a particular value, including that of explaining the meaning, implications for behaviour and indicators as to how this can be ensured.

2.4. Clarifying also involves identifying the possible conflicts that occur between professed values and practiced values; e.g., You claim you value honesty, but when it comes to getting your building sanctioned, you find it is nearly impossible to get across the issue, and give in to the pressure. In effect, your value of having a comfortable house became a greater value than honesty or truthfulness. But clarity

regarding your value hierarchy, helps you in making ethically right choices. When honesty becomes part of your value system in hierarchy, you would be willing to undergo the extra trouble you will have to take in order to get the building permit sanctioned in the right manner; or you may also be willing to forgo your dream building to stick to your professed value system.

2.5. Enabling assimilation through content creation and experiential learning and testing and evaluating the same through a guided and reflective process.

3. Implications for Educational Practice

The primary implication in this regard is that value education in this pattern has to be an important component of the teacher education curriculum. The trend, if at all present, is to treat it as a light subject, to be mugged up and cleared in the exam, with hardly any skill orientation or attitudinal formation involved. This has to be drastically re-hauled from an outcome point of view – in terms of understanding, analysis and application. That is to say, that at the end of the 'teacher education programme' (D. Ed or B. Ed or Bp Ed), the student-teacher would have a) the necessary information regarding values in human lives b) understanding of the implications for human behaviour and human relations – to one's self, other human beings, and other beings – and the indicators thereof c) ability to identify value implications in the prescribed syllabus of a given subject (course) and d) the ability to integrate value education – information, attitudes and skills – through the transaction of the curriculum.

This aspect needs to be assessed in the teacher eligibility tests (TET) as well, with adequate weightage. At the level of higher education, this aspect needs to be adequately addressed in the National Eligibility Test (NET) and in the orientation programme for the newly inducted educators. At the higher education level, it should be made mandatory that the teacher-elect is permitted to engage classes only after completing an orientation in teaching methodology and values education. This is a totally neglected area in higher education today.

The next is having a curriculum integrated with value familiarization, clarification and value choices through experiential mode and prescription or guidelines regarding the pedagogy suited for that. It is not necessary that the conventional mode of devoting specific periods for value education be adhered to, rather healthy integration across disciplines would be a more effective way.

4. Value Orientation of NEP – An Analysis

The NEP 2020 is quite eloquent, with listing, repetition and hinting at methodologies, though in the matter of teacher preparation for value education, the policy almost draws a blank.

We could view the document from two value angles, viz., (i) the values based on which the policy is formulated and (ii) the values the policy intends to have as outcomes in the learners.

4.1. The Value Foundations of the Policy

An examination of the policy reveals the values on which the policy is founded:

4.1.1. **Indianness** of educational system: It envisions "…an education system rooted in Indian ethos that contributes directly to transforming India, that is Bharat, sustainably into an equitable and vibrant knowledge society, by providing high-quality education to all, and thereby making India a global knowledge superpower" and "…to instil among the learners a deep-rooted pride in being Indian, not only in thought, but also in spirit, intellect, and deeds" (NEP 2020:6). It intends 'developing respect towards the fundamental duties and constitutional values, bonding with one's country, aware of one's roles and responsibilities in a changing world' (NEP 2020:6). Accordingly, it seeks the content and methods be tuned to and taken from the Indian (or local) context, to the extent possible.

4.1.2. **Holism: Holistic, Integrated, Inter-disciplinary, Local & Global, Inclusive & Equitable**

It aims at a well-rounded formation of individuals, which requires a holistic perspective, integrating different disciplines including arts, sports and vocational streams, drawing on both global and local trends, technology and resources, while being inclusive and equitable from the angles of access and affordability.

4.1.3. **Flexibility**: It seeks to remove the rigid control regime on education to make it suited to the individual learner's capacity, pace and tastes, giving maximum choices to the learner at all levels, viz., entry-exit, assessment, disciplines and subjects, face-to-face, on-line or hybrid.

4.1.4. **Academic Autonomy**: At the level of higher education, it promotes 'autonomy' and 'empowerment' of individual institutions with 'good governance' that would facilitate the flexibility for learners. This is also about democratization and localisation of higher education (NEP 0:13) with a 'light, but tight' regulatory system.

4.1.5. **Liberal arts** thinking is a sequel to flexibility, with all forms of human endeavour being treated as arts of equal dignity with no separation among such disciplines as curricular, cocurricular or extra-curricular, making learning enjoyable according to one's choices (NEP 2020 Sec 11.1).

4.1.6. **FLN**: Emphasizing the foundational literacy and numeracy as a national priority (NEP 2).

4.1.7. **Enjoyability:** It seeks to make learning 'enjoyable' and the process fun (NEP 2020, Sec 4.0; 4.26).

4.1.8. **Teacher at the Heart:** It wants to rightly re-establish the central role of the teacher and raise the dignity and worth of teaching and make it most attractive as a profession (NEP 2020:4; Chapter 5).

4.1.9. **Value based:** The policy is clear as to its character orientation, as it aims at developing 'not only cognitive capacities … but also social, ethical, and emotional capacities and dispositions' (NEP 2020:4). It lists various set of values and accompanying knowledge and skill sets to be expected from the learners.

4.2. The Learner Outcomes in Value Terms

The policy is articulate in terms of its purpose as developing '… good human beings capable of rational thought and action, possessing compassion and empathy, courage and resilience, scientific temper and creative imagination, with sound ethical moorings and values. It aims at producing engaged, productive, and contributing citizens for building an equitable, inclusive, and plural society as envisaged by our Constitution' (NEP 2020:4).

4.2.1. Values Set

In various sections it lists the values intended to be instilled in the learners. They are broadly termed as constitutional values and human values, though they indeed overlap.

- Traditional Indian Values and basic human and Constitutional values (NEP 2020, Sec. 4.28 & 6.20) such as:
- *seva, ahimsa, swachchhata, satya, nishkam karma, shanti,* sacrifice, tolerance, diversity, pluralism, righteous conduct, gender sensitivity (equality), respect for - all persons and their inherent capabilities regardless of background, elders, environment, human rights; helpfulness, courtesy, patience, non-violence, forgiveness, empathy,

compassion, patriotism, democratic outlook, integrity, responsibility, inclusion, equity, justice, liberty, equality, and fraternity.

4.2.2. Cognitive Content & Skill Sets

"The vision of the policy is …to develop knowledge, skills, values, and dispositions that support responsible commitment to human rights, sustainable development and living, and global well-being, thereby reflecting a truly global citizen" (NEP 2020:6). Thus, the listed values are linked to cognitive content and skill sets such as (NEP 2020:15; Sec.4.23):

- language skills (mother tongue, classical languages, foreign languages), oral and written communication;
- scientific temper and evidence-based thinking; problem solving and logical reasoning; digital literacy, coding and computational thinking; vocational exposure and skills;
- creativity and innovativeness; sense of aesthetics and art; health and nutrition; physical education, wellness, fitness and sports; collaboration and teamwork;
- ethical and moral reasoning; including knowledge and practice of human and constitutional values, gender sensitivity; fundamental duties, citizenship skills and values; environmental awareness, water and resource conservation; sanitation and hygiene; current affairs and knowledge of critical issues facing local communities, states, the country, and the world.

5. Integration of Values into the Curriculum & Pedagogy

Beyond the typical platitudes, the policy underscores "teaching importance of 'doing what is right', with a logical framework for making ethical decisions" (NEP 2020:16; Sec. 4.28).

Practical methods prescribed in this direction are:

5.1. Developing a logical framework for making ethical decisions (*ibid.*)

5.2. Case study method of evolving ethical decisions (*ibid.*)

5.3. Art integration for instilling Indian ethos (NEP 2020:12; Sec.4.7)

5.4. Sports integration for instilling values such as collaboration, self-initiative, self-direction, self-discipline, teamwork, responsibility, citizenship, fitness (NEP 2020:12; Sec.4.8).

5.5. Reading of excerpts from constitution (NEP 2020:16; Sec. 4.28)

5.6. Experiential learning opportunities of crafts, skills and languages in a fun way (NEP 2020, Sec.4.16;26).

6. The Way Forward

In this regard, CBSE has taken steps that several of these aspects have already been foreseen and introduced into its curricular framework, though not specifically as intended here. The great caution of the father of our nation regarding how a public good like education can become a 'social sin', when the focus on character (education for life) is missed out in the process is worth recalling in this context. The policy has forcefully brought this aspect back into the mainstream. But its realization will depend on educational leadership and the teacher community. This requires befitting inputs in the teacher training curriculum itself on the one hand, and on the other hand, the national curricular and assessment framework within which the articulated cognitive, attitudinal and skill contents are adequately integrated. It also requires desire and determination on the part of the school administration with Institutional Development Plan (IDP) with this particular component in place, and incentivizing contributions in this direction.

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i References from NEP have been given in 2 ways: (i) where quoted with page no, as NEP 2020:page number and (ii) where an idea is taken, as NEP 2020 Sec.4.23, indicating the sections from which the idea has been taken, for easy reference for the reader. The typical author based reference is not given in this regard.

Exploring the effects of technology professional development on the 8th grade naep mathematics achievement

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Abstract

The study aimed to explore the impact of teachers' participation in educational technology professional development on eight grade students' mathematics achievement using a non-experimental approach. Analyzing the 2013 National Assessment of Education Progress (NAEP) eight grade mathematics restricted dataset, key variables included socio-economic status, gender, race/ethnicity, teachers' technology professional development, tenure-certification, and professional development on mathematical peer collaboration. Principal component factor analysis and hierarchical regression assessed predictive factors, guided by Bandura's self-efficacy, Schulman's Pedagogical Content Knowledge (PCK), and Mishra and Koehler's Technological Pedagogical Content Knowledge (TPACK). Findings underscored educators' need for essential skills, especially in technology, to enhance student outcomes in mathematics, emphasizing the significance of technology-focused professional development.

Key words: Technology Pedagogical Content Knowledge, teachers' professional development, educational technology self-efficacy, mathematics achievement, NAEP data

Introduction

The research analyzed restricted data from the 2013 National Assessment of Education Progress (NAEP) to investigate whether teachers' participation in educational technology professional development significantly influenced eight grade mathematics achievement, considering variables such as race, gender, and Socio-Economic Status (SES). This nonexperimental study utilized selected NAEP 2013 data focusing on eight grade mathematics achievement, incorporating confirmatory factors for educational technology professional development, SES, parents' education, and teacher tenure-qualification. The theoretical framework, based on Technological Pedagogical and Content Knowledge (TPACK) and Bandura's self-efficacy theory, guided the study. NAEP's selection as the data source was justified by its status as the largest nationally representative and ongoing assessment, facilitating meaningful comparisons across demographic groups at various levels.

NAEP's data collection process is widely respected for its richness and variety. Initiated in 1969, NAEP operates under the oversight of the National Centre for Education Statistics (NCES) and is mandated by Congress to report on reading and mathematics biennially and science at least once every four years. The National Assessment Governing Board (NAGB), an independent entity authorized by Congress, provides guidelines for the assessment. Strict legal provisions ensure data confidentiality. NAEP serves as a valuable tool for informing educational practitioners, policymakers, and the public, offering insights into educational progress and guiding informed actions (Beaton & Zwick, 1992; NCES, 2015).

The Importance of the Study

The study aims for global significance, benefiting regions employing technology-infused curricula. It contributes insights into educational experiences, correlating with student learning and teachers' TPACK self-efficacy (NAEP, 2019). Utilizing Mishra and Kohler's (2006) and Bandura's (1978) frameworks, the research centers around Technological Content Knowledge self-efficacy. Evolving from a historical perspective, the contemporary teaching profession demands multifaceted skills. Shulman's (1986) contributions shaped the profession, leading to the emergence of TPACK. While global consensus is lacking, Mishra and Kohler's (2006) theoretical model is widely accepted. The study investigates factors related to teachers' technology professional development, analysing variables related to technology use in classrooms and teachers' attendance in professional development programs (PD) in connection with eight grade mathematics achievement. Teachers' attitudes toward technology and insufficient TPACK levels impact effective educational technology integration. In line with the 2017 NAEP recommendations, PD in educational technology should actively integrate technology tools into content and methods (U.S. Department of Education, 2017). However, these recommendations lack a specific framework to enhance teachers' TPACK self-efficacy. Therefore, implementing professional development in educational technology is crucial for educational technology leaders, fostering better learning outcomes and cultivating a globally connected and productive society (NAEP, 2019; U.S. Department of Education, 2017).

Research Questions

1. Is there a significant relationship between student socioeconomic status, and 8th-grade students' achievement on mathematics assessment?
2. Is there a significant relationship between student socioeconomic status, gender, and 8thgrade students' achievement on mathematics assessment?
3. Is there a significant relationship between student socio-economic status, gender, teachers' educational technology professional development, parents' education, teachers' qualification, and 8th-grade students' achievement on mathematics assessment for each of the NAEP-identified racial categories?

Literature Review

Socio-economic Status

In 2015, Alordiah, Akpadaka & Oviogbodu conducted a scholarly investigation on the impact of socioeconomic status (SES) on students' academic achievements, particularly in mathematics. The study, based on a sample of 1900 senior secondary students in Delta and Edo states, Nigeria, revealed significant disparities in academic achievement based on parents' SES, with students having higher SES parents exhibiting superior academic performance. The study emphasizes the influential role of resources, time, and financial support and underscores the need for educators to address socio-economic disparities

among students (Alordiah, Akpadaka & Oviogbodu, 2015). Lee, Zhang, & Stankov (2019) conducted a comprehensive study utilizing data from the Programme for International Student Assessment (PISA), identifying the economic, social, and cultural status (ESCS) index and home possessions as powerful predictors of student achievement. Home possessions, as a proxy for family income, showed higher effect sizes compared to parental occupation and education, highlighting the continued significance of SES for academic achievement and the importance of considering multiple SES variables collectively (Lee, Zhang, & Stankov, 2019). Perry & McConney (2010) explored the relationship between SES and academic performance, analyzing Australia's 2003 PISA data. The study found a robust association between SES context and academic performance, emphasizing that attending a school with higher SES positively impacted students' performance, challenging the segregation of educational institutions based on SES, and advocating for an inclusive schooling system considering SES's impact on academic performance (Perry & McConney, 2010).

Gender Difference in Academic Achievements

Falch & Naper's (2013) recognition of gender impact on student test scores lays the foundation for global acknowledgment. McGraw, Lubienski & Strutchens (2006) delve into U.S. gender gaps in mathematics achievement, revealing consistent small disparities favoring males based on NAEP data. The study underscores the persistent role of gender in shaping students' learning and mathematics achievement, with variations noted among racial groups. Meggiolaro's (2018) exploration of gender-related associations between Information and Computer Technology (ICT) use and math achievement, using PISA 2012 data, uncovers nuanced differences. Males exhibit superiority in conceptual understanding, while females excel in routine algorithmic strategies. The study highlights the gender-differentiated relationship between ICT usage and mathematics achievement. Falch & Naper's (2013) study further probes gender gaps in evaluation schemes, exposing disparities where females receive better grading, and boys outperform in competitive exams. The grading gap widens with free school choice, suggesting female inefficiency in competitive settings. Teacher-initiated discrimination contributes to the gender grading gap, revealing a nuanced impact on boys. In conclusion, this synthesis underscores the multifaceted nature of gender differences in academic achievements. The proposed solution involves early integration of technology into classroom teaching, aligning with broader efforts to address gender bias in mathematics education.

Teachers and the use of Educational Technology

Lau & Yuen's (2013) study on educational technology workshops for mathematics teachers revealed significant effects on efficacy and pedagogical orientation. Emphasizing the need for alignment with teachers' needs, the workshops focused on pedagogical knowledge, technological knowledge, and pedagogical content knowledge. Varol (2013) found a correlation between teachers' attitudes toward technology and ICT engagement, highlighting the necessity for enhanced opportunities and knowledge to cultivate positive attitudes. Umar & Hassan (2015) discovered a low level of ICT integration among Malaysian

teachers, emphasizing the importance of additional training for professional development. Maksimovic & Dimic (2016) stressed the role of professional development in information competencies for effective teaching, while Beşoluk, Kurbanoğlu, & Önder (2010) emphasized continuous technology knowledge updates and participation in professional development programs. In summary, these studies emphasize the critical role of educational technology and the necessity for teachers' ongoing professional development to seamlessly integrate technology into educational practices.

From PCK to TPACK: Development and Growth

Shulman (1986) introduced Pedagogical Content Knowledge (PCK) in the '80s, asserting its longstanding presence in the education system. Early universities viewed content and pedagogy as inseparable, with pedagogy addressing how to teach and content addressing what is known (Shulman, 1986). This denotes teachers' comprehension of translating knowledge into subject matter for students. Shulman's insights draw from detailed narratives on medieval university practices, emphasizing that the sharp distinction between content and pedagogy is relatively recent. The motivation behind proposing PCK was to address the perception of teaching as a less professional career compared to fields like medicine and law. PCK, according to Shulman, integrates content and pedagogy, focusing on the how and what of teaching. In his "missing paradigm," Shulman identifies a blind spot in teaching, emphasizing the absence of questions about the content of lessons (Shulman, 1986). Scholars worldwide have sought to integrate pedagogy and content to recognize teaching as a profession, leading to Shulman's theoretical framework proposing three categories of content knowledge: pedagogical content knowledge, subject matter content knowledge, and curricular knowledge (Shulman, 1986).

Shulman (1986) defines Content Knowledge (CK) as the quantity and organization of knowledge in a teacher's mind, emphasizing the importance of understanding why a proposition is correct. Pedagogical Knowledge surpasses subject matter knowledge, focusing on teaching dimensions and diverse representations for student comprehension. Curricular Knowledge spans the entire range of programs needed to teach a specific subject, considering tools, alternative texts, visual materials, and individual student needs. Shulman identified three forms of teachers' knowledge: propositional, case, and strategic knowledge, organized under these categories. Shulman's PCK framework continues to influence teacher education, aiding understanding of the teaching process and the development of effective instructional strategies. In the context of the technology-driven world, Mishra and Koehler (2006) propose integrating technology with PCK, recognizing its relevance in modern education.

TPACK: A Framework for Teacher Knowledge for Technology Integration and its Factorial Structure

Mishra and Koehler (2006) responded to the lack of an educational technology framework by proposing one based on Shulman's PCK. In their research, they highlighted the importance of understanding the relationships between pedagogy, content, and technology, especially in the context of technology integration. They introduced four interconnected

knowledge domains: Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical Content Knowledge (TPCK). Their focus was on the complex understanding required for effective technology integration, termed Technological Pedagogical Content Knowledge (TPCK).

Technological Pedagogical Content Knowledge (TPACK) Emphasized by Koehler, Mishra, Akcaoglu, and Rosenberg (2013), TPACK synthesizes technology, content, and pedagogy to address crafting technology for specific pedagogical needs in particular contexts. Effective teaching involves the synthesized use of these components, highlighting teaching's inherent complexity. TPACK serves as a theoretical lens, offering a nuanced approach to evaluating teaching ability and preparedness to use technology effectively. Rejecting a one-size-fits-all approach, it provides educators with diverse tools for effective teaching, underscoring the importance of technological professional development in education. The interactions among components are visually represented by three circles in the TPACK diagram.

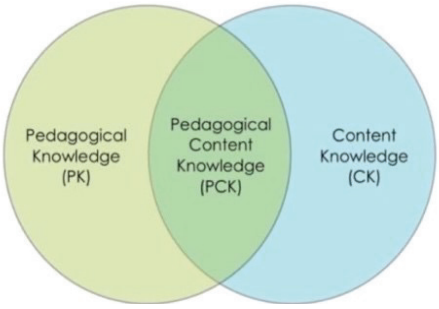

Figure 1. PCK Framework

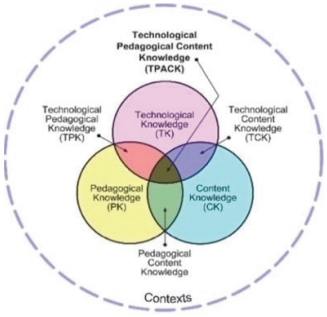

Figure 2. Interactions in TPACK

TPACK Self-Efficacy

Self-efficacy (SE), defined as one's skills in a particular field (Abbitt, 2011), influences teachers' choices and behaviors significantly (Bandura, 1986; Schunk, Hanson, & Cox, 1987). Higher self-efficacy motivates teachers to experiment with teaching methods, while lower selfefficacy may lead to anxiety and less effort (Schunk, Hanson, & Cox, 1987). TPACK self-efficacy, the application of self-efficacy in teachers' technology integration, is linked to effective technology use in teaching (Saudelli & Ciampa, 2016; Compeau & Higgins, 1995). Teachers with higher self-efficacy in technology are more likely to integrate it effectively into their teaching activities (Compeau & Higgins, 1995). TPACK self-efficacy, grounded in the TPACK framework (Bilici, Yamak, Kavak, & Guzey, 2013), significantly influences teachers' attitudes toward technology incorporation in teaching (Rohaan, Taconis, & Jochems, 2012). Improved TPACK knowledge enhances self-efficacy, leading to increased technology use in classrooms. In summary, the theoretical understanding of the TPACK conceptual framework with self-efficacy consistently affects teachers' classroom practices, ultimately influencing student achievement.

Methodology

In this non-experimental study, the researcher utilized the 2013 8th-grade mathematics NAEP restricted dataset, employing principal compound factor analysis and multiple hierarchical regression. The study focused on factors such as socio-economic status, parents' education, teacher qualification, and educational technology professional development. Shulman's PCK, Mishra and Koehler's TPACK, and Bandura's self-efficacy framed the study. The research sample comprised 341,000 students nationally, with variables selected for a non-experimental quantitative analysis, including SES, parents' education, teachers' qualifications, gender, race/ethnicity, and technology professional development. The NAEP framework ensured reliable and valid assessment instruments. Data analysis involved NAEPEX software for statistical and factor analysis, AM software for regression, and a combination of 20 variables as the dependent variable for mathematics achievement.

Results

Socio-Economic Status (SES) Variable: The researcher selected National Lunch Program eligibility (SLUNCH), internet access (B0267A1), family clothes dryer (B0267B1), dishwasher (B0267C1), more than one bathroom (B0267D1), and personal bedroom (B0267E1) to measure non-participation accurately in the plausible regression. Recoding certain values for precision, lower SES scores denote higher students' SES.

Student Gender Variable: For regression analysis, the researcher used the variable DSEX, coding 1 for males and 2 for females. Positive scores represent females, and negative scores represent males, enabling gender-related variance assessment.

Student Race/Ethnicity Variable: The researcher employed the variable SRACE10, coding 1 for White, 2 for African American, 3 for Hispanic, 4 for Asian, 5 for American Indian or Alaskan Natives, 6 for Native American/Pacific Islander, and 7 for non-Hispanic, to account for variance in the dependent variable.

Professional Development of Computers Variable: Aligned with the TPACK framework, the researcher chose the variable professional development of computers and technology (T087708). Coding 0 for multiple, 1 for not at all, 2 for a small extent, 3 for a moderate extent, 4 for a large extent, and 8 omitted, it directly addresses teachers' access to technology professional development for effective classroom use. Other variables were included for a multiple hierarchical regression, gauging the extent to which teachers' professional development in computer use predicts students' math achievement.

Factor Analysis

Conducting a factor analysis on NAEP eighth-grade math achievement scores, the study applied the principal component extraction method and promax rotation. Utilizing the Kaiser Guttman retention criteria, eigenvalues greater than 1.0 were considered, and items with a component weighting of at least .30 were included. Composite reliability for congeneric measures was calculated for each factor. Factors, including SES, Parents' Education, Student

Use of Technology, Teachers' Qualification, Tenure and Certification, and Professional Development, underwent meticulous construction, reliability assessments, and met retention criteria. For example, the SES factor achieved a composite reliability of .788, explaining 21.40% of common variance. Similar procedures were applied to other factors, establishing a robust framework for exploring predictors of eight grade NAEP mathematics achievement (Meyers et al., 2016).

Plausible Values Regression Analysis

To determine this, the researcher carried out plausible values regression analysis. Student's plausible values were determined by a comprehensive marginal maximum likelihood (MML) regression. The eight-grade mathematics achievement is represented by a combination of twenty values. The researcher used twenty values, as the dependent variables in all the regression except the multiple hierarchical in which used only one due to practical feasibility of analysis and limitations of using twenty dependent variables in SPSS. For the purpose of the present study, the plausible values regression analysis calculated using AM statistical software beta version. This reports the overall *F*-statistics and corresponding *p*-value for the regression model as well as the significance of the contribution of each variable to the regression equation reported as *z*-scores. In this, the table-rows are formatted using one column for each of the following items: independent variables and the constant, the estimate, standard error, *z*-score, and the associated *p*-value. In addition to it, the table also shows the Root Mean Square Error (RMSE), R^2, and the effect size, calculated as, $f^2=R^2/(1-R^2)$, (Cohen, 2013). The Root Mean Square Error indicates the absolute fit of the model to the data- measuring the distance between the predicted value for the dependent variable and its actual value. It is one of the most commonly used measures of evaluating the predictions. Taking the square root of the mean of the squares allows the units of measure to be the same as the dependent variable.

Research Question 1

There were 170102 observations collected after all the eliminations. For α=0.05, the overall test for the model was determined to be significant (R^2 = .130, F (1,81) =4604.25, p<.001). The model produced an R^2 value of .130; therefore, the variable SES in this model predicted 13% of the variance in the 2013 eight grade NAEP mathematics results. Since significance was found using this alpha level the null hypotheses, H_o1: there is no relationship between SES and 2013 NAEP 8th grade mathematics assessment results, was rejected. In addition, the independent variable made significant contributions to model at p<.001. The unstandardized coefficients for the variable SES were negative due to the direction of coding with higher scores corresponding to lower SES and fewer home resources. The negative unstandardized coefficients for SES that the lower the level of SES and the fewer home resources, the lower the predicted achievement on the 2013 eighth grade mathematics NAEP. Since f^2=0.149, a small effect size was indicated.

Table 1 *Plausible Values Regression-Step One*

Parameter Name	Estimate	Standard Error	*z* Score	$p > \|z\|$
Constant	283.537	0.239	1186.017	0.000
Students' Socio-economic Status***	-14.004	0.206	-67.855	0.000
Root Mean Square Error	34.043			

***p<.001, **p<.01, *p<.05 R^2 = .130, F(1,81)=4604.25, p<.0001, f^2=0.149.

Research Question 2

Student gender was added to the model for predicting students' mathematics achievement. There were 172983 observations after the selection of values. For α= 0.05, the overall test for the model was determined to be significant (R^2 = .130, F(2,80)=2296.98, p<.0001). The model produced an R^2 value of .130; therefore, when the variable student's gender was added to this model, it predicted 13% of the variance in the 2013 eighth-grade mathematics NAEP results. Therefore, the R^2 increased by 0% from the previous step. Since significance was found using this alpha level the null hypotheses, H_o2: there is no relationship between SES, gender and the eighth grade 2013 NAEP Mathematics Assessment was rejected. In addition, both independent variables made significant contributions to the model at p<.001. The negative unstandardized coefficient for the variable student gender indicated that the predicted achievement on the 2013 NAEP eighth grade mathematics test would be lower for females than males. The RMSE was slightly lower in Step 2 (34.040) than Step 1 (34.043) indicating less error between the predicted and actual values of the dependent variable; thus, this model had a better fit to the data than the prior model. Since f^2=0.149, a small effect size was indicated.

Table 2 *Plausible Values Regression-Step Two*

Parameter Name	Estimate	Standard Error	*z* Score	$p > \|z\|$
Constant	284.730	0.506	562.599	0.000
Students' Socio-economic Status ***	-14.006	0.206	-67.925	0.000
Student Gender***	-0.801	0.284	-2.819	0.000
Root Mean Square Error	34.040			

***p<.001, **p<.01, *p<.05. R^2 = .130, F(2,80)=2296.98, p<.0001, f^2=0.149.

Research Question 3

The remaining five factors were added to this model. There were 153660 observations

in professional development of computer and other technology, 170102 in observations parents' education, 153660 observations in teachers' educational qualification, teachers' tenure and certification, and professional development on math instruction. For α= 0.05, the overall test for the model determined to be significant (R^2 = .175, F(13,68)=485.061, p<.001). Although all variables are determined to be significant only the p-value of professional development of computer or other technology is mentioned here, as it is important for the use of present study. The model produced an R^2 value of .175; therefore, when the professional development of computer or other technology factors were added to this model, it predicted 17.5% of the variance in the 2013 eight grade mathematics NAEP results. The R^2 increased by .45% from the previous steps. Since significance was found using this alpha level the null hypotheses, H_o3: there is no relationship between SES, gender, professional development of computer and other technology, parents' education, teachers' tenure and certification, professional development on math instruction and eight grade students' achievement on the NAEP mathematics assessment was rejected. In addition, all independent variables made significant contributions to the model at p<.001. However, at this step, the factor professional development of computer and other technology made significant contributions at p<.05. The positive unstandardized coefficient for the factor professional development of computer and other technology indicated that teachers who frequently attended educational technology professional development predicted the higher achievement of their students on the 2013 eight grade mathematics NAEP. The RMSE was lower in Step 3 (32.939) than Step 2 (34.040) indicating less error between the predicted and actual values of the dependent variable; thus, this model had a better fit to the data than the prior model. Since f^2=0.212, a moderate effect size was indicated.

Table 3. *Plausible Values Regression-Step Three*

Parameter Name	Estimate	Standard Error	*z* Score	$p > \|z\|$
Constant	283.733	1.043	272.019	0.000
Students' Socio-economic Status ***	-11.570	0.229	-50.568	0.000
Prof. dev-use of compt./other technology***	1.506	0.367	4.107	0.000
Student Gender***	-1.927	0.36	-5.347	0.000
Students parents education***	1.348	0.174	7.748	0.000
Teaachers tenure and certification**	0.971	0.344	2.822	0.005
Prof. dev- on maths instruction***	-1.549	0.391	-3.964	0.000
Root Mean Square Error	32.939			

***p<.001, **p<.01, *p<.05 R^2 = .175, F(13,68)=485.061, p<.001.

t -Tests

The researcher conducted a final regression *t*-tests on all the selected independent variables within the model. It was found that each independent variable contributed significantly and uniquely to the model: student gender $t(80)=-240.57376$, $p<0.001$; prof dev-use of computer or other technology $t(80)=-205.84508$, $p<0.001$; Socio-economic status $t(80)=-286.62209$, $p<0.001$; student parents' education $t(80)=-258.92511$, $p<0.001$, students use of computer and internet for math study $t(80)=-277.61196$, $p<0.001$, students use of calculator for math learning $t(80)=264.50948$, $p<0.001$, teachers qualification graduate $t(80)=-255.73941$, $p<0.001$, teachers qualification undergraduate, $t(80)=-254.58778$, $p<0.001$, teachers tenure and certification $t(80)=255.84306$, $p<0.001$, professional development on math peer collaboration $t(80)=-258.08787$, $p<0.00$, Prof development on math instruction $t(80)=-335.01782$, $p<0.00$, and students use of computer in math class $t(80)=-282.77033$, $p<0.001$.

Final Step Plausible Regressions Filtered by Race/Ethnicity Subgroups

In the final step of plausible regressions filtered by race/ethnicity subgroups using the 2013 NAEP dataset, the variable student race/ethnicity (SRACE10) was categorized into six groups. Dummy coding was applied, and the analysis was conducted separately for each subgroup using a filter in AM. The comparison of regression models revealed varying coefficients influencing students' mathematics achievement. SES had the most substantial effect on the Asian American/Pacific Islanders subgroup (-12.38) and the least on the Black subgroup (-6.800). Student gender was significant for three subgroups, while parent education affected Hispanic and Asian subgroups. Teachers' professional development in math instruction had minimal influence across all subgroups.

Hierarchical Regression

To check if the selected variables of the researcher's interest explain a statistically significant amount of variance in the dependent variable after accounting for other variables. The researcher ran a hierarchical regression analysis with seven steps. The data satisfies assumptions of normality, linearity, tolerance (multicollinearity), and homoscedasticity (histogram, P-P plot, and scatter plot). The model summary of the analysis showed that the multiple correlation coefficient (R), using all the predictors simultaneously, the model 1 is .352 (R^2 =.124) and Adjusted R square (.124), model 2 is .352 (R^2 =.124) and Adjusted R square (.124), model 3 is .357 (R^2 =.127) and Adjusted R square (.127), model 4 is .357 (R^2 =.127) and Adjusted R square (.127), model 5 is .361 (R^2 =.130) and Adjusted R square (.130), model 6 is .362 (R^2 =.131) and Adjusted R square (.131), and model 7 is .362 (R^2 =.131) and Adjusted R square (.131). The Durbin-Watson is 1.613 (well within 1 and 2). Meaning that 12%, 12%, 13%, 13%, 13%, 13%, and 13% of the variance in the 2013 NAEP eighth grade Math Achievement can be predicted from SES, gender, race, professional dev-use of computers or other technology, students' parents education, teachers tenure and certification, and professional development on maths instruction.

Table 4 *Hierarchical Regression Model Summary*

Model	*R*	R^2	Adjusted R^2	Durbin-Watson
1	0.352[a]	0.124	0.124	
2	0.352[b]	0.124	0.124	
3	0.357[c]	0.127	0.127	
4	0.357[d]	0.127	0.127	
5	0.361[e]	0.13	0.13	
6	0.362[f]	0.131	0.131	
7	0.362[g]	0.131	0.131	1.613

The ANOVA table showed that model 1 F (153635) =21750.370 p=.000, model 2 F (153,634) =10882.241 p=.000, model 3 F (153,633) =7468.962 p=.000, model 4 F (153,632) =5611.696 p=.000, model 5 F (153,631) =4609.348 p=.000, model 6 F (153,630) =3862.175 p=.000, and model 7 F (153,629) =3319.302 p=.000. This indicates that the combination of the predictors predicts the 2013 NAEP eighth grade Math Achievement (Table 4.21). The coefficients table shows that the SES, gender, race, professional dev-use of computers or other technology, students' parents education, teachers tenure and certification, and professional development on maths instruction are adding to the prediction. The data also indicates that the other six variables SES, gender, race, students' parents' education, teachers' tenure and certification, and professional development on math instruction are significant to the prediction of the 2013 NAEP eighth grade Math Achievement.

Table 5 *Anova*

Model	*df*	*F*	*p*
1	153635	21750.37	0.000***
2	153634	10882.241	0.000***
3	153633	7468.962	0.000***
4	153632	5611.696	0.000***
5	153631	4609.348	0.000***
6	153630	3862.175	0.000***
7	153629	3319.302	0.000***

<.001, **p<.01, *p<.05

The standardized beta coefficients of SES β=-12.539, t=-.138.490, p=.000, gender β=-.395, t=-2.270, p=.023, race β=-1.601, t=-.23.745, p=.001, professional dev-use of computers or other technology β=-.426, t=-5.526, p=.001, students' parents education β=1.983, t=22.602, p=.001, teachers tenure and certification β=-.912, t=-.10.486, p=.001, and professional development on maths instruction is β=-.908, t=-7.353, p=.001. The data analysis shows that all variables were significantly correlated with the 2013 NAEP eighth grade Math Achievement. They contribute to the multiple regression predicting the 2013 NAEP eighth grade Math Achievement.

Table 6 *Coefficients Table*

	β	t	p
SES	-12.539	-138.49	0.000
Gender	-0.395	-2.27	0.023
Race	-1.601	-23.745	0.001
Professional dev-use of computer or other technology	-0.426	-5.526	0.001
Students' parents' education	1.983	22.602	0.001
Teacher tenure and certification	-0.912	-10.486	0.001
professional development on maths instruction	-0.908	-7.353	0.001

***p<.001, **p<.01, *p<.05, Dependent Variable: Plausible NAEP math value#20 (composite)

Findings

The analysis reveals key findings:

- Teachers with professional development in computer and technology usage had students with higher mathematics achievement.
- Higher socio-economic status (SES) correlated with increased mathematics achievement across all NAEP-recognized race/ethnicity subgroups.
- Positive correlation observed between teachers' technology professional development and students' math achievement.
- Subgroups of White and Asian students with higher SES reported higher mathematics achievements.
- Overall, males outperformed females in mathematics achievement across NAEP-recognized subgroups.

In mathematics education, technology integration supports problem-solving and metacognitive abilities (Pierce et al., 2007). Parental SES significantly impacts student achievement, necessitating attention to disparities. The study's focus on teachers' technology professional development, aligned with the TPACK framework, highlights technology's potential when effectively utilized. The findings stress the need for effective plans, including

regular professional development, to maximize technology's potential in classrooms.

Implications and Recommendations: The study urges administrators and policymakers to invest in technology without compromising effective use. Regular professional development programs for teachers, aligned with the TPACK framework, contribute to higher mathematics scores. The study recommends aligning teachers with Common Core State Standards, integrating technology, and enhancing teacher preparation programs.

Limitations and Future Research: Limitations include reliance on self-reporting data, constraints in consolidating dependent variables, and the correlational nature of statistical analysis. Future research opportunities involve utilizing the latest NAEP dataset, exploring alternative theoretical lenses, and investigating specific technologies' effectiveness in the classroom. Replication for reading outcomes and exploration of various technology devices' impact on student achievement are suggested for further research.

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A review on the impact of spiritual intelligence and emotional intelligence on burnout and job satisfaction amongst IT professionals

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ABSTRACT

Spiritual Quotient (SQ) and Emotional Quotient (EQ) are two factors that could impact the behaviour and performance of employees. This research aims to analyze the Spiritual Quotient and Emotional Quotient of Information Technology (IT) employees and discover their impact on their burnout and job satisfaction. This study intends to examine the extent of the impact of SQ and EQ on Burnout and job satisfaction amongst IT professionals and provide suggestions that can incorporate both intelligence traits in a positive way at the workplace. Various studies revealed that employees' EQ and SQ could be one of the contributors for their success at work than their Intelligence Quotient. This study attempts to revisit the previous research conducted on this aspect of association between EQ, SQ, Burnout and Job Satisfaction amongst employees with special reference to IT Sector. Higher levels of EQ and SQ are the factors responsible for increasing the level of Burnout and enhancing the level of Job Satisfaction. It also have a major impact on employees career as well as Organizational Performance. This study aims to provide a critical review of Spiritual Quotient and Emotional Quotient amongst IT professionals and their impact on their Burnout and Job Satisfaction.

Keywords: IT Professionals, Emotional Quotient (EQ), Spiritual Quotient (SQ), Burnout, Job Satisfaction

INTRODUCTION

IT Professionals constitute a significant number of employed professionals in India. They have an immense contribution to the Gross Domestic Product of the Country. There are various factors that contribute to their performance. Spiritual Intelligence is one such factor that can have an impact on Job satisfaction and Burnout among IT Professionals.

As defined by Wigglesworth as, Spiritual Quotient is the ability to behave with wisdom and compassion while maintaining inner and outer peace regardless of the situation. Spiritual intelligence is the ability of an individual to access higher meanings, values, abiding purposes, and unconscious aspects of the self and to embed these meanings, values, and purposes in living richer and more creative lives. People with a high level of spirituality have healthier, happier, and more productive lives at their workplace. Spirituality is considered one of the key factors for the success of employees and thereby helping for their professional life. Spiritual

Intelligence is something that can reflect a person's behaviour and attitude. Hence there is a need to understand its effects on the performance and job satisfaction of an employee.

Emotional intelligence is the ability to recognize, understand, and regulate our emotions and to respond to those emotions in constructive ways that allow us to communicate, empathize with others, and overcome challenges. It is the ability to regulate our emotions according to the existing situations.

In other words, it is the ability to manage our emotions before our emotions manage us. The five components of EQ are

1. Self -Awareness

2. Self -Regulation-.

3. Social Skills

4. Empathy

5. Motivation

The proper realization of all the five components of EQ can facilitate better Emotional Management. It can be improved and may influence professional success than IQ. Burnout and Job Satisfaction are two important outcomes of the differences in the SI and EI among the employees.

RESEARCH OBJECTIVES

- To examine whether there is an impact of SQ and EQ on job satisfaction amongst IT Professionals.
- To determine the impact of SQ and EQ on Burnout amongst IT Professionals.
- To convey the relevance of incorporating spirituality and EQ positively to IT Professionals in their workplace.
- To examine the relationship between EQ and SQ based on earlier studies conducted on the above topic.

SIGNIFICANCE OF THE STUDY

Though many studies have been conducted to assess the SQ and EQ and their impact, a need was felt to learn its impact on burnout and Job satisfaction of IT Professionals. The conclusion of this study could lead to a better understanding of SQ and EQ amongst IT professionals and how it can affect their burnout and job satisfaction. The results could ideally help employers to change certain work policies, and employees to understand what the level of their SQ and EQ is and how can they reduce their level of burnout and thereby increase job satisfaction. Suggestions could be provided to them based on the results.

REVIEW OF LITERATURE

All the previous relevant studies conducted on EQ and SQ are categorized into five sections.

SPIRITUAL INTELLIGENCE

Spiritual Intelligence, according to Wigglesworth, is the capacity to act in a wise and compassionate manner while upholding inner and external tranquillity in any circumstance.

Spiritual intelligence is the ability of an individual to access higher meanings, values, abiding purposes, and unconscious aspects of the self and to embed these meanings, values, and purposes in living richer and more creative lives. High-spiritual individuals lead happier, healthier, and more successful lives at work.

A person's spirituality is seen to play a major role in their success at work and, consequently, in their professional lives. A person's behaviour and attitude might be reflected in their spiritual intelligence. Therefore, it's important to comprehend how it affects employees' performance and job satisfaction. A workplace where SQ is consistently practiced can improve employee job satisfaction, which in turn reduces Workplace Deviant Behaviour. The study emphasizes the value of spirituality in the workplace for workers since it can lower Workplace Deviant Behaviour. (Wohyano). Workplace spirituality is reported to be correlated with gender, designation, and workplace spirituality (Ujjal, 2018); Bernard (2008) has demonstrated that EQ influences the SQ improved job happiness but negatively impacts employees' inclination to leave mobile telecom firms. The aspects of spiritual intelligence are positively and significantly correlated.

Spiritual intelligence gives one a sense of personal wholeness, goal, and direction (Dincer, 2009). According to Jafri (2000), job satisfaction is defined as "a pleasant emotional state resulting from the appraisal of one's job and an attitude toward one's job." A teacher's affective attachment to their teaching profession is referred to as their "teacher's object satisfaction," which is based on how they view the relationship between their goals for their career and what they believe teaching offers them (Papanastasiou, 2009).He noted that teachers with high levels of spiritual intelligence are able to shape students of all ages to enjoy a wholesome existence full of self-respect and creativity. Spiritual intelligence gives one a sense of personal wholeness, goal, and direction (Dincer, 2009).The experimental group's levels of psychological problems such interpersonal sensitivity, somatization, obsessive-compulsive disorder, depression, anxiety, aggression, phobic, paranoid ideation, and psychoticism are significantly reduced by spiritual intelligence training. (Soylemez, Aydın, 2019)

EMOTIONAL INTELLIGENCE

People with strong emotional regulation skills accurately recognize and assess their emotional states, know when to express their sentiments and maintain mental control. As a result, they have high emotional intelligence (EQ). This group of traits is related to perception. Emotional intelligence and both psychological and physical well-being are positively correlated (P

Salovey, 1999). Ciarrochi, Joseph (2002The capacity to identify, comprehend, and control our emotions as well as to constructively react to them in order to communicate, sympathize with others, and overcome obstacles is known as emotional intelligence (EQ). It is the capacity to control our feelings in response to the circumstances at hand. Emotional intelligence refers to controlling our feelings in order to deal with the circumstances that we find ourselves in.

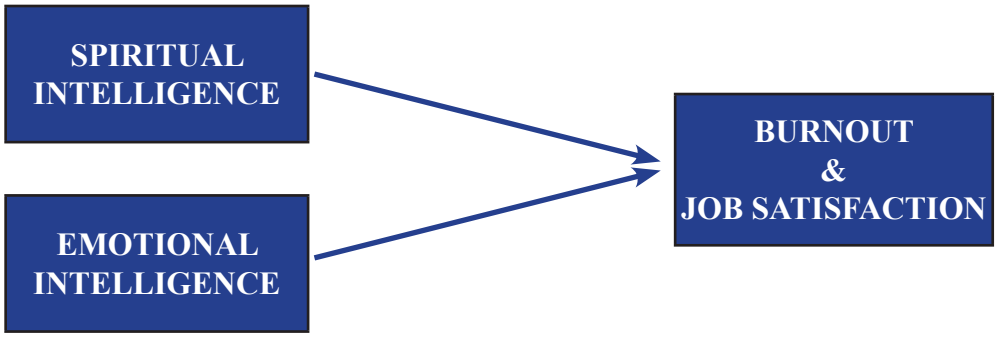
BURNOUT

Chronic interpersonal and emotional pressures at work might lead to burnout. Maslach, Christina (2001). A negative correlation was shown between emotional weariness, one aspect of burnout, and the ensuing performance at work. Thomas A. Wright concluded that figuring out the cause of burnout requires an awareness of how an individual interacts with his or her early professions were less inclined to change careers and showed greater flexibility in their work approach when surveyed by confidants at the time of follow-up. The findings imply that there are no appreciable, unfavourable, long-term effects of early career burnout. But burnout later in a career could have greater detrimental effects.

JOB SATISFACTION

The degree of job content and an employee's perception of accomplishment and success at work determine their level of job satisfaction. It has a direct bearing on both personal well-being and productivity. Finding fulfilment in one's work entails performing well at it and receiving recognition for one's achievements. It denotes zeal and contentment in one's job. It results in acknowledgment, money, a promotion, and the accomplishment of other objectives that give one a sense of fulfilment. (Kaliski, 2007).The assortment of thoughts and emotions that people have regarding their present employment is known as work satisfaction. Extreme levels of job satisfaction can be found in people, as can extreme levels of discontent. Individuals may also hold attitudes toward many faces of their occupations, including the type of labour they perform, their co-workers, managers, or subordinates, as well as their compensation. George (2008).

RELATIONSHIP BETWEEN EMOTIONAL INTELLIGENCE, SPIRITUAL INTELLIGENCE, BURNOUT AND JOB SATISFACTION



The ability to recognize and distinguish between one's own and other people's feelings and emotions, as well as to use the outcome to guide one's thoughts and actions, is known as EQ. The genuine sense of attachment to one's inner self and other people is known as "SQ."

There is a correlation between spiritual intelligence, burnout, and job satisfaction, according to several research. This relationship is dependent on how well spirituality is perceived and applied in the workplace to lessen stress and burnout and increase job satisfaction. Employee turnover intention in mobile telecommunication corporations was shown to be negatively impacted by spiritual intelligence, although job satisfaction was found to be positively impacted by it. (Koranye, Benard, 2021).

There exists a correlation between spiritual intelligence and job satisfaction, as well as a relationship between organizational commitment and job happiness. Spiritual intelligence and organizational dedication are not correlated in any way. Organizational commitment and spiritual intelligence have an indirect relationship that is mediated by job satisfaction. (Awais, Mutstabsar 2015).

SQ could be utilized in policy development and future research on human resource management in firms since it increases the rates at which individuals manage their personal and professional lives. (Singh, 2021) An individual who has a good combination of SQ and EQ could produce a balanced generation to have strong self-defence to face life challenges. It is evident that the level of spiritual and emotional intelligence significantly influences an individual’s level of achievement. The stability in the levels of SQ and EQ not only derives achievements but also develops a positive attitude amongst employees. High level of SQ will also help students to control their laziness and avoid all other emotional disturbances which could lead negative impacts on their level of achievement. Therefore, SQ is much more related with EQ, these are inseparable. The respondent's emotional intelligence and job happiness are positively correlated in a meaningful way. EQ changed based on the type of work. Age and gender did not have an impact on the emotional intelligence score. (Mustafa, 2014, Mohammed Zaid). Emotional intelligence and job happiness are positively correlated among bank workers in the Greek banking industry. The relationship between emotional intelligence (EQ) and job satisfaction was examined, along with how it affected employee demographics including age, gender, education, and prior work experience in the Greek banking industry. Employees' emotional intelligence varies depending on their gender, age, marital status, and job title in the banking industry. It also affects how employees live their daily lives and modifies their degree of job satisfaction. (S Papathanasiou, 2014).

The production of job satisfaction is significantly influenced by emotion. They claimed that workers who have a greater emotional intelligence quotient (EQ) than those who have a lower EQ are able to modify their particular impacts, which increases job satisfaction. Additionally, EQ can affect workers' job happiness and effective management in addition to creating a positive work atmosphere. Ghani investigated the role of emotional intelligence

in lowering occupational stress among banking organization personnel in managerial and non-managerial roles. It was also discovered that emotional intelligence has a moderating influence on both job stress and job happiness. EQ also functions as a moderating factor. Employee job satisfaction rises as a result of the stress process, which also lowers employee job discontent. As per Akhthar there is a positive correlation between job satisfaction and emotional intelligence. He proposed that educators ought to possess the ability to control both their own and others' feelings in order to positively impact both parties.

RESEARCH METHODOLOGY

This study is a systematic review that is conducted with the help of secondary data. The data has been collected from various sources: such as books, journals, and websites etc. Sample size is 40 articles, from the period 1988-2021. The variables are Emotional Quotient, Spiritual Quotient, Burnout and Job Satisfaction.

OBSERVATIONS AND FINDINGS

After the review of the literature, we can find an obvious relationship between EQ and SQ with Burnout and Job Satisfaction. They are interlinked to each other and have an inverse relationship with each other. The study indicated that employees are satisfied at their work, and it is substantially influenced by their Spiritual Intelligence. Decreased level of SI and EQ have resulted in higher levels of burnout and decreased job satisfaction. Higher levels of EQ is sufficient to allow employees to contribute more effectively to changes in the organization. EQ along with SQ increases an individual ‘s capability to take up more responsibility in decision-making. EQ and SQ in the workplace can assist in better adjustment and increase the productivity and performance of each individual and organization. Future study in this area might convey that IT professionals with high spiritual quotient are better performers and are able to contribute more and increasing individual productivity and the overall performance of the company. In the current scenario, it is essential to integrate both SQ and EQ to attain maximum employee performance. Increasing the levels of EQ and SQ can help the organizations as employees will be able to contribute more efficiently and adapt to the changes more effectively. It will psychologically enable the employees to take up their responsibilities more diligently. SQ and EQ can contribute towards the development of each individual employee as well as the organisation.

CONCLUSION

People generally prefer to view a meaning and value in their life and work as well as to make a difference to the life of others. Spiritual Intelligence is the main reason that leads to ultimate level of intelligence without any religious bias and helps to understand self in a better way. IT Professionals as contributors for the economic development of the nation require to be aware of their SI. Hence Spiritual Intelligence is very important. It impacts the burnout and job satisfaction levels of IT employees. So, organizations should create circumstances and factors that could enhance their Spirituality positively.

EQ and SQ are very much important for an individual to be versatile at their workplace. So employers should encourage, and motivate employees. EI and SI lead to the development of an individual's careers by improving their ability to adapt to situations in a positive way.

IMPLICATIONS

Through the results of this study, IT professionals will be able to analyze their level of SQ and EQ. They can assess what are the situations wherein their level of SQ and EQ decreases and how it impacts their level of Burnout and Job Satisfaction. The companies will be able to identify the situations during which the level of SQ and EQ of employees tend to decrease which can affect their Job Satisfaction and Burnout which can have an impact on their overall performance. They can subsequently make sufficient changes in the work policies. The results of the study could ideally aid HR managers of IT companies to modify existing HR policies considering the level of their SQ and EQ.Further studies are required to identify further impact of EQ and SQ

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Embracing Spiritual Leadership in an Evolving World: A study of Teilhard de Chardin's Perspective

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"At the heart of every being lies creation's dream of a principle that will one day give organic form to its fragmented treasures. God is unity" (Teilhard de Chardin).

In the ancient tapestry of Roman mythology, Janus, the god of beginnings and transitions, stands as a symbol of duality, guiding us through the thresholds of time. Much like the month of January, named in his honor, which gazes both backward and forward, Janus embodies the essence of evolution and change.

Renowned mythologist Joseph Campbell reaches into the idea that mythology mirrors the conflicts within the energies shaping life. For him, myths are windows to transcendent realities, personifying the conflicting energies within us and the universe. It's a perspective that views deities not as concrete facts but as metaphors, guiding us towards a unitive consciousness.

The prevalent dualistic thinking in Western culture often creates apparent divisions: good versus evil, light versus darkness, matter versus spirit. However, the call to spiritual leadership is a journey toward reconciling these perceived opposites, transcending binary perceptions to see the unity dwelling in liminal space.

Contemplatives, akin to the spiritual Janus represented by Jesus, regularly inhabit liminal spaces. Liminality, derived from the Latin limen, meaning "threshold," refers to the transitional space that mirrors the Christ consciousness, bridging the visible and invisible worlds. It's a path that reconciles tensions, a narrow way leading to the kingdom life.

Liminal space, and the consciousness it embodies, becomes the realm where apparent contraries find reconciliation. It's a space where spirituality is not about division but about inclusivity and unity, where the "single eye" perception corrects the illusion of duality.

The analogy of the seashore illustrates the relationship between spirit and body, much like the union of land and water. The spiritually awakened soul recognizes itself as a sanctuary, a temple where body and spirit celebrate their joyful union. Scripture's reference to the "Bride of Christ" reflects this mystical union, where 'Bride' and 'Christ' coexist seamlessly, fostering generativity and creativity.

Physicists today acknowledge that everything is connected through slowed-down light and sound waves. This interconnectedness echoes the cosmic awareness of

Christ, the "Light of the World," encompassing all scales of creation. Teilhard de Chardin's vision extends this cosmic consciousness, envisioning a world where all masks are cast off, revealing Christ Omega as the divine force orchestrating the global stage.

Teilhard's synthesis and Thomas Berry's New Universe Story advocate for a new science of humanity rooted in the physics of Spirit, expanding our understanding of Christ to cosmic proportions. The need for a comprehensive, post-modern Cosmo theology is paramount in embracing this evolving universe.

In conclusion, spiritual leadership is about navigating the thresholds of existence, embracing the unity that transcends apparent dualities. As we embark on this journey, inspired by the wisdom of Janus and the spiritual consciousness embodied by Jesus, we are invited to step into the expansive realm of liminality, where the eternal now unfolds, and a new understanding of our place in the cosmos emerges.

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